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Diagnostic

ETUDE DE SUIVI DU TRAIT DE COTE ET SCHÉMA DIRECTEUR LITTORAL DE L'AFRIQUE DE L'OUEST

DIAGNOSTIC NATIONAL EN GAMBIE

2010

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National Environmental Agency

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ACKNOWLEDGEMENT

We would like to take this opportunity to thank West African Economic and Monetary Union (UEMOA) and International Union of Conservation of Nature (IUCN) regional office in Mauritania for initiating, providing funding and implementing such an important regional studies including eleven (11) countries (Gambia, Ghana, Guinea Bissau, Guinea Conakry, Liberia, Mauritania, Senegal, Togo, Sierra Leone, Ivory Coast and Benin) in the West Africa Sub-region.

Our sincere appreciation goes to all the institutions and experts that contributed in one way or the other in providing relevant information for this national diagnostic study without which the document might not be completed.

PART I. ANSWERS AND DEVELOPMENTS

1. Introduction

The Gambia is among the eleven (11) countries in the West African sub region currently conducting national study on coastal erosion. The study is part of West African Economic and Monetary Union's (UEMOA) regional programme to fight coastal erosion, which International Union for the Conservation of Nature (IUCN) has been given the responsibility for producing a regional diagnostics and a development scheme for the West African Coastal Area.

As part of the first phase of the West African Economic and Monetary Union's (UEMOA's) Regional Programme to Fight Coastal Erosion, the UEMOA gave the International Union for the Conservation of Nature (IUCN) the responsibility for producing a regional diagnostics and a development scheme for the West African coastal area. Within this regional study, the National Environment Agency coordinated the national skills resources within The Gambia that were assigned to:

- Gather basic information on the different aspects of coastal development and collect "what the experts say" about the state of the coastal systems.
- Produce reports analyzing the situation and describing the coastal issues at stake with regard to coastal erosion and climate change in social, economic, environmental and more generally developmental terms.

2. Objectives of the study

The objectives of the study are:

- To provide the countries in the sub-region with a coordinated, forward-looking vision of coastal risks and the measures to be anticipated to cope with them.
- To produce a regional plan for adaptation to climate change and prevention of coastal risks in West Africa.
- To ensure that the work to be done contributes to building long-term dynamics at the service of development of the coastal areas of West Africa.

3. Methodology

The National Environment Agency (NEA) is the institutional focal point conducting the study in the Gambia, and a multi sector approach has been used to assign various stakeholders to provide information regarding the study. Upon return from the consultation meeting with the IUCN consultant Dakar, Senegal on the 18th December, 2009, a coordinating team was set up within the National Environment Agency to be responsible for the coordinating all the activities under the study, as well as identifying the institutions having stake in the coastline of the Gambia.

The National Environment Agency convened experts in different national institutions in responding to this initiative to promote close collaboration and cooperation among a number of institutions and an interdisciplinary approach to tackling the emerging problems in the coastal zone. The Gambia diagnostics study on coastal erosion was based on existing documents and information. The work of the national experts focused on two aspects: (1) the diagnostics' capacity to summarize and formulate key issues; and (2) ranking and prioritizing the issues.

4. Overview

The Gambia, located between 13°N and 13°N latitude on the west coast of Africa, is about 480km in length and 50km wide at its widest westerly end facing the Atlantic Ocean, and tapers towards the east to about a width of about 30km. It has an 80km long coastline and a continental shelf area of about 4000Km² that is rich in marine fish resources. Found up to 200kms inland from the mouth of the River Gambia, the estuarine areas have a dense mangrove forest (67,000 hectares, FAO/UNEP, 1996), which provides breeding and nursery grounds for commercial marine fish species, shrimps and other valuable aquatic organisms.

The total land area of The Gambia is about 11,300Km² with about one fifth of the surface area occupied by the River Gambia, which flows 1680 km from the Futa Jallon highlands in the Republic of Guinea to the Atlantic Ocean and divides the country into the North and South Banks. The Gambia has a Sudano-sahelian climate characterised by a long dry season from November to May and a short rainy season from June to October.

According to the 2003 census, The Gambia has a population of more than 1,300,000 with an annual growth rate of 2.4%. With a population density of 97 persons per km², The Gambia is ranked among the four most densely populated countries in Africa. The urban growth rate is estimated to be 8% annually and 52% of the population live in the Greater Banjul Area (GBA) on the strip of coastal land that represents only about 18% of the total surface area of The Gambia.

The coastline extends about 80km between the Northern and Southern international boundaries with Senegal. The literature (Barrow, 1991; UNEP, 1998) indicates that, on the average, the entire coastline is eroding at a rate of 1 to 2m per year. Using these figures, the total amount of land lost annually amounts to 2.5 to 3 ha or 200,000- 300,000 m3 (UNEP, 1998). The rate of erosion is very variable, however, and is much higher in critical areas such as the developed coastline around Banjul and the former sand mining areas, notably Bijilo beach. More than 50% of The Gambia's population lives in the coastal area and more than 60% of economic activities (fisheries, tourism, forestry, agriculture, marine transportation, quarrying and industrial activities) are concentrated there.

Coastal erosion has been identified as one of the most devastating environmental problems in the coastal zone of the Gambia, and it has serious implications for the economy of the entire country. It has already destroyed tourist facilities, infrastructure, and historic and cultural sites. It has posed serious threats to the highway linking Banjul to the rest of the country. Coastal land lost due to erosion poses similar threats to components of the natural ecosystems such as the mangrove forest areas and wildlife parks.

1.1 PROTECTION AGAINST COASTAL EROSION

1. Background

The coastal zone of The Gambia stretches from Buniadu Point and Karenti Bolong in the North to the mouth of the Allahein River in the South. The open coastline measures approximately 81 km and consists of sandy shores, cliffs and to lesser extent mangrove wetlands. 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 alongshore direction and the effect of sea level rise.

Along the Atlantic coast, the alongshore transports and the natural gradients in these transport 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.

Along the coast between Oyster Creek and Banjul the erosion is the result of the development of the sand-spit at Toll Point. Due to local accumulation of sand in the spit, the supply to the coast east of the spit is strongly reduced.

For The Gambia the coast is one of its principal natural resources. Tourism, one of the driving forces of the country's economy, depends to a large extent on the coast.

As discussed above the small net transports along the coast of The Gambia can be partly explained by the natural subdivision into different cells.

Accelerated Sea Level Rise, due to climate change might, however, change the situation in future.

In 2000 a consulting Dutch company addresses the matter by carrying out a Feasibility Study of the erosion problem of the Gambian Coast. Based on this Feasibility Report a detailed design of protection works has been carried out. The project locations were based on an economic assessment of economic, social and cultural coastal values.

2. Developed zones : 4 intervention areas under the 2000 - 2005 coastal protection project :

A detailed design was prepared for:

- The dredging of a sand trap to reduce the siltation of the ferry channel in Barra and the dredging of the access channels to the ferry landings in Barra and Banjul to improve the access of the ferries was one of the intervention areas of the project.
- Construction of works started with the construction of the Banjul Beach Nourishment: 1,400,000 m3 of offshore dredged sand was distributed along a stretch of approximately 3km to protect the capital Banjul, two cemeteries and the Banjul highway against further erosion.
- Approximately 35,000 m3 of rock of various gradings were produce for the construction of a T-groyne in Bakau to protect real estate and fishing activities and the construction of five groynes and a revetment in Cape Point to protect hotels and preserve beach recreation.

The functional design of the groynes in this area is based on the following requirements and conditions in the area just east of Cape Point

- The scheme is primarily a coastal defense structure. The main objective of the scheme is to protect the hotel buildings and not to guarantee a minimum beach width for recreation. Still, the scheme should aim at attractive beaches for the hotels at Cape Point.
- The scheme should not interrupt the large scale sand bypass system from Cape Point to the downdrift coast.
- The supply of sand around Cape Point to the protected area fluctuates strongly. It is estimated to vary between 30,000 and 120,000 m3/yr.
- The dominant waves make a large angle with the shore-normal.

3. Layout

In the area east of Cape Point there may be periods with relatively small sand supply. The scheme is designed in such a way that some beach remains in the groyne sections during periods of very small updrift supply of sand.
In general, the shoreline in a (bypassing) groyne section will tend to assume an orientation that corresponds with the updrift supply. On the basis of the UNIBEST computations the following characteristic shoreline orientations are expected for various updrift supplies, if the waves are not significantly affected by the structures.

Updrift supply (m3/yr)	Beach orientation in groyne section (°N)
30,000 (low)	15
70,000 (average)	30
120,000 (high)	unstable, bar formation

Figure 1 : Showing coastal cells of the Gambia

Figure 2 : Groyne system at Cape Point

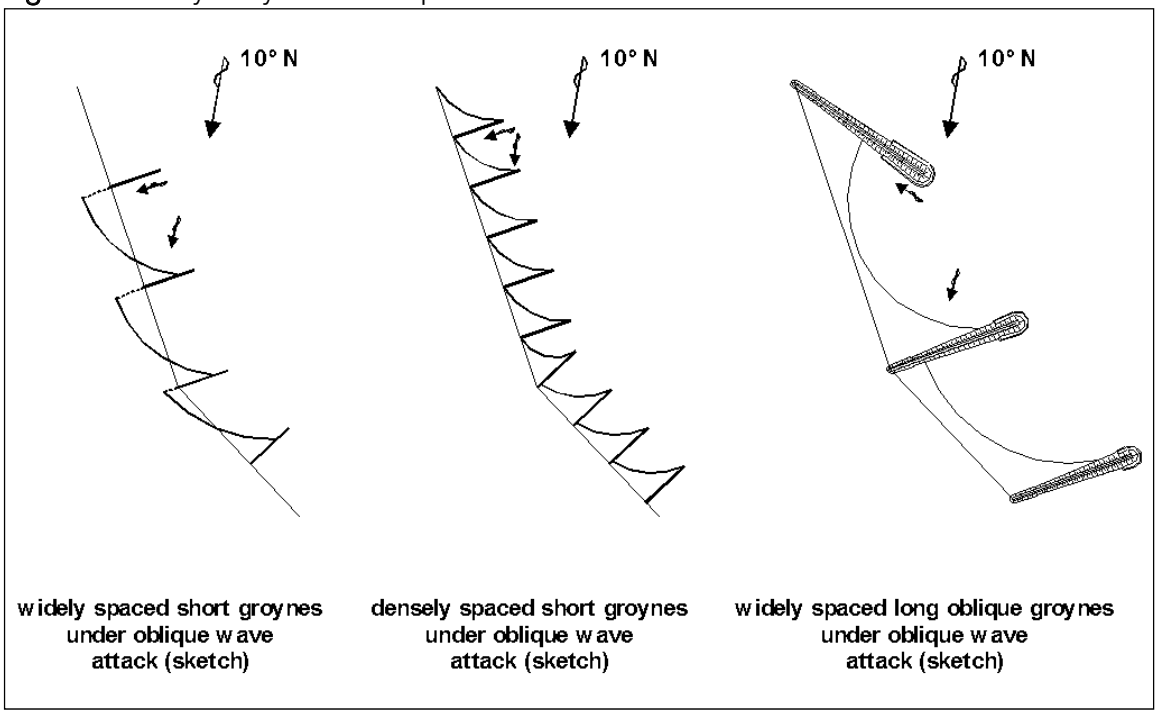


Figure 3 : Protective schemes with groynes at Cape Point (cell 3b)

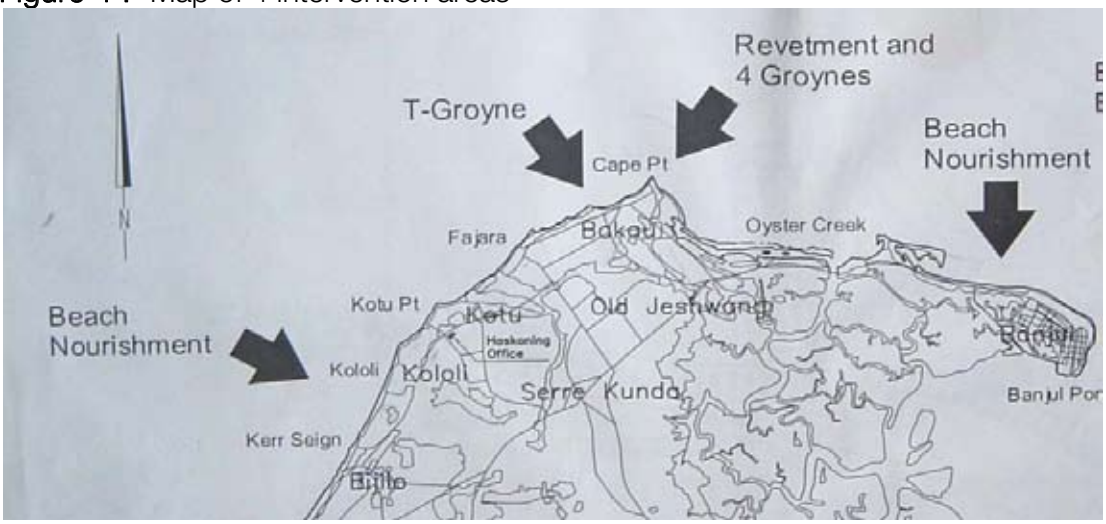
This illustrates that during a low updrift supply, the beach will tend to make a large angle (50 to 60°) relative to the overall shoreline. As a consequence of this large re-orientation of the beach, in a scheme of short groynes orientated normal to the coast, considerable volumes

of sand will be lost from the groyne sections as illustrated in Figure 5.5 (left and centre sketch). The situation can be improved by constructing relatively long groynes under an angle with the shoreline. The objective of these oblique groynes is not only to arrest the sand but also to change the shape of the beach in the groyne section in such a way that some sand remains in the groyne sections, also during periods of low updrift supply. This reshaping of the beach is achieved by wave diffraction of the waves around the heads of the structures. As a result of the wave diffraction the direction of the incoming waves will change in the groyne sections, to a more shore-normal direction. For a more detailed description of the computations reference is made to Appendix B. On the basis of the computed diffraction patterns the shape of the shoreline in the groyne sections was predicted with the model UNIBEST. For the computations the influx of sand in the groyne system was considered negligible.

4. A beach nourishment in Kololi to protect hotels and preserve beach recreation was done with 1,000,000 m3 of offshore dredged sand.

a. intervention areas

Figure 4 : Map of 4 intervention areas



b. Design of

- Banjul Point – Palm Grove
- Cape Point – Bakau Groynes/Revetment

c. Project Implementation

d. undeveloped areas/areas with immediate attention

Senegambia/Kairaba Beach Hotels Seafront (Kololi Area)

The nourished beach have been decreasing in meters since the project completion. The rate of decrease is estimated to be 2 meters monthly, and this rate is expected to accelerate during the rainy season. Powerful wave energy force attacks the beaches and there is a need for devices to minimize the force. In addition, storm waters from the hotels are

channeled through drainage pipes to the beach, and this is contributing to the problem of coastal erosion.

Kotu Stream Outlet

The stream's outlet to the sea is dynamic. It was observed that always in January the outlet is close to the Palm Beach Hotel. However, by the middle of the year, it moves towards the Sunset Hotel. It creates a deep depression at the outlet that makes it difficult to cross to the side.

Radio SYD/Mile Two

The recommendations of the feasibility study for the Completed CPP included the complete filling of the lagoon. However, at the time the contractor felt that the lagoon would be filled up naturally. Instead, the contractor did not fill up the lagoon completely, and now the lagoon is expanding and eroding the nourished beach. The concern is that if it is not quickly addressed, the lagoon will be expanding greatly, eroding much of the nourished beach, and widening landwards towards the Main Highway.

1.2 STRUCTURAL HABITAT PROJECTS OR COASTAL INFRASTRUCTURE

Over the past decades, the coastline of the Gambia as in many other places has been developed intensively and presently is occupied up to the very limits of the sea. This occupation includes residential, commercial and fish landing facilities and following the tourist boom of the 1970's, a significant number of beach hotels.

Viewing the dynamics of the coast in relation to the littoral drift regime and the effects of sea level rise and mining activities, over the years the sea has encroached at several places to such an extent that valuable structures and socio- cultural heritages are threatened or already even damaged. As such the experienced erosion problems can be intimately linked to the socio-economic pressure on the coast.

For the purpose of this study, the list of structural habitats identified along the coastline includes all hotel infrastructures in progress or planned, fish landing sites, mining quarries (old and new sites), salt production sites, horticulture gardens, poultry rearing. List of protected areas etc.

1.3 LEGISLATORY AND LEGAL FRAMEWORK

1. Background

Environmental issues are trans-boundary and affect national, sub-regional, regional and global communities and therefore require the adoption of common approaches to address them. Recognition of the importance of International Environmental Conventions in helping to promote international co-operation in environmental management, protection and conservation has motivated The Gambia Government's participation in several international conventions. As part of her commitment to the management of the global environment, The Gambia is a Party to a number of Multilateral Environmental Agreements (MEAs) and with most of their associated conventions and protocols.

2. Institutional and Legal Framework in The Gambia

The Gambia has been a forerunner in environmental awareness and management. Concerted and systematic public policy actions to deal with natural resource degradation commenced with the proclamation of the Banjul Declaration of 1977 and the adaptation of the country's institutional framework for sustainable management of the natural environment.. In a concerted effort to address the environmental and natural resources management problems of the 1970s and 1980s, the Government prepared and adopted the Gambia Environmental Action Plan (GEAP) in 1992. The GEAP was intended to provide a legislative and policy framework for the management of The Gambia's environment. It identified the major environmental issues of concern and proposed Government actions to address them. The GEAP is an umbrella framework which serves to avoid duplication and segregation in the various national action programmes. The National Environment Management Act (NEMA) 1994 is the principal piece of legislation for environment management in The Gambia. However, the matter of sound environmental planning and management as enshrined in the NEMA is cross sectoral and cannot be treated in isolation of the other legislation relevant to the other phenomena that comprise the environment.

Government has introduced *The Gambia Incorporated . . .VISION 2020* development program in which it commits itself to conserve and promote the rational use of the nation's natural resources and environment for the benefit of present and future generations in a manner that is consistent with the overall goal of sustainable development at all levels. VISION 2020 is in harmony with the Gambia Environment Action Plan (GEAP), as well as the MEAS such as the post-Rio conventions to which The Gambia is a Party.

3. The National Environment Management Act (NEMA)

The NEMA was enacted by an Act of Parliament in 1994 and it provides the legal framework for the control and management of the Environment.. Institutional mechanisms such as the National Environment Management Council (NEMC), the National Environment Agency (NEA), the Technical Working Groups (TWG) and Local Environment Committees (LEC) were established under this Act. This Act aims to facilitate the implementation of international treaties.

The Gambia is a signatory and a Party to several regional and international and treaties agreements related to coastal and Marine Management.

4. Regional Agreements

The Gambia has been involved in the preparation and/or implementation of the following regional agreements.

a. Convention for Cooperation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region (WACAF)

The Convention entered into force in 1984 and was ratified by The Gambia the same year. The objective of this Convention is to protect the marine environment, coastal zones and

related internal waters falling within the jurisdiction of the States of the West and Central African Region. The Convention makes provision for the prevention, reduction, combat and control of pollution and coastal erosion. The Convention also makes provision for the protection and preservation of rare and fragile ecosystems and the development of technical and other guidelines regarding environmental impact assessment of development projects. The Gambia has actively participated in the WACAF regional action plan for the control of marine pollution and the management of marine and coastal resources developed under the auspices of the regional seas programme of UNEP.

b. Bamako Convention on the ban of the Import into Africa and the Control of Transboundary Movement of Hazardous Wastes within Africa (1991).

The objectives of the Bamako Convention are to protect human health and the environment from dangers posed by hazardous wastes by reducing their generation to a minimum in terms of quantity and/or hazard potential.

As a member of African Unity (AU), The Gambia is a party to the Bamako Convention. All Parties are obliged to prohibit the importation of all hazardous wastes, for any reason, into Africa from non-Contracting Parties (Article 4.1). The Bamako Convention places the duty on the Parties to monitor their respective waterways to ensure that no dumping occurs. The Gambia as a Party to the Convention report annually to the Secretariat any hazardous wastes as required.

5. International Agreements

The Gambia has been involved in the preparation and/or implementation of the following international agreements.

Table1 : International Agreements and Conventions ratified by The Gambia.

AGREEMENT	FOCAL POINT	FOCUS AREA
1. UN Convention on Law of the Sea (UNCLOS)	Fisheries dept	Fisheries and continental shelf
2. UN Convention on Biological Diversity (UNCBD)	Dept of Parks and Wildlife Management	Biodiversity Conservation.
3. Cartagena Protocol on Bio safely. to the Convention on Biological Diversity (Cartagena Protocol)	Dept of Parks and Wildlife Management	Protection from effects of modern technology
4. Convention on Wetlands of International Importance (RAMSAR Convention)	Dept of Parks and Wildlife Management	Wetlands
5. Convention on International trade in Endangered Species of Wild Fauna and Flora (CITES)	Dept of Parks and Wildlife Management	Endangered species
6. Convention on the Conservation of migratory Species of wild Animals (CMS Convention)	Dept of Parks and Wildlife Management	Migratory species
7. UN Convention to Combat Desertification (UNCCD)	Forest Department	Desertification

8. UN Framework Convention on Climate Change (UNFCC)	Dept on Water Resources	Climate change
9. Kyoto Protocol to the UN Convention on Climate Change (Kyoto Protocol)	Dept on Water Resources	Climate change
10. Bamako Convention on the ban of the Import into Africa and the Control of Trans-boundary Movement and Management of Hazardous Wastes within Africa. (BAMAKO Convention)	NEA	Trans-boundary Movement and Management of Hazardous Wastes within Africa
11. Convention for Cooperation of the Protection of the Marine and Coastal Environment of West and Central Africa region. (ABIDJAN Convention)	NEA	Marine and Coastal Management
12. Basel Convention on the Control of Trans-boundary Movements of Hazardous wastes. (BASEL Convention)	NEA	Trans-boundary Movements of Hazardous wastes
13. Convention on the Prior informed Consent procedure for Certain Hazardous Chemicals and Pesticides in International trade. (Rotterdam (PIC) Convention.)	NEA	Hazardous Chemicals and Pesticides
14. Convention on Persistent Organic Pollutants. (Stockholm (POPs) Convention)	NEA	Persistent Organic Pollutants.
15. Convention on the Protection of the Stratospheric Ozone Layer. (Vienna Convention)	NEA	Protection of Ozone Layer
16. Montreal protocol on Substances that Deplete the Ozone Layer (MONTREAL Convention)	NEA	Protection of Ozone Layer
17. Convention on the Prevention of Pollution from Ships (MARPOL Convention)	GPA	Marine pollution.
18. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter from Ships. (LONDON Dumping Convention)	GPA	Marine waste dumping
19. Convention on the Protection of Cultural and Natural Heritage (World Heritage Convention)	National Council of Arts and Culture	Protection of Heritage sites

a. Convention on Wetlands of International Importance especially as Waterfowl Habitat (The Ramsar Convention)

Recognising the fundamental ecological functions of wetlands and their economic, cultural, scientific and recreational value, the objective of this Convention is to stem the progressive encroachment on and loss of wetlands now and in the future. The Convention entered into force in 1975 and was ratified by The Gambia in 1996. The Convention makes provisions for Parties to designate at least one national wetland for inclusion in a List of Wetlands of International Importance, to establish wetland nature reserves, co-operate in the exchange of information and train personnel for wetland management. . The Department of Parks and Wildlife serves as the national focal point. In the Gambia, the Baobolong, Tan-Bi and Niumi Wetlands have already been designated as Ramsar Sites.

b. Convention on Biological Diversity

The Convention entered into force in 1992 and was ratified by The Gambia in 1994.. The objective of the Convention is to conserve biological diversity, promote the sustainable use of its components, and encourage equitable sharing of the benefits arising out of the utilisation of genetic resources.
With regards to protection and conservation of endangered habitats, Government's commitment to the preservation of flora and fauna for future generations is contained in the Banjul Declaration of 1977. The first wildlife protected area was established in 1977. The Gambia Biodiversity legal and institutional profile was developed in 1997 and forms the basis for subsequent amendments of sectoral laws which have a bearing on issues addressed under the Convention.

c. United Nations Framework Convention on Climate Change (UNFCCC)

As one of the low-lying countries in the world The Gambia is likely to be affected by climate change and therefore attaches great importance to climate change issues. The Gambia signed the United Nations Framework Convention on Climate Change (UNFCCC) at Rio in June 1992. The Convention was subsequently ratified in 1994. The Gambia has also ratified the Kyoto Protocol of UNFCCC on 1st June 2001. The Protocol sets mandatory targets on greenhouse gas emissions for the world's leading economies, and among other things seeks to mitigate emissions whilst favouring a sustainable development path. The Department of Water Resources is the Lead Agency and Chair of the constituted National Climate Committee (NCC). The Gambia has so far completed some major studies relating to the Convention. A national Greenhouse Gas inventory was carried out in 1993 and updated in 2000. The inventory identified all the major sectors which are emitters of greenhouse gases as well as the quantities emitted per sector. Based on the findings of the inventory, National Climate Action Plan for the Gambia was prepared. The action plan aims to influence a number of strategies, which are mainly of adaptation to Climate change. The Gambia also carried out Mitigation Studies in the Energy, Livestock, Land use Change and Forestry sectors. .

As a signatory to the United Nations Framework Convention on Climate Change (UNFCCC), The Gambia participates fully in the activities of the Convention at all levels. The Gambia submitted her First National Communication to the Conference of Parties to UNFCCC in

December 2003. Currently, it is in the process of preparing the second National Communication document. A National Adaptation Programme of Actions (NAPA) on climate change has also been developed.

The Gambia is a net sink of greenhouse gases yet one of the most vulnerable to the impacts of climate change. The NAPA has highlighted the need for interventions in the various socio-economic sectors of the country in order to reduce the negative impacts of climate change. Funding is currently being sought to implement some of the identified interventions. Until funding is made available to enable the implementation of hard projects, the current situation is that of soft responses.

d. The United Nations Convention to Combat Desertification (UNCCD)

The Gambia signed the Desertification Convention in June 1994, and subsequently ratified it in January 1996. To date, more than 165 countries and institutions are Parties to the Convention.
UNCCD marks a conceptual break-through since it not only identify climatic, social and behavioural causes for the spreading menace of global desertification, as traditionally is the case, but lays equal emphasis on the need to create a conducive institutional framework. The Lead Agency for this Convention is the Department of Forestry.
After the signing and ratification of the Convention to Combat Desertification, the newly formed National Desertification Task Force working through the ANR Working Group, initiated a participatory process for the elaboration of the National Action Programme to Combat Desertification (NAP). This was in fulfilment of the provisions of Article 10 of the Convention and in line with the country's environmental policy framework. The exercise was jointly undertaken with the preparation of the action programmes for the Convention on Biological Diversity (CBD) and UN Framework Convention for Climate Change (UNFCC) as well as the Local Environmental Action Plans (LEAPs).

The NAP is a comprehensive action plan encompassing all the major areas contributing to the process of desertification in the country and will be implemented over a period of 15 years. However, the implementation of the NAP at the country level is limited by financial and capacity constraints.

e. Convention for the Protection of the Ozone Layer

Realizing the dangers of ozone depletion, member countries of the UN including The Gambia adopted the Vienna Convention (1985) for the protection of the ozone layer, and the Montreal Protocol (1987) on Substances that deplete the ozone layer. The Government of the Gambia showing its firm commitment to phasing–out consumption of Ozone Depleting Substances (ODSs) ratified the Vienna Convention for the Protection of the Ozone Layer in July 1990 and the Montreal Protocol on Substances that Deplete the Ozone Layer in July 1990. The Gambia has also ratified the London Amendments to the Montreal Protocol in March 1995. . The Gambia ratified amendments to the Montreal Protocol in London in 1990 and the Copenhagen, Montreal and Beijing amendments in 2008.

f. The Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal

Transboundary movement of wastes refers to movements across country boundaries. It is a movement from one state to another. In recent years there has been increased production of wastes that pose a serious threat to humans as well as the environment. This has been mostly a direct result of the need for humans to make their life more comfortable. In their quest for better lives, humans have in their production systems released wastes that are increasingly proving to be very dangerous to their own existence.

The Gambia joined the Basel Convention (give date) and the national focal point is the National Environment Agency. This was as a result of concern to ensure that hazardous waste movements across borders are effectively controlled to ensure protection of human health and the environment.

g. Stockholm Convention on Persistent Organic Pollutants

The Gambia acceded to the Stockholm Convention on Persistent Organic Pollutants (POPs) in 2002. By acceding to the Convention The Gambia shows concern and commitment to protect the health of her population and environment from the risks of POPs.

The POPs Convention entered into force on the 17th May, 2004 and aimed at protecting human health and the environment from persistent organic pollutants. POPs are chemical substances that result from industrial processes, chemical manufacturing and incineration. They are found in food, water, soils and air. The problem about POPs is they are persistent in the environment, resist chemical and biological degradation and can be transported through air, water and migratory species across international boundaries and deposited far from their place of release, where they accumulate in terrestrial and aquatic ecosystems.

1.4 WEATRHER FORECAST AND CLIMATOLOGY

1. Background

Weather forecasting is the application of science and technology to predict the state of the atmosphere for a future time and a given location. Human beings have attempted to predict the weather informally for bob, and formally since at least the nineteenth century. Weather forecasts are made by collecting quantitative data about the current state of the atmosphere and using scientific understanding of atmospheric processes to project how the atmosphere will evolve.

Once an all-human endeavor based mainly upon changes in barometric pressure, current weather conditions, and sky condition, forecast models are now used to determine future conditions. Human input is still required to pick the best possible forecast model to base the forecast upon, which involves pattern recognition skills, teleconnections, knowledge of model performance, and knowledge of model biases.

2. Meteorology

Meteorology is the interdisciplinary scientific study of the atmosphere that focuses on weather processes and forecasting (in contrast with climatology)..

3. Climatology and weather prediction

The climate of a place may be defined as a "composite" of the long-term prevailing weather that occurs at that location. Climate can be measured quantitatively by calculating the long term averages of different climate elements such as temperature, precipitation, wind, humidity, rainfall, cloud cover and etc). A complete description also includes the variability of these quantities, and their extreme values.

Climatology is the study of long-term weather patterns and variations, usually over a number of years. It is concerned with both the description of climate and the analysis of the causes of climatic differences, and more recently climate changes and their practical consequences. Climatology investigates the same atmospheric processes as meteorology, but also seeks to identify the longer-term influences on climate, such as the circulation of the oceans and the small variations in the intensity of sunlight.

4. Marine Meteorology

Marine meteorology, deals primarily with the physics of the marine atmosphere including the study of atmospheric phenomena above the oceans, their influence on shallow and deep water, and the influence of the ocean surface on atmospheric processes (example El Niño & La Niño, storms, waves & etc). Marine Meteorology is not yet introduce in The Gambia Meteorological service, but plans are on the way in the operation.

Scientists and other agencies use a variety of tools and techniques to monitor and forecast changes in the Pacific Ocean and the impact of those changes on global weather patterns. In the tropical Pacific Ocean, El Niño is detected by many methods, including satellites, moored buoys, drifting buoys, sea level analysis, and expendable buoys. Many of these ocean observing systems were part of the Tropical Ocean Global Atmosphere (TOGA) program, and are now evolving into an operational El Niño (warming of the Sea surface temperatures in the equatorial and central pacific) observing system.

Good forecasting is very much dependent on verification provided by the 10,000 mariners who participate in the Voluntary Observing Ship Programme by sending in regular weather reports while at sea. Their data help continually to update the theoretically derived forecasts.

5. Specific studies conducted on the theme of Adaptation to Climate Change

Climate change is an entirely natural process that occurs over a wide range of timescales, from a few years to hundreds of millions of years. The challenge faced by climate scientists is not so much detecting the changes in climate as attributing them to a specific cause - and importantly, making the distinction between natural climate variability and climate

change which has been forced by human activity. Climate varies from place to place depending on latitude, distance to the sea, vegetation, relief, etc. Climate varies in time: from season to season, year-to-year, decade to decade on much longer time-scales.

6. National Adaptation Plan of Action to Climate Change (NAPA)

Under the United Framework Convention on Climate Change (UNFCC), countries are required to report two things Emission of Green House Gases and what actions are they taking to reduce the impacts of Climate Change. NAPA is to communicate priority activities addressing urgent & immediate needs & concerns of Least Development Countries (LDC)s, in relation to adaptation to the adverse effects of climate change. Low capacity of LDCs renders them in need of immediate & urgent support to start adapting to current and projected adverse effects of climate change. Activities proposed through NAPAs would be those whose further delay could increase vulnerability or lead to increased costs at a later stage.

Socio-economic sectors, Agriculture, Energy, Fisheries, Health, Rangeland and livestock, Water resources, Ecosystems, Coastal zone and Forests & woodland. Priority activities identified through NAPA process are Climate monitoring, Coastal Zone Restoration and Fisheries.

NAPA & Millennium Development Goal (MDGs)

NAPA & Millennium Development Goal (MDGs) share common objectives of promoting national food security, & enhancing livelihoods of those actively engaged in agric, livestock, & fisheries sectors. NAPA provides a check on progress towards attainment of MDGs. There are many commonalities between NAPA & Poverty Reduction Strategic Plan (PRSP) in agriculture, fisheries, livestock, health, forestry & water resources.

Prior to 2007, several studies were conducted; some specifically others relatively, to the theme of climate change adaptation in the Gambia. The most notable document of these specific studies on adaptation of Climate Change is the Gambia National Adaptation Programme of Actions (NAPAs) 2007. Background documents used to develop the Gambia NAPA 2007 are all relevant to the theme of climate change adaptation as they were specific studies conducted.

1.5 MARINE AND LAND PROTECTED AREAS

1. Background

There are currently seven protected areas in the Gambia under the management of the Department of Parks and Wildlife Management (DPWM). The total land area covers 42,000 hectares which equate to 4.2% of the total land area of the Gambia. The DPWM aims to have 5% of the land area ultimately protected and including example of all major habitats within the country. It also aims to manage and develop these protected both for tourism and conservation and to carry out research to provide baseline information necessary for the formulation of management plans.

Apart from the wildlife protected areas, there is an additional sixty-six forest park that are also legally considered as protected areas, under the management of the Forestry Depart-

ment which was established in 1976 under the state forest law 1968. Before the creation of Wildlife Conservation Department by the wildlife act of 1977, the Wildlife Conservation was a unit under the Forestry Department. These protected areas as exemplary of ecosystem types are being designated and managed as demonstration sites for biodiversity conservation. Thus this approach intends to ensure regulating sustainable use of biodiversity in order to meet today's needs and aspirations while ensuring the continuous availability of the resources for future generation uses.

2. Status and trend

The Gambia's coastline stretches from Buniadou point and Karenti Bolong in Nuimi, North bank Region to the Allahein River in Kombo South, Western Region measuring about 80 km in length. However the coastal zone includes the coastline plus 200km of River Gambia from Atlantic Ocean. This extent constitutes one of the areas identified as being of particular importance in The Gambia Environment Action Plan (GEAP) and in the National Biodiversity Strategy and Action Plan (NBSAP). It is an area rich in natural resources and with particularly high biodiversity of national, regional and global environmental significance, housing important nursery grounds for regional coastal and marine fisheries and provide breeding, nesting, feeding and refuge habitats for endangered and threatened species.

The coastal environment is under serious threat from all kinds of pollution and uncontrolled and unsustainable natural resources exploitation. This environment is so important in the economic and social life of the Gambia that it needs to be protected to ensure its sustainable utilization. To meet this objective Government has made rules and regulations to ensure effective utilization and protection of our natural resources. The traditional potential referred to as the sun, sea and sand are the three essential elements of the Gambia's Tourism industry but during the past few years, ecotourism has gain a momentum, advancing more and more. Ecotourism depends on the maintenance of a good quality environment, particularly, at and around the coastal areas.

Status of biodiversity
The biodiversity of the coastal zones The Gambia consist of beautiful littoral forest historical dominated by Palm Rhun *Borassus Aethiopum, Saba senegalensis,Landolphia heudelotti etc.*

Table 2 : List of Protected Areas

National Park	Area (ha)	Year of creation	IUCN Categories	Status	Type
Abuko Nature Reserve	106	1968	Strict Nature Reserve	State managed	Forest
Kiang West National Park	11,526	1987	National Park	Co-managed	Forest
Niumi National Park	4,940	1986	National Park	Co-managed	Coastal wetland
Tanji River Bird Reserve	612	1993	Nature Reserve	Co- managed	Coastal wetland
River Gambia National Park	570	1978	National Park	Private managed	Island Forest
Baobolon Wetland Reserve	22,000		Nature Reserve	Co-managed	River Flood Plain
Tanbi Wetlands National Park	6,034	2001	National Park	Co-managed	Coastal Wetland
Bijilo forest park	68	1952	State Forest	State managed	State forest
Bolon fenyo community wildlife reserve	320	2007	Community Reserve	Community managed	Community managed/NGO
Kanuma game reserve	?	N/A	Private	private	private
Kartong excavation	?	N/A	Community, Reserve	Community managed	Community/NGO

3. Protected Areas in Coastal and Marine Environment

a. Niumi National Park

The Niumi National Park occupies the coastal strip of the Gambian north of the river. The park is approximately 4,940ha (49.4 km^2) in extent. Apart from being an important fish breeding ground, it constitutes one of the last untouched mangrove stands on the West African Coast north of the equator. The more terrestrial parts of the park contain an interesting cross section of threatened regional fauna and wide diversity of habitat types. The international character of the Delta complex as one ecological entity with vital and incalculable environmental value to the region and its people prompted the Gambia and Senegal to recognize the need to protect this area. The mainland part of the park consists of savannah woodland and bush, and there is a large area of mangroves and salt flats lining the banks of two creeks. The site is considered to be a candidate Ramsar Site and the Ramsar Bureau has funded the preparation of a management plan in preparation for the designation of the site.

The Gambia declared its portion of the Delta as a national park in 1986, comprising the southern part of the coastal wetlands and mangroves of the Saloum Delta. The park is contiguous with Senegal's Delta Du Saloum National Park and Biosphere Reserve. Niumi National Park encompasses the island of Jinack which is separated from the mainland by the narrow Niji Bolon. The island is mainly low-lying with extensive areas of coastal dune woodlands, salt water marsh dominated by tamarisk and mangrove fringing the bolon. The mainland section of the park incorporates dry woodland and grassland savannah which is on a raised laterite plateau. This plateau is dissected by the Masarinko Bolon which is mangrove

lined and backed by salt-pan to the escarpment edge. West African Manatees occur within the bolon and were previously hunted for meat. The African Clawless Otter (Aonyx capensis) is also found in the Masarinko Bolon but as with the manatee it is shy and difficult to observe.

Avi -Fauna
Niumi National Park is home to a large diversity of resident bird specie and also is an important site for European migrants. A bird ringing programme has been in operation on Jinack Island from 1994 to 2001 and has added numerous new species to the park's bird list. A large variety of warblers (17 species) have been found to use the island as a stop-over and feeding site both on the journey south and on their return north. The shallow offshore waters provide excellent feeding conditions for terns, gulls and other piscivorous species which roost in large numbers off Buniadu Point. The mangrove and tidal flats are rich in waders, many of which are seasonal migrants but some, such as the White-fronted Plover, nest on the dune fringe. Harriers are frequently encountered quartering the area during the European winter months.

The current bird species stand at 300 species from 63 families. The most recent survey has added the first record for river prinia Prinia fluviatilis, for the Gambia. Two pairs of this species were located breeding on the island of Jinack and one nest was successful. There appear to be ideal habitat present on Jinack (waterside vegetation and rice fields) for this rare species.

Fauna
Leopard, Spotted Hyena and a variety of smaller carnivores are found on the island which feed on Oribi, Bohor Reedbuck, primates and carrion. Hyenas often forage the shoreline looking for dead fish. Crocodiles occur in the seasonally flooded lagoons and swamps, retreating to semi-permanent waterholes as the dry season progresses and excavation burrows several meters long when these are also dry. Green Turtles nest along the coastal strip, coming ashore on moonless nights to lay their eggs. In addition to supporting a complex of fauna and avi-fauna of great scientific interest, the area possesses one of the world's rarer mammalian species-the West African Manatee and also an endangered member of the otter family-the African Clawless Otter, Atlantic Humpbacked Dolphin, Nile crocodile and Bush Duiker also occur in the area.

b. Tanbi Wetland National Park

The Tanbi Wetland Complex occupies the southern portion of the River Gambia estuary. It is composed primarily of low mangrove forest with a complex of vegetation types on its northern boundary and along the mangrove fringing the mainland. As in all wetland ecologies its functions include coastal stabilisation, sewage sink for the urban area, fish breeding and recreation.

The area covers approximately 6,000 hectares and it includes the area between the island of Banjul and Cape Point in the north and extends to the village of Lamin and Mandinari Point in the South. Despite the fact that much of the land to the west of the site's boundary is urbanised, farmland, and highly deforested the wetland area is intimately connected both to the Atlantic Ocean and the River Gambia, thus forming part of a much larger wetland complex and extending inland along the north and south banks of the River Gambia. The

wetland complex also lies adjacent to Abuko Nature Reserve, an area containing remnant gallery forest, and is connected to the Mandina wetlands further south by a thin stretch of mangroves near Mandinari Point. The latter may act as a corridor for animal movement between the two wetland complexes.

The Tanbi Wetland Complex is located within an area of high population density being fringed by Banjul to the east, and Bakau, Jeshwang, Serrekunda, Tallinding and Lamin to the west. The area is subject to considerable agricultural activity on its land ward side and industrial development along the Banjul Highway. The functions of the wetland include acting as a sewage sink for the urban areas, coastal stabilisation on its seaward fringe, fish breeding and nursery grounds and numerous recreational activities especially for tourists visiting the area.

Fishing within the area is widespread and conducted at a subsistence level by the local communities and for semi-commercial purposes at a number of locations. Oyster collection is widespread throughout the wetland and is mainly undertaken by women. The shells are subsequently burnt for the production of lime. Not all the fish and oyster harvest is sold but some part is used for domestic consumption, therefore providing a valuable protein source for low-income families.

The Tanbi Wetland Complex suffers from diverse threats to its ecological integrity and functioning. The major threats are on its northern, southern and western peripheries where urban encroachment, industrial development and increasing agricultural activities are occurring. With industrial development the incidences of pollution has increased and the cumulative impact on the wetland may result in the loss of fish and bird life through contamination. This phenomenon may be further exacerbated by the increasing agricultural development and the associated use of herbicides and pesticides. The clearance of natural vegetation associated with any development results in the fragmentation of habitat that reduces the value of the area for wildlife.

c. Tanji River Bird Reserve and Bijol Island

The Reserve covers 612 hectares and was gazetted in 1993, primarily due to the diversity of avifauna present. It includes 3.7 km of coastline, open beach, coastal lagoon, rocky headland, estuary of the Tanji River and two off shore islands called Bijol islands. It lies on the Atlantic coast, 15 km Southwest of the main tourist centres of Fajara and Bakau and 1km from Brufut. The Reserve is also close to the communities of Tanji, Madiana and Ghana Town.

The Reserve boundary encloses the tidal, saline reaches of the small Tanji River which is bordered by 2 km^2 of low mangrove forest, salt marsh and mudflats. Long shore drift creates a shifting channel for the river as it reaches the ocean and is blocked by a beach parallel to the land. This has also created several small lagoons between the river's mouth and Cape Point.

The Bijol Islands are the only off shore islands along the entire 80 km of coastline of The Gambia and are an important site both at the local level and national level. They provide the only known breeding site in country for Caspian Terns, Royal Terns and Grey-headed Gulls at the present time. The surrounding waters are used by Monk seals *Monachus monachus,*

Atlantic Hump-backed Dolphins *Sousa teuszii* (which are endemic to West African coastal waters), Bottlenose Dolphins,*Tursiops truncatus* and Minke Whales *Balaenoptera acutorostrata*. The Bijol islands may, officially, only be visited for research purposes. However, they are regularly disturbed by fishermen (who are known to harvest tern and gull eggs) and tourists. The Department of Parks and Wildlife Management (DPWM) has setup a management system for daily functioning of the reserve. A troop of conservation cadres were recruited to manage the park. The management undertakes series of activities including monitoring and surveillance around the colonial nesting islands which reduces legal landing and egg collection. Other activities that are carried out by the park management are school visits, community awareness meetings, patrol, audiovisual show etc.

The Reserve comprises a good variety of habitats including dune scrub woodland, dry coastal woodland, mangrove, salt pan and flats and seasonal fresh water swamp. Green turtle (*Chelonia mydas*), a globally threatened species also occurs here and nests within the mainland reserve and Bijol Islands. It is designated as an important Bird Area (criteria: that 4 species namely turnstone, Caspian tern, lesser black-backed gull and Audouin's gull occur on Bijol Islands in numbers greater than 1% of the African population.

The major threats associated with TBR are the overexploitation of its natural resources by a growing local population, which will result in further degradation, and fragmentation of its habitats. Loss of forest around the reserve serves to isolate the area thereby reducing its value due to the lack of corridors for terrestrial fauna to move to and from other suitable habitat. This threat is further exacerbated by the fact that there are no alternative affordable resources for the local population to use (e.g. gas instead of wood for cooking), or alternative income generating activities that would permit them to be able to afford the alternatives. Lack of resources at the level of DPWM also prevents an ongoing dialogue with the communities being developed to address the issue of education and sensitization, and possible remedies in the form of developing alternative resources, income generating activities etc. Cattle grazing and sand mining activities are a threat to vegetation and coastal habitat directly through vegetation loss by trampling and grazing and also by subsequent coastal erosion.

d. Bolong Fenyo Community Wildlife Reserve

This protected area was designated on the 25th March 2008 by the Minister for Forestry & Environment gazette / declared Bolong Fenyo as the Gambia's first Community Wildlife Reserve. The site is located in the Village of Gunjur, Kombo South, along 2 kilometers of the Atlantic Coastline. Its area's geographical coordinates are 16°47' E - 16° 47' E - 13°21'N - 13°23'N and covers a total area of 320 hectares.

This area of Gunjur incorporates mangroves, dry woodlands and coastal dune scrub. The area is very fragile and provides critical roosting ground for both residential and migratory species of birds. It is also a breeding ground for green turtles. Such ecosystems include marine, coastal dune, fresh water mash, mangrove, woodland/savanna and thicket. The presence of mangroves makes it ecologically important locations for spawning and chick rearing. However, human activity in the area is damaging the delicate ecosystem. Because of the threat the Gunjur Environmental Protection and Development Group, the local people, the Department of Parks and Wildlife and the World Bank came together for the project which is called the Integrated Coastal and Marine Biodiversity Management Project.

Avi-Fauna :

The importance of the area is because of the diversity of bird species found their which for example is a roosting and feeding area for sea gulls, terns, and other avian species. Because its shoreline location is on the western most tip of Africa means that it is one of the stop-overs on the flight path for many Palearctic migrants species. Among these are Caspian terns, black winged stilt, black backed gull. In 2006, 76 species of birds (marine and woodland), were recorded from Bolong Fenyo.

Fauna :

So far 11 reptilian species and 16 mammal species have been recorded. Past the shoreline there are 3 crab species, bottle nose dolphins and humped backed bottle nose dolphins, mudskippers and jellyfish. The green turtle which is a threatened species also comes to lay its eggs on the beach.

Among the reptiles are: black forest cobra, spitting cobra, geckoes, Nile monitor, chameleon and the African python.

Among the mammals are: Sun squirrel, Epaulet fruit bats, hare, Gambian mongoose, the porcupine and others.

Flora :

Typical plants in the woodland and scrub are rhun palm, African locust bean, baobab, Acacia and mango trees.

e. Bijilo Forest Park

Bijilo Forest Park also known as Bijilo Monkey Park is located on the ocean front between Kerr Seringe and Bijilo. The park was gazzetted in 1952 and managed by the Department of Forestry. The size of the park is 68ha. The park inhabits a huge population of primate species such as Calithrix Green Monkey and Red Colobus Monkey, which has become a menace to hotels and resorts surrounding the park. The park attracts a large diversity of butterflies, forest birds, insects and plants.

This forest park is the most frequented park by tourists due to its proximity to hotels. Bijilo Forest Park, in Gambia, is a small rainforest nature reserve which is located on a cliff edge on the beach right next to the Kololi, Senegambia strip about 11 kilometres from Banjul in the Western division of Kombo North (Latitude 13.42861 Longitude -16.73139). It is an ideal place for eco-tourists & birdwatchers staying in the nearby Kairaba & Senegambia hotels as it is just 10 minutes walk away.

The nature park is an old forest which covers an area of 126 acres and was open to tourists and the public in 1991. Today the park received around 23,000 visitors a year. Prior to this there was heavy de-forestation for valuable rhun palms and its resident green monkeys were persecuted by youngsters and stray canines.

A foot path with seating areas places occasionally along its length meanders its way through varied woodland forest, shrub and tree savannah as well as sand dunes.

Wildlife :
Bijilo Forest is host to over 133 species of birds such as the Red-necked Falcon, Grey Hornbill, Prinia and various types of Bee-eaters.
There are also 4 primate species that inhabit the park which are the patas monkey, green vervet monkeys, red colobus and the galagos or bushbabies.
There are signs asking visitors not to feed the monkeys as this will interfere with their natural behaviour and reduce their fear of humans and puts them in danger of being harmed or stolen.

Flora :
Among the flora are lilies, wild orchids, salt-tolerant vines, magnificent silk cotton trees, palms and the odd looking baobab trees (sometimes called the upside down tree).

4. Proposed Protected Areas

The protected areas of the Gambia comprised of 4.1% of the national territory while the national target is to increase it to 10%. Apart from the seven protected areas, there are several biodiversity-rich ecosystems that require be protecting and managing. With the outstanding importance of the shoreline ecosystem to the growing population, mangrove ecosystems exist on four important sites including River Gambia estuary. These sites are ecologically important for fish spawning and nursery, flood control, etc while the same time urbanization is influencing increasing pressure on coastal resources leading to many interconnected problems such as siltation, mangrove dieback, standing crop dwindling, mangrove cutting etc.

The issues relating to governance and management of this entity all have a legal instrument which has no synergy and remains in conflict. Policy and legal instruments are traditionally designed to regulate issues by the order of an uncomprising law which is normally not the best way to address development issues. The new approach of policy and legislative documents should understand the goal and audience of the document. However all the estuarine mangrove ecosystems on the coastline namely Allahein River, Kotu Creek, Kanuma Game Reserve and Kartong Excations are soon becoming protected areas in addition to Tanji Bird Reserve, Bolong Fenyo Community Wildlife Reserve and Tanbi Wetlands National Park.

a. Allahein River

Allahein River Mouth, coastal scrub/grassland on stabilized dune system, lagoon complex, river estuary and mangrove fringe. Also Folonko Crocodile pool at Kartong village with relic patch of riverine forest. Allahein River is a mangrove-rich ecosystem located on the borderline between Gambia and South Senegal. The river is a short creek, extremely important for waterbirds such as Caspian tern, royal tern, lesser black back gull, osprey, sanderling, slenderbill gull, black tailed godwit. A good stands of mangrove forest exists on the fringes of the waterbody. Species of mangrove ranges from *Rhizophora racemosa, Rhizophora mangle, Rhizophora harisonii, Conocarpus erectus, Avicenia Africana and Laguncularia racemosa.* This complex serves as an important spawning and nursery site for all shell fish and fin fish in the upwelling.

b. Kartong Excavation

The area is located on the west side of the village between the community and ocean. They were anthropogenically generated due to sand mining. This man-made ecosystem provides a freshwater reservoir support by water holding and filtering plants species such as *Typhae australis.* This multiple excavations form a complex of fresh and brackish water wetlands that provide support for migratory water bird and afro-tropical birds such Dab Chick. This opportunity provides a niche for freshwater avi-fauna in exclusively marine entity. The site is also significant for bird watching, naturing tourism, and collection of Typhae grass for fencing.

c. Kotu Creek

It is located in Kotu Community behind the Kotu Power Station. The water bird flow through a big gully has dissect Latrikunda and Manjai Kunda. This creek is adjacent Badala Beach and Gulf Coast. A significant number of water birds occupies the wetlands year round which made it a free zone bird watching and training sites.

d. Kanuma Game Reserve

This is private land proposed for conservation of biodiversity located in Kombo South, between Sanyang and Kartong. Proprietor is planning to introduce wild animals into the area, from the subregion to attract touriam in the area.

5. Key pressures/ Problems

There are several problems affecting the natural system of the ocean and the wellbeing of its rapid growing society. However some of them are highlighted below;

a. Unplanned & Uncontrolled Urbanization

Apart from a few provincial towns, most of The Gambia outside the Greater Banjul Area is sparsely populated, and either agricultural or unused. The environment in these areas is generally pristine. Air quality and surface water quality are high and industrial pollution is rare. Where localised groundwater pollution from sanitary waste does occur, the affected people tend to be those who rely on unlined shallow wells for drinking water. Similarly the problem of solid waste disposal and litter in these areas is highly localised. Although waste disposal is almost unregulated, the amounts generated are low because the customary approach to domestic waste handling approximates to good practice in waste minimisation and recycling.
Within the Greater Banjul area the situation is much different. This area covers most of the 80km coastline and within which the large preponderance of tourism development is located, has a relatively large and rapidly growing population crowded into the urban and peri-urban settlements. Clean water is provided through a piped network to most homes, or at least to publicly accessible standpipes, but provision of other environmental and munici-

pal services (sewerage, solid waste collection, street lighting, and road maintenance) is partial and unreliable.
Solid waste is a particular problem as generation has overwhelmed collection and management capacity. The result is that litter and uncollected waste are present in almost every street. Informal dumps of unsightly and potentially harmful waste are scattered around residential and commercial quarters providing breeding grounds for vermin and disease.

The large open dump at Bakoteh, less than 1 kilometre from the coast, has long been the main disposal site for wastes collected in the KMC area, but the recent rapid growth in waste volume disposed there is posing a major environmental hazard. The other open dump at Mile II in Banjul is situated in the Tanbi wetland just few meters from the Atlantic coast. There are few industrial waste streams affecting the urban environment in The Gambia. Vehicle emissions are not yet a significant threat to air quality, and there are other sources of air pollution (waste burning, bush fires) that threaten only their immediate surrounds.

b. Depletion of Water Resources

The Gambia relies principally on groundwater as a source of potable supply. The extraction rate is still well below the recharge rate. At present the national water budget suggests that maximum potential water demand is equivalent to just over 2% of renewable water resources. Projections into the future, even assuming high demand growth and making conservative assumptions about the future availability of the resource, show maximum demand in 2050 equivalent to only around one quarter of potential supply

Most consumers rely on the National Water and Electricity Company (NAWEC) for water supply. This is obtained from a series of boreholes located in the Kombo area, well away from the major population centres, and pumped to a central treatment plant. The quality of NAWEC's piped water is good, but supply can be erratic. For this reason some consumers, including most hotels, have storage tanks or supplementary supplies from their own boreholes. Despite the large surpluses there is some potential that pumping from boreholes could lead to local shortages or, in coastal areas, to intrusion of saline water into the groundwater. This is controlled by the Department of Water Resources who issue abstraction licenses to all individual well operators and prohibit the siting of boreholes within 2 km of the coastline.

c. High Damage for Land Resources

Although The Gambia is densely populated, there remains a comparative abundance of unused land suitable for tourism development. The land closest to the coast is not very useful for agriculture and has not been heavily settled in the past. Previously, settlements tended to be concentrated around the most productive agricultural areas leaving many vacant sites available for sensitively designed tourist infrastructure. But the situation is changing rapidly as the population pressure in the Greater Banjul Area is driving people to look for homes in less crowded, more pleasant areas. With the advent of new coastal roads, land along the southern coastal strip in particular, is increasingly sought after.

Following the passage of the 1990 State Lands Act, the State is deemed to be responsible of state land. People owning land under customary tenure are deemed to be holding 99-year leases under which they may continue with the current use, so long as that use is not in contravention of an approved land use plan. The Land Acquisition and Compensation Act, passed together with the State Lands Act, give the state the power to acquire land for "planning purposes", where necessary to implement the provisions of an approved plan, and sets out a procedure for determining appropriate compensation for such acquired land.

d. Pollution from Land-Based Activities

The bacteriological and chemical quality of the coastal waters is not closely monitored. However, several potential sources of pollution are readily identifiable.

- Inflowing streams might bring in domestic and industrial wastewater;
- Runoff and ground water contaminated with sanitary wastes from sewage and leakage from unregulated dumps will enter the sea directly by infiltration and through streams;
- Wastewater from the marine outfall used to dispose of Banjul's sewage, might circulate to the beaches before being fully neutralised.

Litter is also often observed all along the coast. Some appears to be the result of irresponsible waste dumping from small beach businesses but there is also scattered waste that was most likely discarded by individuals. Further south the beaches are often pristine, although there may be some washed up fishing detritus (broken floats, nets) and there are reports that some fishermen dump unwanted remains of their catch on the beach.

Controlling coastal and marine pollution.
The Gambia is party to international conventions such MARPOL and the Basel conventions all of which in one way or the other control marine and coastal pollutions. There also exist national laws and regulations that deal with controlling pollution in coastal and marine waters; principal among these is the National Environment Management Act (NEMA) of 1994, section 30(1) of which indicates against pollution of coastal and marine environment including the introduction of organisms. Further pollution control measures are indicated in section 38 of the Act. There are also a series of public health and pollution control Acts that control coastal and marine pollution. Key among these is the Environmental Protection (Prevention of Dumping) Act of 1988. To enforce these Acts particularly the NEMA, the National Environment Agency has an inspection team that continuously monitors the coastal area against pollution. The Gambia Navy also do marine surveillance.

e. Depletion of Forest Resources

The Department of Forestry has been active in the Gambia since 1979, managing 66 national forest reserves of huge ecological and commercial value. During the period 1972 to 1988, however, forest cover declined from some 30% of total land area to just 6% (333,200 ha to 68,500 ha). Moreover the condition of the remaining forest is often poor with more than 70% of the remaining stock degraded. A major change of emphasis in forest management and movement towards modern best practice began in the 1990s with the introduction of Community Forest Management and the revision of the Forest Act. There are now three systems of forest management as follows:

- State managed forests, which include three of the original 66 national reserves;
- Community managed Forests, which are owned and managed by local communities, with technical oversight by the Department of Forestry; and,
- Joint Forest Management Scheme forests, which are open access (i.e. not formally under a protection regime, but which are jointly managed by the state and the local community with a view to creating a Community Forest in the near future.

The Community Forest model is proving very popular and shows signs of helping to arrest the decline in forest cover. Losses are continuing, however, albeit at a slower rate.

f. Loss of Biodiversity

Abuko Nature Reserve was sealed off as a protected water catchment in 1916 and declared a nature reserve in 1968. The Department of Parks & Wildlife Management (DPWM) is responsible for the conservation, management and sustainable use of Gambia's wildlife resources and protected area system. Currently it manages a total of seven protected areas including four national parks and three bird reserves. Only Abuko is fenced, the others are demarcated with pegs. DPWM's task is therefore to work with local people to indicate buffer areas, areas of mixed land use (where local people may collect dead wood or farm, for example, as long as they avoid clearing trees or destroying valuable habitats) and areas of complete protection. Each park is protected by a patrol team that has powers of arrest, although the staffs are often poorly equipped, and few has motorised transport.

The parks are rich in fauna with more than 67 species of mammals and 507 species of bird recorded as well as many fish, reptiles and amphibians. It should be acknowledged, however, that many of these are rarely seen and few of the mammals are of species that attract interest from the ordinary tourist.

The 1996 ratification of the Ramsar Convention on Wetlands of International Importance was a step of major significance for birdlife protection and conservation. There are now three designated Ramsar sites (Tanji River Bird Reserve, Boa Baolong Wetland Reserve, and Tanbi Wetland Complex).

g. High Demand for non-renewable Energy

Energy is an environmental issue because pollution is an almost inevitable by-product of most fuel use and because all use of non-renewable fuels depletes the stocks available for future generations. In The Gambia fuel wood accounts for a large proportion of all the energy used, either directly or as charcoal. When the demand for wood exceeds the sustainable supply, over-exploitation leads to degradation of forests and mangrove areas, reducing their suitability as wildlife habitats and, therefore, their potential value in enriching the coastal and marine ecosystem.

Electricity generation causes polluting emissions (waste oil, greenhouse gases, several kinds of air pollution) and the use of small generators, as in The Gambia, localizes and intensifies any pollution that does occur.

h. Fisheries resource extraction

A number of fishing methods are practiced within The Gambian waters that are described as unsustainable and exploitative to the fisheries resources. These practices that are common to both the industrial and artisanal sectors are either fishing gear related or through the method employed. Their impacts range from over fishing, wasteful resource use to destruction of marine habitats. Key ones among them are:

- Beach seining:

The beach seine is a type of fishing gear used by artisanal fishermen; the gear has mesh sizes smaller than the regulated ones and therefore captures juveniles and other small-sized fishes that are often not consumed and discarded on the beaches.

- Trawling

A great number of the vessels involved are foreign-owned. For example, records show that 95% of the fleet in 1997 was foreign-owned. The impact of this practice has been noticed to include destruction of the marine habitats of demersal and benthic organisms and physical damage to ecosystems. Their catches at times include a lot of by-catches that end thrown away and wasted.

- Stow nets

This method employs small mesh-sized nets in shrimp fisheries by artisanal fishermen; the result is wasteful exploitation and use of fisheries resources threatening the very existence of the resources. Poaching and sharking fishing are the other activities that are unsustainably exploiting the fishery resources and negatively impacting on the coastal and marine ecosystems.

1.6 ARCHITECTURAL, BUILT, HISTORICAL AND ARCHEAOLOGICAL HERITAGE

1. Background

Tourism in The Gambia is a key sector for socio-economic development, with focus on tourism as an effective tool to fight against poverty and improve the lives of the people. Tourism is envisaged to maximize the positive cultural impacts and strengthening economic and social development possibilities. It helps to improve community living conditions, protect and conserve biological diversity. Tourism also promotes the development of infrastructure at national level. In The Gambia it is also envisaged that tourism will raise the level of the main sector of the economy on the basis of a triple plan for economic growth and creation of wealth through investment, modernization and opening of the country to the rest of the world.

The Gambia has a great potential in coastal tourism, as well as in cultural tourism. It is part of an old and ancient civilization with two world heritage sites and one listed, which are all tourist attractions.

Roots Tourism, with its related attractions could be experienced in places like James Island, Juffureh and Albreda and the coastal town of Barra's Fort Bullen and the Battery Guns of Banjul. This is also part of the River Gambia experience.

Cultural and Religious sites such as "Sannemantering", "Kenyeh kenyeh Jamango", the tomb of Sait Matty Bah, Katchikally, Kartong and Berending sacred crocodile pools, are

all located in coastal towns and are living cultures that provide an insight into The Gambian way of life .

In terms of the potential dangers arising from global warming and the consequent rise in sea levels, historic and cultural sites located around the mouth of the River Gambia are most vulnerable because of their close proximity to the sea. These sites are not only National Monuments, but have also been inscribed in the UNESCO World Heritage List in 2003 under the serial inscription of 'James Island and Related Sites'. The relevant sites are: 1. James Island; 2. the villages of Abreda and Juffureh in the North Bank Region and the historic buildings and archaeological sites located around them; and 3. Fort Bullen at Barra Point, and the Six-Gun Battery in Banjul.
As cited in the World Heritage inscription notice, the sites are of outstanding universal significance because, together they present a testimony to the main periods and facets of the encounter between Africa and Europe along the River Gambia, a continuum stretching from pre-colonial and pre-slavery times to independence. The sites are particularly significant for their relation to the beginning of the slave trade and its abolition. They also document early access to the interior of Africa. Hence the resolve to preserve them for posterity for the invaluable lessons they can give to humanity.
Most of the sites are architectural structures built of local laterite boulders and/or fired bricks and bonded with lime mortar. The spaces in and around them also have immense archaeological potential.

2. State and trend

a. James Island

James Island is situated on the Gambia River, 30 km away from the river mouth. Its location at equitable distance between the North and South banks made it a strategic place to control the waterway. The fort is situated in the middle of this very small island which covers an area of approximately 0.3 hectare.

The fort is roughly square in plan with bastions at each corner. The bastions are polygonal in shape with the end chamfered, probably to fit in the limited available space above the water line. The bastions rise about 5 meters above the ground level, and between them are curtain walls of the same height. Against the northeastern curtain wall, on the water side, a large water cistern divided in two equal compartments was built to collect rainwater.

The Fort is made of stones extracted from the main land and from Dog Island, situated 17 km downstream, on the north bank. Imported stones, broken tiles and burnt bricks brought as ballast can also easily be identified in different parts of the fort. All these materials are bonded with mortar made of river sand, shells and lime. Lime was obtained from the heating of oyster shells in basic kilns fed with firewood. This type of lime is produced at present on the south bank.

Openings in the masonry work were bridged with Rhun palm lintels. All roofs have collapsed, but most probably, they were flat, using timber (or palm tree) beams and covered with lime mortar. The magazine, under the Eastern bastion, is the only remaining covered space. It is roofed with a stone vault.

Because the Island was just big enough to hold the fort, it had to be artificially extended to provide more space for its occupants. This was done through erecting a series of poles all around the Island and backfilling so as to get platforms on which activities could be developed and buildings constructed. This backfilling has almost completely disappeared today. All original structures are in ruins. They comprise: the fort itself; the slave house (north of eastern point); the governor's kitchen (south of eastern point); the blacksmith shop (south); a store (south of western point).

There are a few recent additions to the site: the jetty made of rhun palm trunks; a sea wall to the north made out of piling boulder stones held together by wooden posts; a navigation light; a replica of a slave hut housing a model of the island used for visitor interpretation; and flag poles. There are also several cannons mounted on concrete. At low tide, some remains of the poles that were used to contain the backfill of the island extensions are visible.

Access to the site is by boat, either from Albreda / Juffureh or directly from Banjul. The larger boats coming from Banjul rely on fishermen's canoes from Albreda / Juffureh to transfer their passengers onto the island. The jetty allows access at any tide. During the rainy season, however, access becomes more difficult because the tide becomes so high that the jetty proves a bit too low on the island side.

The island is partly covered with immense baobab trees that have grown naturally since the island was abandoned. These baobabs house a colony of pelicans. The surroundings of the island are still very rich in various species of fish.

b. Conservation Status of James Island

The main conservation problems revolve around the erosion of the island and structures by tidal waves; plant growth, especially on the masonry; poor drainage conditions; the saline environment; and human activities.

The fort and all historic structures on the island are in a ruined state. Recently, the ruins have been stabilized and protected by capping all top surfaces with lime mortar. The structures built just at the limit of the high tide are at times beaten by the waves, especially during storms. In some cases, the base of the walls has been undermined by the repeated lapping of the lime mortar by the waves. Most of the threatened parts have already been repaired and protected.

Recent observations and monitoring show clearly that erosion is still on-going, but at a very slow pace. A programme for the stabilisation of the shore has been set up, as well as continued monitoring of the whole site.

c. The villages of Albreda and Juffureh and their historical buildings

Apart from its vulnerable location, James Island's limited size posed several difficulties for its European occupiers. Infact, the island had to be artificially extended to provide more space for its occupants. Fresh water was always in short supply because of the seasonality of the rains and limited capacity of the cistern. This situation increased the dependence of the

occupiers on the goodwill of the inhabitants of the mainland, forcing them to acquire territory on land, with the resulting buildings dotted in and around Juffureh and Albreda.

Albreda

Albreda is a typical Mandinka village located on the north bank of the river opposite James Island. Its inhabitants are predominantly fishermen and farmers. To a large extent the village still maintains the traditional building styles and settlement patterns. Buildings in the main are adobe structures with thatched roofs and convivial verandahs. Communal meeting spaces (*bantabas*) are found in strategic locations within the village, often under huge trees. Part of Albreda was rented out to the French traders by the King of Niumi in 1681. This place became the seat of French colonial enterprise in The Gambia and a strategic location to control the inhabitants of James Island.

Remains of European settlement in the village comprise a ruined Chapel, some freestanding walls and foundations, and the picturesque CFAO building on the waterfront.

The **Chapel** is known to have been constructed by the Portuguese in the late 15th century. It is presently in ruins but more than 50% of its walls are still standing. The large walls of the building are built of sand and lateritic stones laid in lime mortar.

The **CFAO Building** stands at the water's edge near the wharf. It is a two story-building made out of brick and stone masonry with an adjacent single storey warehouse. The ground floor, accessible through an open arcaded verandah, served as a shop and store for goods. The top floor was used as residence for agents of the French trading company. Though the architect is not known, a plan of Albreda in 1847, shows a stone building in the same location.

Juffereh

Lying next to Albreda to the north-east is the present day village of Juffureh. Like Albreda, it is a typical developing Mandinka village with a mixture of round and rectangular earth structures, roofed with thatch, and more recently, corrugated iron.

One of the most important aspects of Juffureh is its identification by Alex Haley as the village of his ancestor who was taken to America during the era of the Trans-Atlantic Slave Trade. It is here that the Kinteh family, from which Alex Haley claims ancestry, continues to live to the present day. The compound of the Kinteh family is a pilgrimage destination for Africans in the Diaspora and has a large *bantaba* where pilgrims and visitors are received. Juffureh is also the site of the **Maurel Freres Building;** a historic building constructed by the British around 1840 and was later used as a warehouse by a Lebanese trader called Maurel from whom the building takes its name. The building was rehabilitated in 1996 and was transformed into a small museum on the Slave Trade.

Located about a kilometer east of Juffureh is **San Domingo,** the earliest Portuguese settlement in the area. The settlement was already established in the late 15th century. Most sources say that it was largely inhabited by Luso-African traders who acted as host-brokers and middlemen for the Europeans. In its heydays, San Domingo is said to have had gardens, a cemetery, a church and a well. It was here that the sick and worn out on the Island were taken for recuperation.

Today only the ruins of a one-storey house and piles of rubble can be identified as the remains of the settlement. The house with barely one wall remaining was constructed out of laterite stone bound together with lime mortar. Loopholes at ground floor level suggest that the occupants were preoccupied with defense and security.

3. Conservation Status of Albreda-Juffureh

As living places, the villages are well kept by the inhabitants. Apart from the roofs, which are gradually being replaced from thatch to corrugated iron, the houses are well maintained in the traditional way. Circulation in the villages is still done on narrow earth roads or paths, and cement buildings continue to be very few.

- CFAO Building

Because of the ravages of the sea, and having lost its roof, by 2008, less than 40% of the walls of this building were still standing.
At present the building is in the process of being restored to its original state. A sea-wall made from boulders supported by wooden posts has been constructed around the seaward end of the building to minimize the impact of the sea on the structure.

- Maurel frères building

The building is in a very good state of conservation as it was restored in 1996 and converted to use as a museum with an exhibition on the Slave Trade in Senegambia.

- San Domingo and the Portuguese Chapel

The Portuguese chapel and San Domingo are in a complete state of ruin. However, the ruins were stabilised and the most endangered parts have been reinforced.

4. Fort Bullen and the Six-Gun Battery

The abandonment of James Island and the founding of Bathurst (1815), now the capital city, Banjul, was born out of Britain's war against slave trading in the 19th century. As the River Gambia was recognized as a British possession by *Treaty of Versailles, 1783,* the passing of the Abolition Act of 1807 made slave traffic on the River unlawful. However, the French, Portuguese, Spanish and Americans continued to trade in slaves.
Situated on the mouth of the River, Banjul was more strategically placed than James Island for controlling the entry and exit of river traffic. In November 1815, Sir Charles MacCarthy ordered Captain Alexander Grant to proceed from Goree (a fortified Island to the north, off the coast of Senegal) with a detachment of the African corps to examine the viability of establishing a military strongpoint on St. Mary's Island, later Bathurst, and now Banjul, the capital city.
Soon after acquiring the Island from the King of Kombo, Grant started work on a barracks to house 80 men and on the erection of a battery of six 24 pounder guns and two field pieces. (This battery is now within the grounds of State House, the President's residence). The idea was that the battery could afford sufficient fire power to stop any ships trying to run out of the river mouth and that their capture could then be effected by naval vessels on patrol. Within months of setting up the base in Banjul, five slave ships were captured.
However, it soon became apparent that the Battery's fire power could not traverse the entire width of the river mouth which is about 8 miles at this point. Ships could easily escape

by moving closer to the north bank of the river. Fort Bullen was therefore constructed around 1827 on the north bank, opposite the Six-Gun Battery, to cover this escape route. With gun batteries on both sides of the river mouth, the British finally had full control over all trade on the River Gambia.
During the Second World War Fort Bullen was again put to use as an observatory and artillery base by the British Army as a means to protect against a possible attack from the French Vichy Government which was controlling Senegal.

a. Conservation Status of Fort Bullen

Fort Bullen is located at the extreme end of Barra Point, opposite Banjul in south bank, a peninsular barely a few meters above sea level. The tide laps the foreshore on three sides of the fort. The fourth side faces a tract of land under rough grass. The landward side is bordered on the north by a line of trees and on the south by an old rest house overlooking the sea. On the seaward side a stone sea wall protects the fort from encroachment by the sea.
The fort is basically a rectangular structure (45m x 30m) with circular bastions at each corner. On at least three of bastions were traversing guns which supported Bloomfield iron 32 pounder canons. The thick walls of the fort are made of local laterite stones and lime mortar. The bastions are linked by curtain walls enclosing an open courtyard 45 by 30 meters. There are two entrances to the fort and within the walls are traces of former buildings which stood against the curtain walls. Two free standing buildings inside the fort walls still survive.
Two blockwork structures to the north and south end of the courtyard were introduced during World War Two(WWII) to serve as ammunition store and communication centre respectively. These have since been demolished because of their unsafe state. Further changes made during WWII were the mounting of a 4 inch Vickers and a 12 pounder. The Vickers was mounted on the S.E. bastion and part of its platform is still in place with the gun itself lying outside the fort walls.

Within the walls there is evidence of decay and demolition but the outer walls and bastions are sound and strong with the masonry in good condition. The bastions are approached by stone and brick staircases, all of which survive in good condition. Inside the walls, to the south west side is a navigation light supported by a tall steel work structure. A vaulted magazine room is found at ground level inside the S.E. bastion.
To the north of the fort is a new resthouse for visitors constructed in 1996, and to south an old resthouse which served the Travelling Commissioner in colonial times.
The fort itself is in a good state of conservation. The most endangered part of the site is the sea defense wall on the ocean side. The wall is continuously beaten by the waves, and parts of it have collapsed. Twenty meters of the damaged wall was rebuilt in 2000.

b. Six- Gun Battery

The Six-Gun Battery consists of six 24 pounder guns installed on incline traversing platforms fixed at an average height of one meter. They are protected by a large parapet wall made of stones laid in lime mortar and plastered. Their layout allows an angle of coverage of about 30 degrees.
The Battery is located within the State House compound which is very close to the river mouth. It stands almost exactly facing Fort Bullen on the opposite northern bank of the river.The battery is in a very good state of conservation and the area around it is well cared for.

5. Progress/Improvements

The Tourism Development master plan is a new tourism policy that aims to provide a sustainable development and poverty reduction, though projects that identify and develop profitable tourism services that can expand opportunities for employment and income, reduce pressure on the environment by a growing population. A pilot project in Kartong has provided useful lesson for application in many other communities. The kartong project has enabled the community to develop transitional systems for managing a fragile environment, and still engage in appropriate and profitable tourism.

On the other hand, investment both local and foreign has not only expanded the capacity of accommodation, but has also diversified on the product with quality and choice. This has triggered public investment namely construction of roads, bridges, electrification, telecommunication thus improving access to various tourist places both spatially and financially.

Promoting sustainable tourism in the destination that maintains economic and business viability for all stakeholders justified the redefinition through investigation of boundaries, land ownership and status of proposed projects and resort development. There is development clustering comprising of existing settlements, tourism sites, sites designated for conservation and other tourism facilities.

Table 3 : Tourist arrivals by percentage of nationalities 2005-2008

Year	Nationality			
	British	**Swedish**	**German**	**Dutch**
2005	45.21	6.26	4.58	15.77
2006	42.31	5.1	5.26	12.26
2007	46.31	5.23	4.5	11.6
2008	42.32	5.70	3.60	12.89

(Source: Tourism Development Master Plan Studies)

The tourism sector continued to enjoyed above average results and recorded a third year of sustained growth. One notable feature of 2006 was the continuing healthy performance of The Gambia as a destination. Based on the trends as recorded in the Tourism Master Plan, a significant growth level was registered for the previous years.2005 registered 19.8%, 2006 15.7% and 2007 14.2

Though 2008 registered 2.9% over 2007, it did not follow the high percentage trend as was projected and expected as per the trend of the previous years due to the global crisis. The period January to April 2008 has registered a significant increase of tourist's arrivals (86,791) which is 27.4 per cent increase compared to the same period in 2007 (68,107). For the remaining period of the year, the growth rates were negative.

6. Key pressure/ problems

The deficiencies in The Gambia's tourism-related infrastructure are already negatively affecting the sector, in particular with regard to electricity and water supply as well the conditions of the road and ferry services. Presently work is ongoing in development both by upgrading

the quality standards and the expansion of capacity with the objective to create significant improvement in this field, thus also opening-up the interior for new product segments, e.g. nature-based tourism.

The main constraints to growth for tourism in The Gambia are:

- Limited awareness
- Inadequate infrastructure
- Limited level of investment
- Inadequate product quality

7. Impacts

Socioeconomic

Tourism as a multifaceted socio-economic activity has a variety of linkages to other sectors, in the case of The Gambia in particular to agriculture, the major sector in the national economy. There are still ways to increase the supply of local produce to the accommodation and restaurant sector, thus reducing the imports and saving foreign exchange. Presently, the Gambia is Good (GIG) is one project that has been trying to fulfill this objective.

The diversification of the tourism product into the interior and through the introduction of new types of niche markets, e.g. eco-tourism, has allowed communities to participate and benefit from the development of the sector. It has contributed to an improvement of living conditions in rural areas such as Kartung, Tumani Tenda, Berefet, and Juffureh and Albreda, through the creation of jobs and generation of income, and mitigates the drift to the urban areas.

Although research related to the Tourism Master Plan showed that tourism has only a modest negative impact on the social fabric of the host country and the natural environment, measures have now been undertaken to control any negative developments in this field. The handling of the 'bumster' issue is one of the important initiatives through a considerable effort of planning, investment, training, and awareness.

Ecological

All architectural, built, historical and archeological heritages along the coastline are mainly affected by coastal erosion resulting from the action of tidal waves on one hand and the corrosive effect of the salt water on the structures on the other.

In addition, cultural and religious sites such as Katchikally, Kartong and Berending sacred crocodile pools located in coastal towns are at the verge of drying up due to the effect of climate change among others.

8. Response/innovative approaches.

Tourism is one of the growth engines and over the years a lot of achievements have been registered in the sector in terms of product development, human resources development, destination marketing and quality control. However, a lot of hurdles still persist such as the quality of the facilities, and lack of certain complimentary products such as golfing facilities, water sports and marinas.

The Gambia's tourism sector realized and taped through symbioses with other sectors such as fisheries, agriculture, horticulture, culture to produce the synergy for economic development. The new tourism paradigm therefore recognizes tourism as an important vehicle for economic development puts poverty alleviation at the core of development efforts, and factors tourism into all other areas of development by ensuring coordination and encouraging public, private partnerships. Therefore tourism is now integrated into the governments program for accelerated and sustainable development and strategies for elimination of poverty.
Promoting sustainable tourism in the destination that maintains economic and business viability for all stakeholders justified the redefinition through investigation of boundaries, land ownership and status of proposed projects and resort development. There is development clustering comprising of existing settlements, tourism sites, sites designated for conservation, mixed use tourism-related developments, including hotels, resorts, housing, commercial and other tourism facilities. It is expected that sufficient critical mass will be created to make more efficient use of costly Government infrastructure investments such as sewage treatment plants, whilst providing the range of support services and facilities to help stimulate the conditions for private sector involvement and initiative.
Western River, stretches from Denton Bridge to Brefet/Buluck Bolong, includes Oyster Creek, Lamin Lodge, Abuko Nature Reserve, Mandinari village, Makasutu and Tumani Tenda. The area presents an interesting product including a broad range of activities combining a number of different interests – historical, wildlife, bird watching, nature trails, river and creek trails, local customs etc. It has been developed as an 'introduction' to The Gambia's ecotourism product with the objectives to promote the area and help visitors find their way to the variety of interesting Tourism Sites, enabling them to learn more about and fully appreciate the country's natural, historic and cultural resources.

Apart from the Six-Gun Battery, which is not yet open to the public, James Island and Related Sites are well promoted by the tourism industry and the Gambia Government (The Gambia Tourism Authority. web site: http://www.gambiatourism.info/; and www.ncac.gm .The sites are one of the main tourist attractions of the country, also constituting the focal point of the popular Roots Excursion and the biennale International Roots Homecoming Festival, which is designed to attract visitors from the African Diaspora. James Island is mentioned in a great number of other web sites as well.

Site promotion and presentation is mainly realised through:

- The Slave Trade Museum at Juffureh which opened in 1996 in the restored Maurel Frères historic building, Juffureh.
- A 106 pages guidebook on all historic monuments and sites in the Gambia was published in 1999 by the National Centre for Arts and Culture.

Many promotion and site presentation activities have been realized aimed at improving the visitor's experience. These include :

- Signboards;
- Postcards
- A presentation flyer of James Island
- An exhibition room in Fort Bullen
- Road signs directing people to the sites
- Several newspaper articles, radio and television programmes designed to promote the sites

Three main objectives guide the management of these sites. These are encapsulated in the Management Plan as:

- To stabilize the state of conservation of these sites
- To increase awareness about the sites and improve the visitor's experience
- To use the sites to generate development within the local communities.

An action Plan which defines desirable actions and responsibilities at the National, Local and Institutional levels has been developed to meet these objectives.

9. Opportunities

The Gambia has potential new product components which have been added and expanded, by using the River Gambia cruises, and involving the communities through a specifically designed offer, cultural and nature based holidays, opening up the interior.
Resources are being concentrated on further developing those core value elements of the Gambian tourism product which can be managed, namely

- Beach
- Sun-bathing facilities
- Bathing – pool, ocean, river
- Fresh air
- Walking / jogging
- Cycling
- Lack of stress
- Relaxation
- Culture and history
- Informal entertainment
- Food / drink
- Comfort
- Beauty
- Luxury

All the above are based on reliable assured quality of:

- Health / hygiene
- Safety
- Security

Other measures that have been undertaken to complement the measures considered under air access, marketing and product development are as follows:

- Infrastructure, essential for the tourism destination maintaining competitiveness;
- Environmental Management, essential to The Gambia maintaining its appeal;
- Social Aspects, in particular 'bumsters'
- Linkages, notably with Agriculture; fisheries, culture and heritage
- Human resources - a key opportunity with the friendly, intelligent and interesting Gambian people – highlighting the 'product plus' that exists and acting as an interesting contradiction with the 'bumster' issue

10. Product expansion and deepening

With its present focus on middle/lower class beach tourism, The Gambia is dependent on a limited number of tour operators thus making it very vulnerable against trends and the ever-changing tourism environment, thus widening the presently small spectrum. The Gambia has potential new product components which have been added and expanded, by using the River Gambia cruises, and involving the communities through a specifically designed offer, cultural and nature based holidays, opening up the interior. The traditional beach tourism has also been extended by adding capacity south of the present areas as well as complementing the present accommodation by facilities directed to upper market segments and new clientele, e.g. in the self-catering sector.

11. Stabilization of existing and opening up of new source markets

At present, the flow of tourists to The Gambia is concentrated on a few source markets, dominated by the United Kingdom with a small number of tour operators. To retrieve the German market which has disappeared within a short time, the country has improved this disadvantageous situation by strengthening its position in the traditional markets; recaptured lost markets and approach new ones. Efforts to deal with new market segments beyond the conventional "3 Ss" have also intensified.

12. Institutional strengthening and capacity building

The management, monitoring and control of the day-to-day operation of tourism as well as its medium and long term planning require an efficient institutional and legal framework. The key role of The Gambia Tourism Authority has to be strengthened and equipped with adequate financial, human and technical resources. Cooperation between the public and private tourism sector in a close partnership relationship is a key issue for any future development.

13. Development of human resources in tourism and related sectors

Tourism is a service industry and therefore the human factor plays an essential role in the delivery of the product. While the friendly attitude of the staff in hotels and other tourist enterprises is regarded as very positive by the visitors, there is an evident lack in terms of professional skills and service standards. The design and implementation of a coherent training and education system in tourism is imperative to meet present and future demand in terms of quantity, quality and qualifications.

PART II. CAPACITIES

2.1 RESEARCH AND GEOMORPHOLOGY OF THE COAST

1. Background

The lower course of the Gambia River is a drowned valley, where the water level has risen to its present level from about –100 m below present sea at the end of the Pleistocene. The sediment supply from the Gambia River is limited and hardly reaches the coastal zone. The river's estuary acts as a sediment trap for material transported along the coast by wave induced littoral drift. Sedimentation is expected to be the dominant process along the north coast of Kombo North, giving rise to the formation of spits and bars. The erosion presently experienced along the coast between the Old Muslim Cemetery and Banjul point is a local and, in geological terms, temporary phenomenon; in the human time frame however this erosion poses serious threats.

The embayed sandy parts of the coast have been since the end of the latest Holocene (Nouakchottian) transgression i.e. about 5500 years BP. The amount of progradation varies for different places. These predominantly sand deposits, in both the surf zone (present beach) and the raised or ancient beaches have been grouped together as the Holocene Coastal Beach Complex.

The raised beaches consist of yellowish medium to fine sands with distinctive black colouring as a result of heavy mineral presence. These sands have been originally reworked by waves and exceptionally high waters into series of broad, low ridges, parallel to the present shoreline, and later modified by aeolian processes.

Landward, behind the Beach Complex, the geology of the coastal area is made predominantly of the CTS. The CTS rise from 10 - 15 m at the coast to 100 m at 400 km inland. The protruding rocky headlands along the coast all appear to consist of laterite formed within this CTS. The laterite layer that can be observed at several places along the coast has a thickness of 1 to several meters. It is not necessarily a horizontal layer; it can be undulating or sloping, as can be seen at the coast near the Japanese jetty at Bakau). At all locations where the material underlying the laterite could be observed, it was found to consist of coarse sandstone, well cemented by iron oxides or hydroxides. The sandstone is fairly hard due to this cementation, though it is easily friable. On the southern part of the headland near Sanyang, this sandstone was used to construct a low dike to protect private property against wave action.

Apart from erosion by waves, the escarpment and cliffs along the coast at Bakau and Fajara are under attack by one other process. The discharge of wastewater and surface runoff seriously aggravates the problem of erosion. Many drain pipes or surface drains can be seen protruding from the cliffs, causing deep incision of gullies and local retreat of the cliff coast.

2. Seismic information

No indications have been discovered which point to the need to take earthquake loadings into account in designing any structure. Further confirmation will be sought on this aspect before proceeding with the detailed design.

3. River discharges

The Gambia River, with a catchment area of 77,000 km^2 and a length of about 1150 km runs through Guinea, Senegal and The Gambia. The mean annual discharge at Goulombo, 490 km from the mouth was about 250 m^3/s between 1953 and 1981. The once in ten years flood reaches a discharge of about 2000 m^3/s.
These river discharges are small compared with the peak tidal discharges, which vary between 2,500 m^3/s and 4,000 m^3/s at Kaur, 200 km from the river mouth, and 30,000 m^3/s to 45,000 m^3/s at the river mouth of the estuary at Banjul
The dominance of the tidal discharges over the river discharges indicates that the lower 200 to 250 km of the system is much more an estuary than the lower part of a river

4. Human and scientific resources

Table 4 : Principal Institutions and researchers working on the problem issues related to coastal erosion and geomorphology.

Institutions	Contacts	Contact Details	Coastal Research and Monitoring Projects in Progress
National Environment Agency	Coastal Zone & Marine Environment Unit	Jimpex Road, Kanifing, PMB 48, Banjul	Beach profiling and compiling (42 beach profiles along the 81 kilo-metres coastal zone. Period 2005 - 2007
Gambia Government	NEA	Jimpex Road, Kanifing, PMB 48, Banjul	Dutch Consulting Company – Coastal Protection Study 2000
Gambia Government	GPA	Banjul	Dredging
Gambia Government	DWR	Banjul	Weather Forecast
Gambia Government	Dept. Geology	Banjul	Mining
Gambia Government	NARI	Brikama	Adaptation
Gambia Government	UTG	Kanifing	
Gambia Government	Dept. Fisheries	Banjul	Landing Sites Monitoring
Gambia Government	Forestry	Banjul	Coastal Parks and Forest
Gambia Government	DPWM	Abuko	Turtle Wildlife Research
Gambia Government	GTA	Kotu	Beach Monitoring and Protection
Gambia Government	DPPH	Banjul	Land Allocation
Gambia Government	DLS	Banjul	Beach Surveys
Royal Haskoning	CityScape As-sociates	Kairaba Avenue	Gambia Coastal Protection Project 2001

5. Human and scientific resources: Shoreline monitoring systems implemented over the past 10 years and currently operational.

Table 5 : Shoreline monitoring systems implemented over the

Institutions	Names and contact details	Sites monitored (localization and extension – periodicity of measures) – current status of system	Period covered by data	Measurement methods
National Environment Agency	Coastal Zone & Marine Environment Unit, NEA Jimpex Road, Kanifing, PMB 48, Banjul	Jinack to Kartong, Entire 81 Kilometres of the Gambia coastline	2001 - Present	Digital leveling machine for topography and batimetric surveying, using tapelines to high water mark.

2.2 RISK REDUCTION

The Hazards Profile of the Gambia and its Vulnerability and Capacity Assessment Report 2007, identified several hazard as posing real potential threats to the country related to drought, floods, and environmental degradation. These including core biological hazards such as locust invasions and epidemics, for example, between 2002 and 2006 there were 65 flood related disasters, 45 incidents of fire in the western region only which mostly are highly populated and urbanized. The severe floods in 1999 and 2003 in Upper River and Central River Regions and in many parts of the country affected 13.1 per cent of the population

Disaster issues had long been pronounced in normative and policy documents in various government policy documents and development agenda. These include The Gambia Vision 2020 Document, the National Environment Management Act (NEMA) in 1994, the first and second GEAP and desertification conventions, the National Disaster Emergency Relief and Resettlement Committee, the Capacity Building for Sustainable Development (CAP 2015) project, the MDG Reports 2003, 2004 and the PRSP.

The paradigm shift in recent years from disaster response to disaster prevention and risk reduction is largely motivated by the high toll of disasters both in terms of human sufferings and the loss of economic assets. What is needed, as clearly indicated in a recent DFID Policy Paper is 'a well-resourced and prepared response system with a focus on national and local capacity.'

Cognizant of the above, the Gambia government developed in 2008 a National Disaster Management Act and Policy which emphasizes that any successful mechanism for disaster prevention must be multifaceted and designed for the long-term. The capacity to anticipate and analyze possible disaster threats is a prerequisite for prudent decision-making and effective action. Yet even practical early warning will not ensure successful preventive action unless there is a fundamental change of attitude towards disaster perceptions. An integrated approach that brings together the efforts of the government, UN agencies, NGOs,

civil Society, Local authorities and local communities is the most viable, effective and sustainable disaster management strategy.

Currently the UNDP provide project support in the form of a National Disaster Management Programme aimed at developing a comprehensive disaster management framework in the country and to improve national capacities to anticipate, manage and respond to disasters. Through the project, a secretariat was fully operational and served as the nerve-centre for all disaster related issues in the country. The capacities and institutional memory developed during the project implementation were used to establish a National Disaster Management Agency charged with the implementation of the disaster Policy and Act thus justifying the formulation of this strategy. The project also assisted in the development of a national hazard/disaster profile, restructured regional disaster committees and undertook training and capacity building country-wide in addition to the development of a comprehensive National Action Plan for Avian and Human Influenza (Pandemic Preparedness plan) and its integration in to the National Disaster Management system and Structures.
Recently, the UN,s International Strategy for Disaster Reduction (UNISDR) following the government's request, provided technical support to the Government in the assessment of the national institutional framework for DRR and formulation of a National Programme of Action.

The National Disaster Management Act, (2008) provide the institutional framework for DRR in the Gambia. It established a National Disaster Management Council under the Office of the Vice President. The Council is responsible among other things for advising government on the coordination of government and NGOs, ensures the Agency executes government's policies, advise the president on the need for disaster relief aid and declaration of state of public emergency and to make available to the regional disaster coordinators resources for the mitigation of potential disaster. The Council has a Technical Advisory Group (TAG) to advise it on disaster issues and a National Disaster Management Agency as its technical arm. A Technical Advisory Group (TAG) is made up of professionals and through the National Disaster Management Agency shall advise the National Disaster Management Council and will also prepare the National Disaster Management Plan and review Regional Disaster Management plans.

The institutional framework defined in the Act tried to mimic government's decentralized structure by empowering all Regions, the Banjul City Council and the Kanifing Municipal Council, Districts and Villages with DRR leadership and coordination responsibilities within their respective geographical confines.

Currently there is no existing National Platform on ISDR for disaster reduction but however a National Platform for Disaster Reduction and Climate Adaptation comprising all DRR and CCA stakeholders in government, development funding organization , NGOs, CSOs ,the private sector and private individuals is proposed and yet to be finalized.
The Technical Advisory Group (TAG) and the National Climate Change Committee (NCCC) shall be merged and transformed into a National Disaster Risk Reduction Platform just like the National Climate Change Committee and try to integrate its Disaster Technical Teams with the Thematic Working Groups.

Table 6 : Composition of the TAG

INSTITUTION	PEOPLE IN CHARGE	CONTACT DETAILS	HEAD COUNT
OVP	The PS		
NDMA	Executive Director		
NEA	Executive Director	4399422	
NPC	Director General	8800693	
GAFNA	Executive Director	4496742	
DOSH	Permanent Secretary	4228624	
DWR	Director	4228216	
GFARS	Chief Fire Officer	4228211	
GPA	Managing Director	4229940/4227813	
GN	Navy Commander	4201753/4201002	
GAF	Lieutenant General	4224223/4224220	
GPF	Inspector general	4227210/4202778	
LG&L	Permanent Secretary	4226292	
FINANCE	Permanent Secretary	4227221	
GRCS	Secretary General	4392405/4393179	
TANGO	Executive Director	4390521	

PART III. PRESSURE ON COASTAL MILIEUS

3.1 DEMOGRAPHICS AND POPULATION MOBILITY, URBAN FRAMEWORK

1. Background

The broad definition for coastal area adopted by the NEA, Coastal Definition Study, 1996, includes the areas that border the Atlantic Ocean and brackish water environments that border the River Gambia, extending 200 km inland. The Gambian coastal environment is characterised by rocky/cliff features, internal mud sand flats, coastal dunes, brackish lagoons, and living reefs. The coastal environment also consists of marine, brackish water, fresh water and terrestrial habitats such as salt marsh, mangroves or swamp forests.

However the definition of coastal area, called coastal strip, for the purpose of this study involves a much smaller area.

It covers the area bordering the Atlantic Ocean Coastline which is 80 km long. This stretches from Buniadu and the Karenti Bolong in the North Bank Region to the mouth of the Allahein River around Kartong in the Western Region. About 70 km of this coastline is exposed to the actions of waves and tides is therefore vulnerable to sea erosion

Only about 20 km of the area bordering the sea is significantly developed for human settlement and for business activities including tourism. This includes Banjul, Bakau and Cape St. Mary, Fajara and the Tourism Development Area (TDA).

On the coastal strip bordering the Atlantic Ocean on the south bank of the Gambia there exist about 28 settlements which are to varying distances close to the sea shore. They are separated by patches and mix of at least one of the following: mangrove swamps, community forests, vegetable gardens, orchards, hotels, guest houses, protected forest, roads, streams, reserved land with bush and open shrub land.

The two main natural causes of erosion in the Gambia are *wave action* and *sea level rise.* The phenomenon of coastal erosion has prevailed in the coastal areas of The Gambia for the past four decades. The erosion threatens monuments, significant cultural sites cemeteries, the Serrekunda-Banjul highway, the hotel and housing industry, infrastructure including government administrative buildings, and the city of Banjul. As a result some of the country's socio-economic activities around the zone such as tourism, housing, and fishing are in danger due to the loss of land and advancing water front on fishing jetties and storage facilities.

2. Population trends in the coastal strip.

Between 1993 and 2003 the population of the Gambia grew by 2.8 % per annum on average. The population within the study area has been growing by 3% per annum on average. It is projected to reach about 0.7 million persons in the year 2020 and in 2050 about 1.1 million persons. Most of the settlements along the Atlantic-Ocean coastline depicted negative growth rates between 1993 and 2003. Hence, the average annual growth rate of set-

tlements in this area was less than 2%. The lower growth rate is indicative of a tendency of population mobility in which people would continue to move away from the coast land near sea shore to the nearby hinterland. Notwithstanding this outward mobility the population of the study area is expected to reach 1.1 million in 2050.

Table 7 : Projected Distribution of Populations in settlements along the coast line and shorelines within a defined area of the Gambia, 2020 and 2050.

	2003	2020	2050
1. Settlements along the Atlantic Ocean shoreline	85,779	214,314	342,903
2. Settlements on the shorelines of the Lower Mouth of the River Gambia (West of longitude in Essau)	65,409	70,874	113,399
3. Settlements on the shorelines of the Upper Mouth of the River Gambia (East of longitude in Essau and West of longitude in Buniadu)	144,708	417,256	667,609
	295,896	702,444	1,123,911

3. Population mobility – migration pattern.

The population of The Gambia in 2003 was 1, 360,681. About 18% of this population was involved in the process of internal migration. Kanifing and Brikama Local Government Areas (LGAs) were major destinations for the migrants. Except for Kanifing and Brikama, net internal migration was negative in the remaining 6 LGAs.
The census reveals that 16.6 % of the population of the Gambia consists of rural–urban migrants, 10.5% constitutes the urban–urban migrants and 1.8% forms the urban–rural migrants.

4. Sanitation, water treatment, main waste discharged into the sea.

Safe drinking water is essential for good health. The MICS III report, 2006, defined safe drinking water as water whose source is one of the following: piped water into buildings/dwelling place, public tap/standpipe, tubewell/borehole, protected well and rainwater collection. In Kanifing 43.7 % of the population use water piped into building, yard or plot. In Banjul, the 2006 MICS survey shows that 66.5 % of the population uses this improved source of drinking water.

Sanitary means of excreta disposal include the following: flush to piped sewer system, flush to septic tank, flush to pit latrine, ventilated improved pit latrine (VIP), and pit latrine with slab. In Banjul, 96.6% of its households use improved sanitation facilities and 45.5% of its households flush into piped sewer system.
In Kanifing, 95.8% of its households use improved sanitation facilities and 49.6% of its households use pit latrine with slab.

5. Urban spread and extension tendencies, projects for urban re-qualification, sanitation under study or in progress, sea front developments and urban development schemes.

Urbanisation is a dynamic process, which involves a variety of changes in all aspects of the society and its environment. In 1963 the total population of Banjul, Kombo St. Mary, Kombo North and Brikama, (the current Greater Banjul area), was 53,000; in 1973 it was 95,000 (excluding Brikama); in 1983 it was 200,000; in 1993 it was 430,000 (including Kombo South) and currently it is over 640,000. The current annual growth rate of the GBA is 8% (2003 census) this is more than twice the national population growth rate. Now over 45 percent of the total population of the Gambia lives in the G.B.A. and it is projected that by 2010 about 665,700 people will live in the G.B.A.

There is however no specific legislation on waste management, although some existing legislation relevant to waste management are: the National Environment Management Act, (NEMA) of 1994 which is the umbrella legislation for environmental management and includes the regulation that controls pollution and the discharge of waste substances into air, water or land; the Public Health Act (1990); the Physical Planning and Development Control Act, 1990 and Regulations, 1995; the Environmental Protection, Prevention of Dumping Act, 1998. Currently under preparation, a national Waste Management Act is expected to address the implementation problems associated with waste pollution and management that could not be addressed by the above legislation.

The Poverty Alleviation and Capacity Building (PACAPB) project (jointly financed by the government of The Gambia and IDA/World Bank) was a four-year, US$18.0 million project. The primary thrust of the project is to enhance the sustainable provision and development of adequate public infrastructure and services for the Municipalities within the GBA. The project also provided access to public infrastructure and facilities as well as social services to the residents in the respective Municipalities. The emphasis was to improve access for the poor to such services.

As part of that project, the GBA and Brikama benefited from the conduct of a comprehensive study on waste management, and the development of a solid waste management system. The study recommended and selected a new `landfill site at Tambana near Brikama. This new landfill is expected to be operated as a sanitary landfill and served the entire GBA and Brikama. After the GBA and Brikama waste study the UNDP also provided a grant to the Gambia government to support waste management at the Bakoteh dumpsite. The UNDP support for Waste management at Bakoteh provided detailed information on Bakoteh Dumpsite and a detailed design for the improvement of the dumpsite. The implementation of this design significantly improved the situation at the dumpsite. Dumping became more organised due the provision of access roads and fencing. Most of the environmental impacts such as smoke and stench reduced significantly.
The President also launched the Operation Clean the Nation in April 2004 and from then till now this has become a national event. In June 2007, the President signed into law the Anti littering regulations 2007.

However, with the feasibility study of the coastal problem in 2000 and the implementation of the coastal protection works from July 2003 to April 2004 resulted in minimizing/halting the coastal erosion problem. It also resulted in recovery of some lost coastal areas through soft

and hard engineering interventions (Beach nourishment, construction of Groins, Revetments).

A Coastal Zone Management Policy and Guidelines have been formulated and established, they are legal instruments for sustainable exploitation/utilization of the coastal zone and its resources.
A Tourism Development Area (TDA) has been delineated and a national tourism office created for control of development activities within this area, development has largely remained uncontrolled for the most part.

6. Trends in seaside residential habitat, holiday home settlement and migratory settlements.

Few settlements along the southern Atlantic coastline inhabited with people that are mainly preoccupied by fishing, fish processing and marketing of fish products are growing in size. Ghana town and Tanjeh are typical examples. Since the inception of tourism in the late 60s the number of hotels and guest-houses built along the coastline from Banjul to Brufut has increased manifold.

7. Report on land control, speculation and urban-rural conflicts.

Land is one of our most precious assets. Land is finite in extent, but the number of people competing for it is still increasing. The Gambia has a total land surface area of 1,037 million square meters but its population has doubled between 1975 and 1995.

With an actual growth rate of 2.8%, it is expected to double again and reach the mark of 2 million by the year 2020. Given the increasing population and competition for land, there is a need for planning and regulation in order to avoid future conflicts. The objective of national land and land use policy is to optimize the sustainable use of land in line with the legitimate needs of all stakeholders, but within the long-term development objectives of the Government.

The Government through the Minister for Local government and Lands has the mandate to design, designate and even make declaration as a measure to control land use and as well as urban sprawl.

This is done by means of one of the three strategies of the land use plan 2000 whereby bigger plots are subdivided into smaller plots to meet the urban plot standard of 250 meter square to 500 meter square to prevent urban sprawl. Controls are also done by means of provision of layouts for any parts of the country, provision of community plans and upgrading strategy.

Preservation strategy involves conservation of the following: forest, gardening and rice growing areas, green belts, minerals and water resources, special land use features, historical or religious sites, etc.

Land conflicts or speculations: this happens within the unplanned industrial, institutional, commercial and even agricultural zones.

Land Use Act, 1991: This urges Government to acquire land for certain public purposes. Any private land acquired for public use is adequately compensated.

Physical Planning and Development Control Act 1991, also provide legal basis for the systematic preparation of layouts and effective development control mechanism particularly buildings and, this regulations must be followed by all developers.
Both the Physical Planning and Department of Land and Surveys regulations are all enforceable for effective and efficient management of all land related issues. These regulations were all promulgated in 1995.

Table 8 : settlements on shoreline bordering the atlantic ocean

No	Name of settlements	Enumeration Areas	Population 2003	Population 1993
1	BAKAU WASULUN	20001 – 004	1,312	2,195
2	BAKAU NEW TOWN	20005 – 068	31,600	26,687
3	KOTU	20140-166	11,844	4,419
4	KOLOLI	20167-177	5,498	4,416
5	KERR SERIGNE N'JAGA	30001-023	7,984	2,278
6	BIJILO	30024-028	2,981	1,542
7	TRANKILL	30029	490	157
8	BRUFUT MADINA	30031	88	
9	GHANA TOWN	30314-315	94	452
10	BRUFUT BEACH	30314		3
11	BRUFUT	30032-054	5,537	8,644
12	TANJEH	31088-099	3,194	4,623
13	BATO KUNKU	31014	160	230
14	TUJERING	31081-087	2,126	2,534
*15	SANCHABA	31110	23	10
*16	TINTINTO	31110	16	11
*17	KENENDING SAIBALI	31110	95	114
18	HAWABA	31055	154	22
19	SANYANG	31040-055	3,053	4,435
*20	KACHUMEH	31107	79	101
*21	SAMBOUYA AMMANSONG	31107	31	8
*22	SAMBOUYA KONOTO	31107	15	62
*23	NYANTANG FARABA	31017	16	15
24	GUNJURR	31008-029	5,722	9,983
*25	KAJABANG	31101	16	73
*26	DUWA DULA	31105	11	24
27	MADINA SALAAM	31100	674	453
28	KARTONG	31001-005	2,858	2,536
*29	ALLAHEN	31105	96	29

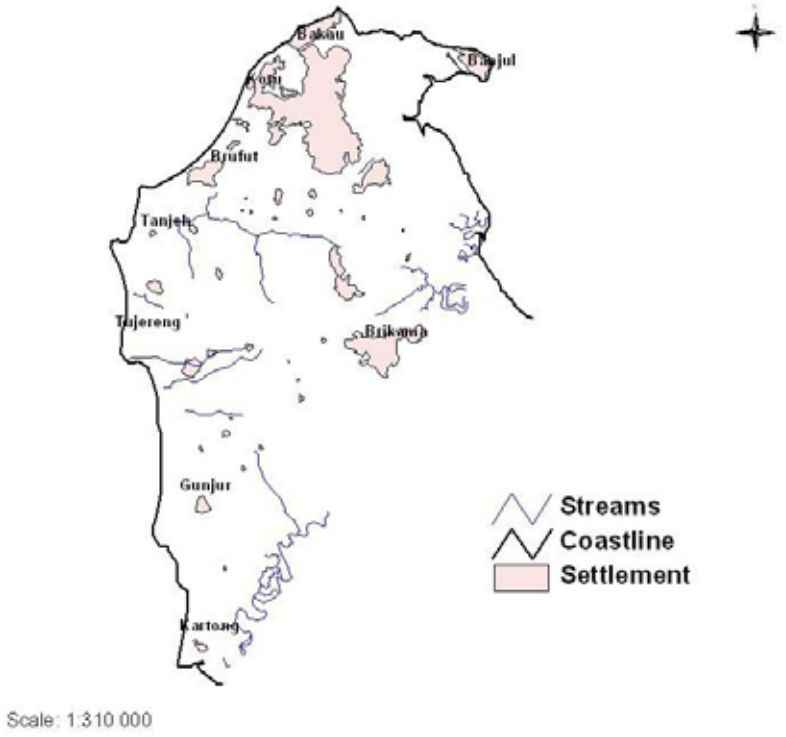
Table 9 : settlements on shoreline of the lower mouth of the river gambia

No	Name of Settlements	Enumeration Areas	Population 2003	Population 1993
1	OLD JESHWANG	20069–095	13,319	8,480
2	BANJULSOUTH	10001-019	8,453	10,745
3	BANJUL CENTRAL	11001-019	9,094	11,029
4	BANJUL NORTH	12001-054	17,514	20,552
5	BARRA	50001-012	4,470	4,257
6	ESSAU	50013-024	6,689	4,486
7	MADINA KUNUMA	50025-026	774	580
8	MAYAMBA	50079	423	225
9	KANUMA	50027-029	1,338	900
10	M'BOLLETBA	50030-031	1,297	1,125
11	M'BANKAM	50032	607	513
12	JINACK NIJI	50062	538	336
13	JINACK KAJATA	50060-061	687	522
*14	BAKINDICK KOTO	50054	206	40

Table 10 : settlements on shorelines of the upper mouth of the river gambia

No	Name of settlements	Enumeration areas	Population 2003	Population 1993
1	SAMI	50081-082	532	104
*2	GALLOYA (JIFFET)	50063	2,723	129
*3	MENDY KUNDA	50063	60	47
4	BUNIADU	50033-034	691	582
*5	BAKINDICK TABO KOTO	50064	110	59
6	BAKINDICK MANDINKA	50050-051	953	527
*7	BAKINDICK WOLLOF	50064	209	664
8	ALJAMDU	51014-015	848	856
9	SITANUNKU	51012-013	784	664
10	TOUBAKOLONG	51010-011	1,127	1,259
11	NEW JESHWANG	20309-346	17,023	21,656
12	EBO TOWN	20347-387	18,363	2,563
13	TALINDING	20388-455	34,206	19,773
14	FAJI KUNDA	20549-588	23,969	12,744
15	ABUKO	20622-634	8,958	4,345
16	LAMIN	30262-295	17,033	10,668
17	DARANKA	30296-297	1,054	363
18	KEREWAN	30298-302	2,262	458
19	MANDINARING	30306-312	4,725	3,423
20	KUNKUJANG JATAYA	30313	419	301
21	KUBUNI	32029-030	549	182
22	BONTO KOTO	33030	702	647
23	BONTO KUTA	33031	107	81
24	KULORO	33006-008	2,085	1,647
25	PIRANG	33012-014	2,080	1,703
26	FARABA BANTA	33049- 052	2,771	2,276
*27	SUMA KUNDA	33042	141	140
*28	TUMAN TENDA	33047	224	189

Figure 5 : Map of Atlantic Coastline of The Gambia



3.2 ROAD INFRASTRUCTURE

1. Background

Given the heavy investment made on the national road network, Government saw the need to create a body to be responsible for the upkeep and management of the road sector. In this regard, the National Roads Authority was created by an Act of Parliament in November 2003. The operational aspect of the Authority commenced in October 2006.

The NRA has recently conducted a nationwide inventory of the entire road network in the Gambia. The roads are classified as Primary, Secondary, Urban and Feeder. The road network around the coastal zone from Buniadu in the North and Allahein in the South comprises of both primary, secondary, urban and feeder roads. The map attached shows the primary network in thick red lines, feeder roads in thick yellow, red broken lines are the district boundaries, red-medium lines are the secondary roads and the thin red continuous lines are the unidentified feeder roads. The primary, secondary and urban roads are constructed to a High standard Asphalt or surface dressing but the feeder roads are mainly gravel or earth with most of them in a state of repair. However, the newly constructed feeder roads in the Western Region are of high standard double surface dressing and there are plans that all the forthcoming construction of feeder roads to be of at least single seal pavement.

Among the major developments in road infrastructure, the Gambia had in the recent past years embarked on a major road construction project in the Kombos called the Kombo Coastal Roads Project. These roads are linked to the Banjul-Serrekunda Highway and the Serrekunda-Mandinaba Road, making the zone accessible from Banjul to Kartong and other major Towns in the Greater Banjul Area. The Herman Mainer Highway links the heart of

Serrekunda to the Kombo Coastal Roads. These roads made the coast line accessible at working distance. The construction of these roads also facilitated access to all the major Hotels and beaches in the Gambia. Another great benefit of this road is its linkage to all parts of the greater Banjul Area, making provision for the accommodation of traffic especially during the rush hour.

The Kombo Coastal Roads made easy access to Banjul, Tanji, Gunjur and Kartong beaches where fishing activities, business and the movement of people and goods in and around the Country is paramount. In addition, roads such as Bond Road facilitate the movement of goods from both the main Port of Banjul to the Kombos and beyond and at the same time the movement of people and goods from the Ferry Terminal to destinations inland and outside of the country. The access roads to the beaches are used by the fishermen, fishmongers, beach goers and above all the trucks used for sand mining

The area of study has no enclave and there are several proposals for the rehabilitation of some of these roads. Currently, there is a pre-identification study of 240km feeder road funded by the EU for possible design and reconstruction. Priority of the 240km would be determined base on the social-economic benefit of the road for roads with high traffic. In addition, smaller roads within the coastal zone such as the access road from Gunjur village to the beach and the Market, Ghana Town in Brufut and Bond Road in Banjul were all recently surveyed for possible rehabilitation. However, the cost estimate of Bond Road was prepared and funding is being sought.

Selected roads, mainly feeder roads that were affected by flooding were surveyed all over the country by the Disaster Management Agency as part of the Disaster Management Programme for the Rehabilitation of flood affected roads. These roads are in the process of being finalized. In addition, JICA has expressed interest in the feasibility study and rehabilitation of feeder roads in the country and this would be determined in due course.

2. Principal Documents

Documents for the road development scheme are The National Transport Plan, Vision 2020, Millennium Development Goal and PRSP II.

3. Principal Issues

As stated in its Act, the operations of NRA will be funded from a Road Fund whose revenue sources are mainly from vehicle registration, licensing and road tax. At the moment, the Road Fund is generated through a monthly subvention from the Ministry of Finance and Economic Affairs. The Funds for Construction and major rehabilitation works are provided by Government and/or Funding Agencies through loan or grant to the Government. The NRA maintenance programme is done to suit the available funding. The principal issue is therefore the availability of sufficient funding for the execution of NRA's programmes.

Table 11 : Principal Road Projects

Project Name	Period Start-End	Donors	Authority	Name and Contact of Person in Charge	Refe-rence on the Web	Remarks
Pre-identification of Feeder Roads	January-May 2010	EU	MOWCI/NRA	Engineer		In progress
2009 Main-tenance Programme	2010	GoTG	MOWCI/NRA	Engineer		Just Com-pleted
2010 Main-tenance Programme	Yet to commence	GoTG	MOWCI/NRA	Engineer		To com-mence soon
Dimbaya-Dasilami Loop	Yet to commence	Saudi Fund, etc.	MOWCI/NRA	Engineer		Financial agreement signed
Bond Road	Yet to commence	GoTG	MOWCI/NRA	Engineer		Yet to commence
Herman Mainer Highway	Yet to commence	GoTG	MOWCI/NRA	Engineer		Yet to commence
Gunjur-Gunjur Beach	Yet to commence	GoTG	MOWCI/NRA	Engineer		Yet to commence

3.3 DOCKS AND AIRPORT INFRASTRUCTURE

1. Background

The Gambia Ports Authority was established in 1972 as a statutory public corporation with the task of running Gambia's port facilities in an efficient and customer orientated way.

The Port of Banjul is located on the estuary of the Gambia River, 26 miles from the Atlantic Ocean. The river can be navigated up to 300 miles inland by seagoing vessels and further still by commercial barges, providing a cost-effective and reliable alternative to road transport. Gambia's strategic position within the Atlantic Trade Triangle makes it eminently suitable to serve as a hub to the Economic Community of West African States (ECOWAS).

Situated at latitude 13 degrees 27' North and Longitude 16 degrees 34' West and located on the estuary of the River Gambia, 26 nautical miles away from the Atlantic Ocean, one of the World's busiest Shipping lanes, the Port of Banjul is the main seaport that serves The Gambia's seaborne trade. It constitutes almost 90% of the total of the country's foreign trade in volume and weight terms. It is thus the main gateway to the Gambian economy.

A thriving and vibrant port established in 1972, the Port of Banjul has been recognized over the years as one of the safest and most efficient in West Africa. Banjul Port offers a prompt, reliable and value-for-money service.

2. Facilities and infrastructure

The Port has well-developed facilities for handling all type of cargo using modern equipment and techniques. This infrastructure, combined with a competitive tariff, comprehensive use of information technology and dedicated workforce ensures that customers are always provided with quality service.

The Port of Banjul is strategically located close to major shipping routes and is regularly serviced by well established conference and independent lines.

A long-established tradition of close co-operation between the Port and Customs, Immigration, Health and Shipping Agencies enable our service to be consistently delivered in a smooth and efficient manner. The Port of Banjul is unrivalled in Africa for its simplified trade documentation procedures. The Port has a deep sheltered anchorage with no record of piracy, thus making it one of the safest in the region. The facilities and infrastructure includes:

a. Banjul Wharf

This wharf, the first to be built, is 120 metres long and 17 metres wide. Its outer berth has a navigation depth of between -9.5 and -12.0 metres while that of the inner berth is -8.0 metres.

b. New Banjul Jetty and Extension

The 123 metres long New Banjul Jetty was extended by 177 metres to give a total berth length 300 metres. The outer berth can accommodate vessels with draughts of between -12 to -14 metres. The inner berth, designed for lighter vessels, has a navigational depth of 7.0 metres.

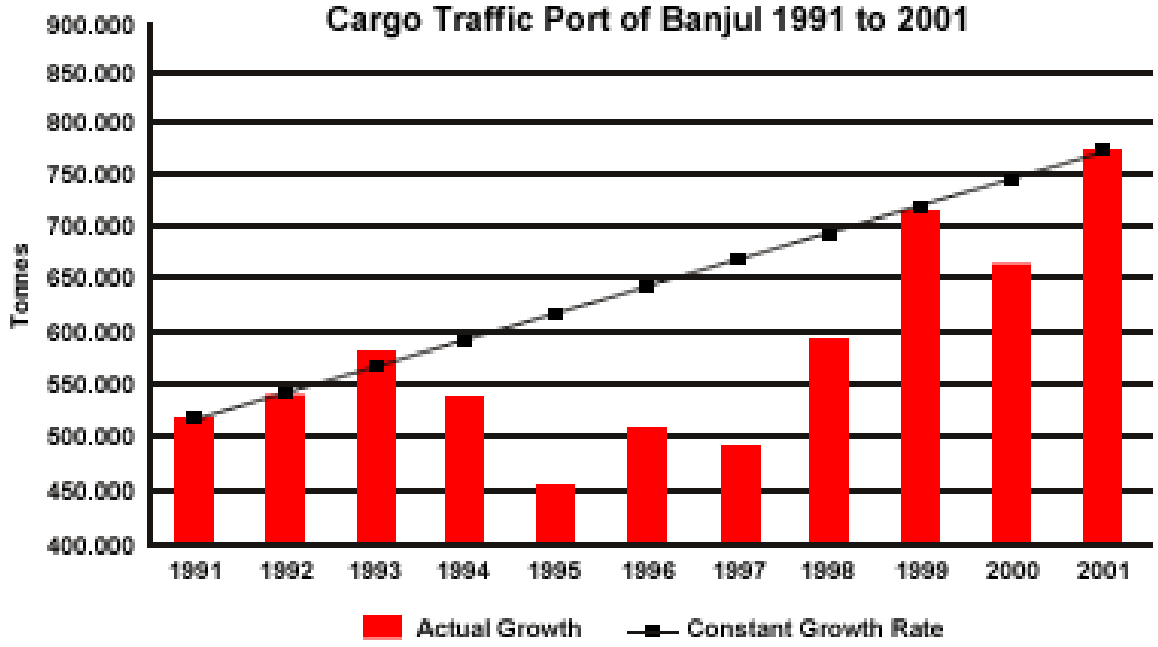
c. Facilities to Ship

- Pilotage is compulsory from buoy #5 to the port and is available 24 hours a day.
- Berthage
- Mooring
- Ship chandling
- 24 hour stevedoring.

3. Statistics and flow of goods

Since 1991 cargo traffic at the port of Banjul has grown at an average annual rate of 4 per cent, but figures have fluctuated from year to year due to the impact of re-exports. Annual throughput now stands at around 800,000 tonnes, which is split 90:10 in favour of imports.

Figure 6 : Graph showing Cargo Traffic



Container traffic has seen an average 11 per cent annual growth rate in recent years and represents the most dynamic trade and the port of Banjul now handled over 30,000 TEU each year.Containers, cement and petroleum products comprise nearly 70 per cent of all imports with smaller sectors such as rice, sugar (the majority of which is re-exported), flour (again a portion is re-exported) and general cargo making up almost of the balance.

Containers (although 90 per cent are empties) form the largest export with only comparatively small amounts of groundnuts and groundnut-related products as the only tangible export commodity and even this has declined from a peak year in 1998.

Senegal, Guinea (Bissau) and Guinea are the three main destinations for re-exported cargoes through the Port of Banjul.
Due to the larger average size of vessel, the number of ship calls at the Port of Banjul has remained broadly static over the last 20 years or so. This is despite the significant increase in cargo throughout.

4. Airport infrastructure

a. Background

The Banjul International Airport is managed by the Gambia Civil Aviation Authority. The airport can handle up to one million passengers a year and has open skies agreements with the United States and EU Countries and is certified as a last point of departure to the U.S.

There are direct flights from Banjul to London and Brussels and other major world destinations such as the US, France, Frankfurt, Hong Kong, Taiwan, Japan, and South Africa can be reached via London and Brussels or via Dakar which is 20-25 minutes by air from Banjul. The airport has undertaken a significant transformation despite being faced with a competitive air transport market and considerable growth in air traffic demand.

b. Facilities and infrastructure

The Authority continues to invest heavily on human capital, equipment, airport infrastructure and safety. Banjul is regularly served by a number of international airlines and is only a few hours flying from the world's major trading centre. The airport is currently the focus investment with the construction of a new ultra modern terminal complex. The superb NASA-built runway is one of the longest in West Africa.

The Gambia Civil Aviation Authority (GCAA) was established by the Government of The Gambia as an autonomous body in July 1991 (under the Public Enterprise Act of 1989) to give effect to the Chicago Convention and to monitor and regulate the aviation industry in The Gambia to acceptable International Standards. In addition to its traditional role of regulating and managing the aviation industry for the facilitation of safe, regular and efficient air transportation in the Gambia, the GCAA is also entrusted with the management of Banjul International Airport (BIA) which includes among other things to ensure the provision and maintenance of the required infrastructure and facilities as per user demand.

3.4 FORMS OF COASTAL TOURISM

1. Background

Tourism is one of the growth engines in The Gambia for socio-economic development, with the focus on tourism as an effective tool to fight against poverty and improve the lives of the people. It is for this reason that the new tourism paradigm is envisaged to maximize the positive cultural impact and strengthen economic and social development possibilities through:

- Improving community living conditions.
- Protecting and conserving biological diversity.
- Promoting the development of infrastructure at the national level.

Tourism is the focus of a three-pronged plan envisaged to raise the pace of economic growth and investment, modernization, and opening the country to the global economy. Therefore tourism is now integrated into the government's program for accelerated and sustainable development and strategies for elimination of poverty.

2. State and trend in each issue

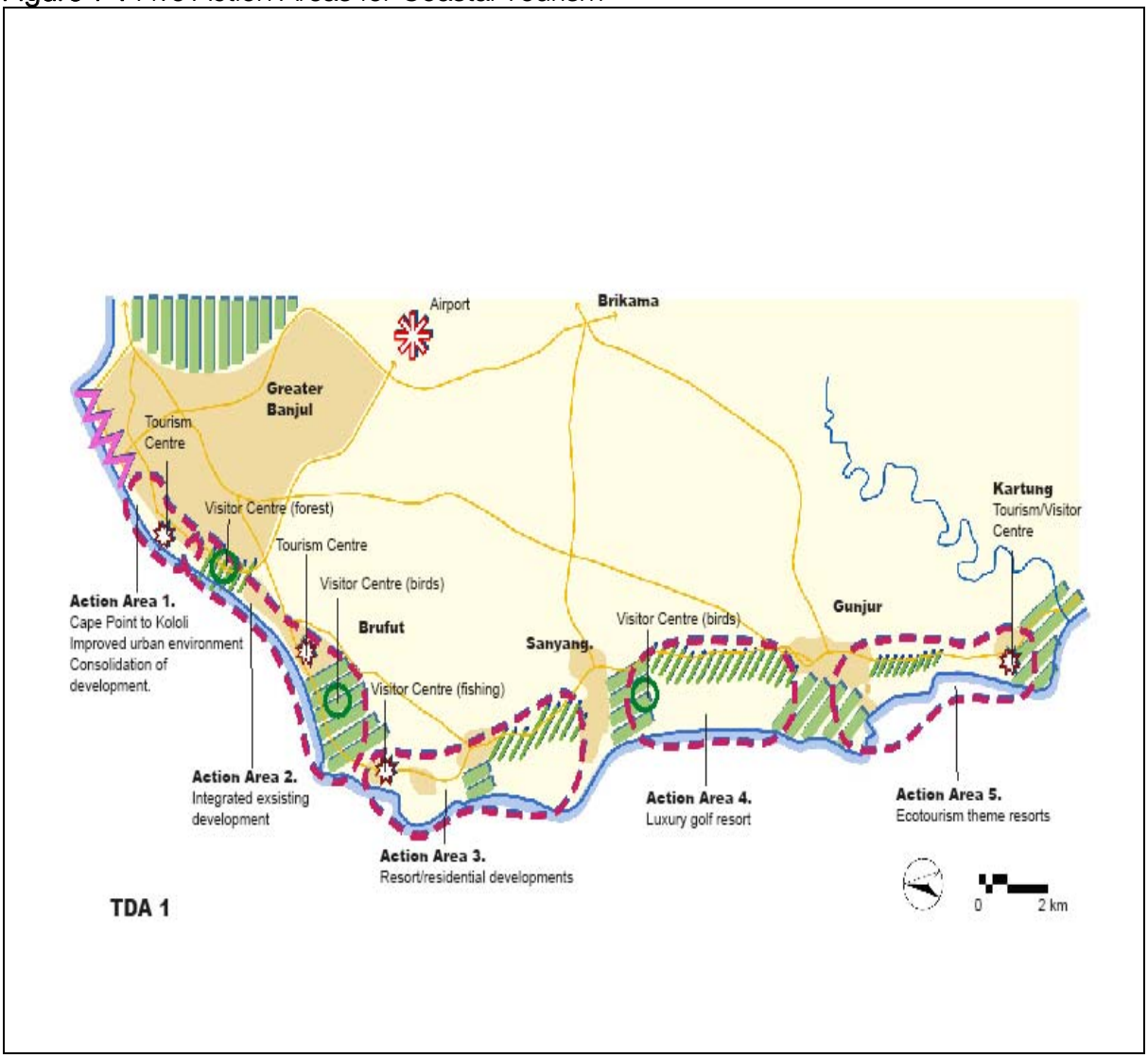
The Gambia's potential in coastal tourism, as well as cultural tourism is based upon the following resources and infrastructure.

- Its society is multi-ethnic, multi- lingual, multi- religious and multi-cultural. The Gambia enjoys exemplary inter- religious tolerance and harmony.
- It is part of the ancient civilization of the Songhai, Ghana, and Mali Empire.
- There are two World Heritage sites, namely James Island and its related sites, the Stone Circles, and the Kangkurang Masquerade, which is jointly listed with Senegal. These are tourist attractions.
- There are natural attractions including wild life, and a magnificent river with lush wetlands and mangrove forests. The Tanji bird reserve, Tanbi National Park, a RAMSAR site, and Solifo and Bijilo Islands are a bird watchers' paradise.
- Eco-tourism in the form of world renowned facilities, such as Makasutu Lodge and Cultural Forest and Lamin Lodge.
- Sun, Sea and Sand tourism featuring beaches and seafronts (leisure tourism), adventure excursions, water sports, bird watching, and sport fishing.
- Creek tourism (water sports), including Creek cruising, fishing, boating, and bird watching.
- Community based tourism.
- Cultural and Religious sites located in coastal towns such as "Sannemantering", "Kenyeh kenyeh Jamango", the tomb of Sait Matty Bah, Katchikally, and Kartong and Berending sacred crocodile pools are living cultures that provide an insight into The Gambian way of life.
- Shopping, especially for Gambian textiles and clothing are becoming popular activities for tourists from other English-speaking West African countries.
- Diaspora and "Roots" Tourism, with its related attractions in such places as James Island, Juffureh and Albreda, and Barra's Fort Bullen and the Battery Guns of Banjul.
- Culinary tourism and the Gambia is Good (GIG) are gaining in popularity in the West African sub- region.
- Sports tourism, especially sports on the beach are popular with the locals and are becoming so among international tourists.
- Conference and meeting facilities.
- Attractive investment climate and laws of investments that encourage and protect private investment through codes of fiscal benefits and incentives.

Five Action Areas have been identified which are as follows :

- Cape Point to Kololi includes the concentration of hotel development, with 8,000 beds available and 4,000 beds planned
- Bijilo Forest Reserve to Tanji Bird Reserve
- Tanji Fishing Village to Sanyang
- Sanyang to Gunjur
- Gunjur to Kartung

Figure 7 : Five Action Areas for Coastal Tourism



Source, Tourism Development Master Plan 2007

The Gambia's tourism sector has been registering stability in the level of attraction of investment since 2005 and the value of projects approved is estimated to be $50million (1.2 billion dalasis).

The following table provides thematic information for visits to The Gambia during calendar year 2008 by month.

Table 12 : monthly arrivals by purpose of visit january - december 2008

PURPOSE OF VISIT	MONTH													%
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL	
Holidays	22,244	27,880	17,504	9,142	2,937	2,595	3,332	3,774	3,058	5,825	12,547	11,208	122,046	83.2
Business	113	149	94	100	135	71	72	52	70	85	1,434	4,921	7,296	5.0
Conference	25	96	26	57	14	31	11	21	7	17	100	283	688	0.5
Family/Friends & Relatives	258	295	278	199	115	130	161	78	70	65	202	95	1,946	1.3
Transit	36	92	48	56	23	17	31	23	13	41	55	273	708	0.5
Religion	1	36	6	23	1	4	6	6	5	1	32	7	128	0.1
Health	1	4	3	1	3	7	6	2	-	1	-	-	28	0.0
Residence	1,117	1,281	608	500	491	516	404	451	726	512	624	223	7,453	5.1
Purpose of visit not Stated	1,891	2,291	164	76	240	98	229	151	283	356	297	155	6,231	4.2
Other	16	51	14	15	15	11	25	10	16	13	41	8	235	0.2
TOTAL	25,702	32,175	18,745	10,169	3,974	3,480	4,277	4,568	4,248	6,916	15,332	17,173	146,759	100.0

Source: Gambia Tourism Authority, May 2009

In 2007, total out-of-pocket expenditures by tourists visiting The Gambia by air charter were estimated to be D1.4 billion. As shown in the following table relative to these expenditures by year during the period 1972 – 2007, the average annual growth rate was as follows (Gambia Bureau of Statistics):

- 12.5% between 1972 and 1980
- 13.8% between 1983/84 and 1987/88
- % between 1995 and 1999.

Table 13 : total out-of-pocket expenditure in thousands of dalasi by air chartered tourists 1972-2007

Year	Expenditure	Year	Expenditure
1972/73	3,759	1990/91	202, 766
1973/74	5,155	1991/92	239,814
1974/75	4,993	1992/93	241, 498
1975/76	6,476	1993/94	354,567
1976/77	8,992	1994/95	162,378
1977/78	7,490	1995/96	311, 435
1978/79	11,729		
1979/80	11,723	1995	199,122
198081	9,773	1996	311,097
1981/82	6,847	1997	326,535
1982/83	12,868	1998	410,365
1983/84	18,643	1999	508,012
1984/85	21,679	N\A	
1985/86	22,879	N\A	
1986/87	83,454	N\A	
1987/88	102,794	2007	1,447,369

Source: Gambia Bureau of Statistics\Gambia Tourism Authority, Feb. 2008
Source: Gambia Tourism Authority, May 2009

3. Progress/Improvements

The Gambia's tourism sector realized the synergy for economic development through symbioses tapping other sectors such as fisheries, agriculture, horticulture, and culture.

The new tourism paradigm puts poverty alleviation at the core of development efforts and factors tourism into all other areas of development by ensuring coordination and encouraging public, private partnerships.

Over the years the achievements registered in the Tourism sector include the following:

- Promotion of corridors of development (clusters) with emphasis to the west coastal region. There is development clustering comprising of existing settlements, tourism sites, sites designated for conservation, mixed use tourism-related developments, including hotels, resorts, housing, commercial and other tourism facilities. It is expected that sufficient critical mass will be created to make more efficient use of costly Government infrastructure investments such as sewage treatment plants, whilst providing the range of support services and facilities to help stimulate the conditions for private sector involvement and initiative.
- Private investment (foreign and domestic) through direct incentives.
- Investment both local and foreign has not only expanded the capacity of accommodation, but has also diversified on the product with quality and choice. The number of luxurious hotels (4-5 stars) has increased.
- This has triggered public investment to expand physical infrastructures to improve access and services to various tourist sites, including construction of roads, bridges, electrification, and telecommunication
- Promotion of sustainable tourism in the destination that maintains economic and business viability for all stakeholders justified the redefinition through investigation of boundaries, land ownership and status of proposed projects and resort development.
- Human resources development through:
  - Upgrading the hotel school to a Tourism & travel institution
  - The University of the Gambia's tourism courses will soon be introduced.
  - Creating the new university's department for tourism and hotel management.
- The Tourism Development master plan, a new tourism policy that aims to:
  - Encourage sustainable development and poverty reduction.
  - Promote projects that identify and develop profitable tourism services to expand opportunities for employment and income.
  - Develop transitional systems for managing a fragile environment to reduce pressure on the environment by a growing population.

4. Key pressures/Problems

A number of hurdles still persist such as the quality of the facilities, and lack of certain complimentary products such as golfing facilities, water sports, and marinas. The main constraints to growth for tourism in The Gambia are:

- Inadequate awareness
- Limited infrastructure
- Limited of Investment
- Inadequate product quality.

There is a significant market opportunity gap in The Gambia's accommodation portfolio, excluding as it does any self-catering or all-inclusive style properties. Each of these accommodation options has constraints to development. In the case of self-catering, operators were concerned that the infrastructure in terms of restaurants and supermarkets etc did not exist in sufficient quantity or quality to support this option. The lack of a reliable public electricity supply, and the consequent reliance on generators, was also a significant constraint.

5. Impacts

Although research related to the Tourism Master Plan showed that tourism has only a modest negative impact on the social fabric of the host country and the natural environment, measures have now been undertaken to control any negative developments in this field. The handling of the 'bumser' issue is one of the important initiatives through a considerable effort of planning, investment, training, and awareness

6. Responses/Innovative approaches

The Tourism Master Plan calls for strengthening the Gambia Tourism Authority (with technical assistance and capacity training) so that it is capable of undertaking the substantial range of management tasks with which it is entrusted.

In its strategy, The Gambia has focused tourism development on its core tourism comparative advantage in providing a combination of convenient winter sun / beach / pool product that offers value for money, thus linking it with other advantages and opportunities for product diversification that take advantage of the special characteristics of The Gambia.

Product development has been linked with vigorous marketing and promotion to encourage:

- tour operators to return who have wholly or partially dropped The Gambia, both in the UK and in Germany;
- new tour operators to feature The Gambia;
- the gradual growth of independent travel and of direct booking and the reintroduction of scheduled services notably from the UK; and
- Development of Meetings, Incentives, Conferences and Exhibitions business, focusing initially on neighboring West African countries, extends further afield once flight frequencies rise.

7. Opportunities

Improvement of Air Access and Visitor Facilitation: Only a few charter companies are serving the destination, mostly limited to the winter season, therefore expansion of business requires an increase of frequencies, routings and capacity, which have been partially achieved by a joint effort of the Gambian public and private sector together with the industry's partners in Europe.

Tourists' expectations with regard to the facilitation and comfort of their stay in the destination are growing, and the Gambia has met some of these demands in terms of immigration/ customs procedures, tourist information, signage etc. However the use of credit cards, clarification of the benefit of engaging a licensed porter, prior explanation of customs procedures with clear guidance to visitors should be provided and constant improvement in this field is required to compete with other destinations.

Improvement of Linkages to Other Sectors: Tourism as a multifaceted socio-economic activity has a variety of linkages to other sectors, in the case of The Gambia in particular to agriculture, the major sector in the national economy. There are still ways to increase the

supply of local produce to the accommodation and restaurant sector, thus reducing the imports and saving foreign exchange. Presently, the Gambia is Good (GIG) is one project that has been trying to fulfill this objective

Development Of_Community-Based Enterprises in Tourism: The diversification of the tourism product into the interior and through the introduction of new types of niche markets, e.g. eco-tourism, has allowed communities to participate and benefit from the development of the sector. It has contributed to an improvement of living conditions in rural areas such as Kartung, Tumani Tenda, Berefet, and Juffureh and Albreda, through the creation of jobs and generation of income, and mitigates the drift to the urban areas.

Figure 8 : Map of the Gambia showing Tourism Development Areas

Figure 9 : Projections of Air Charter Arrivals

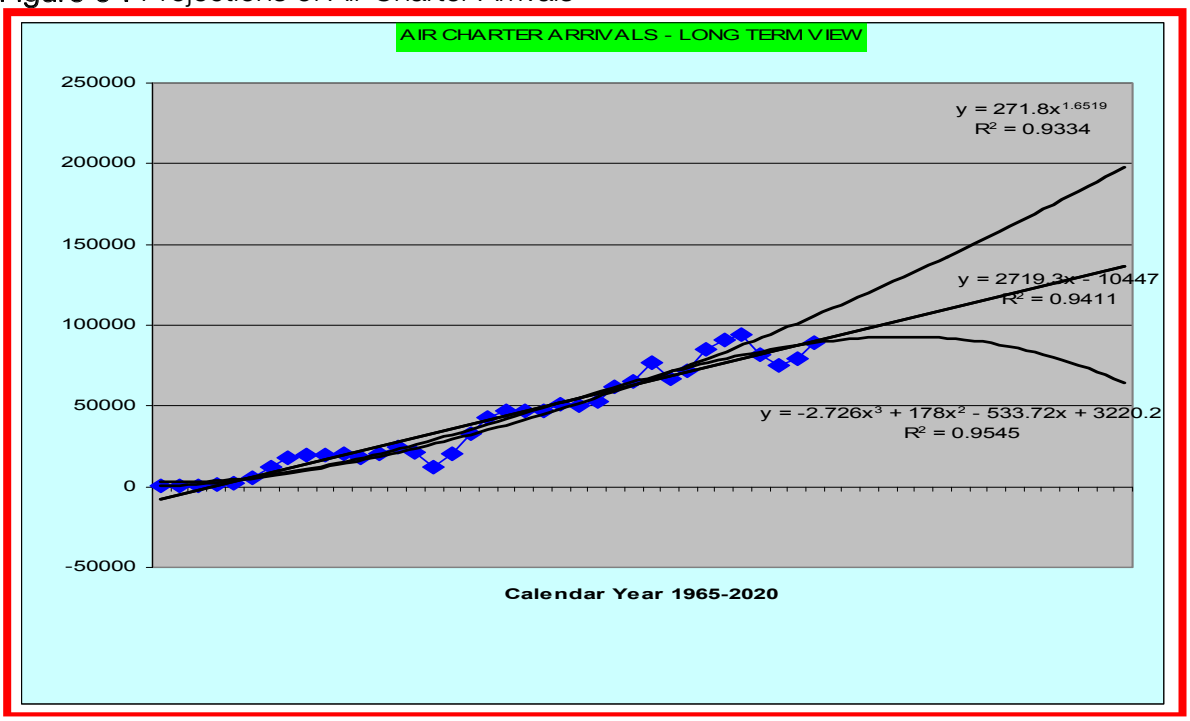


Table 14 : main measures and targets for ten years

MAIN MEASURE	NEW TARGETS – HIGHLIGHTS
Growth in tourist arrivals	Reach 150,000 tourist arrivals by 2015
Increase in air connections	• Annual daily scheduled flight from London • At least two new originating airports from UK for charters (seasonal) • At least four 'scheduled charters' weekly frequency from Germany (seasonal) • Maintenance of direct air access from North America and from key points in West Africa
Lengthen season into September, October, April and May	50% plus uplift in current low occupancy factors in hotels in these months
Accommodation Capacity	• Three to five new large hotels (say 150 - 200 rooms each) operational by 2015 • Increase in self-catering and small hotel accommodation (say, up 75%) • At least three new small scale community related accommodation developments
Human Resources: Upgrading The Gambia Hotel School	National Tourism Training Institute running at full capacity, building upon the outstanding asset of the Gambian people, giving them the needed professional and technical skills

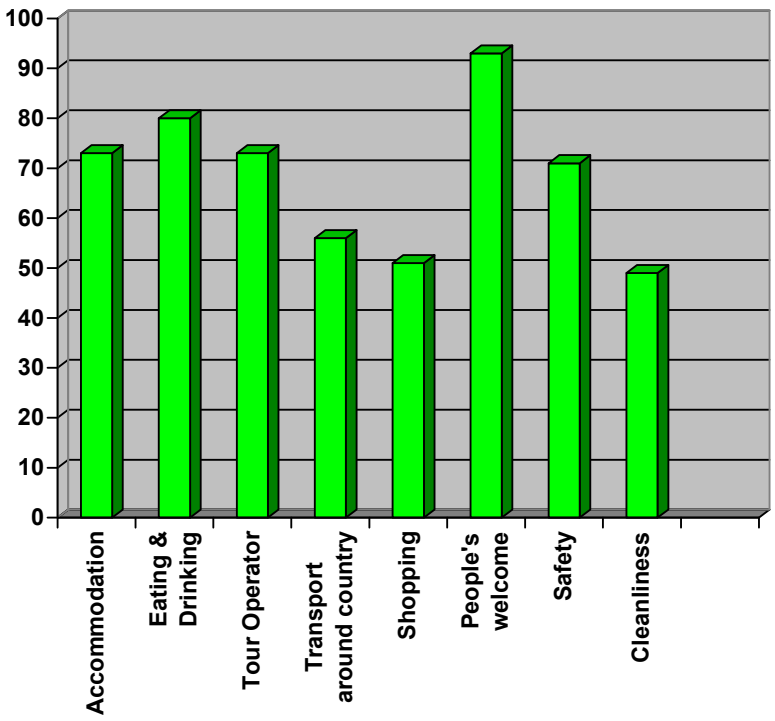
sources: tourism master plan

Table 15 : Tourism' Contribution to Monetary GDP, 2004-2020

	2004	2020
Gross tourism earnings (D million)	2,440	7,000
Proportion of imports (%)	45	35
Net earnings (D million)	1,300	4,500
Total tourism-generated GDP (D million)	1,600	5,500
GDP (D million)	12,000	29,000
Contribution to GDP (%)	13.3	19.0

Figure 10 : Graph of Good and Very Good(Sources Tourism and Master Plan).

THE SURVEY INDICATES THAT RATINGS ARE GOOD FROM THE TOURISTS WHO COME TO GAMBIA



3.5 INDUSTRIAL, MINING AND EXTRACTION ACTIVITIES

1. Background

There are quite a few industrial activities that are located on the Gambian coast, such as fish landing and curing sites, ice processing plants, hotels and restaurants which are part of the tourism industry, mining activities and in very few cases a manufacturing industry.
Some of these industries tend to have the potential to negatively impact the coastal environment, although the significance varies from one activity to another.
The main industrial processes on the Gambian coast that may have a negative impact on the coastline are those involving extraction of natural resources such as the more common sand/gravel mining and the less common heavy mineral mining.

There are also hotels and restaurants along the coast as well as a few manufacturing industries which can also have a negative impact. Typically the environmental damage that can be attributed to the hotels and restaurants is mainly pollution, usually in the form of solid waste and effluent disposal problem, which although a serious issue, is less damaging than the activities of mining.
Un-controlled industrial mining has been known to leave land degraded and aesthetically unsightly, not to mention it also increases the risk of soil erosion on the coast significantly.

Controlled mining with an Environmental Management Plan for the rehabilitation of the site after mining stops is very important. Uncontrolled mining previously done in Kartong was recently stopped as it had increased the risk of potential flooding and thus mining was brought to a stand still whilst an alternate site is being located.
For this reason projects on the coast have to go through an EIA before implementation, depending on the classification, some go through the entire process but others are approved with given conditions and provision of information on Environmental Management plans, contingency plans. This goes for projects such as petrol filling stations, tourist camps, sand mining and processing plants among others. On the other hand there are other projects that are only approved after carrying out a full study. These include Free Zone project, Waste Incineration, heavy metal mining and most recently the Greater Banjul Water project.

There has not been a major impact reported from the activities of most industries within the coast of the Gambia. The main types of mining/quarrying activities along the coast are sand and gravel quarrying for construction and heavy mineral mining for export. The former has taken place alternatively in different locations namely, Kartong, Kachumeh, Sambuyaa and Hawba as shown on figures below.

The latter is done on smaller scale employing manual labour, with minimal infrastructure in the form of a small check-point building and a revenue collector's office. The access road to the quarry is the only other infrastructure associated with the quarries. The heavy mineral mining has been carried out in Brufut, Batokunku and Sanyang:

2. Location of site and infrastructures on the map (co-ordinates)

Brufut closed mine located between coordinates 13˚ 23' 06, 87" N -13˚ 23 02.43N and 16˚ 46, 28.41" W-16˚ 46'25.86"W. This site had been closed and rehabilitated as shown in figure 2. It is about 100metres away from the beach.

Batokunku mine is located between coordinates 16˚ 48'05.00W 16˚ 48'05.00"W and longitudes13˚ 19'05.88N-13˚ 18' 47.29"W fig 3. It is about 150m away from the beach and has dimensions 500m * 120m is about 150metres away from the beach.

Sanyang Central mine is located between coordinates 13˚ 16'11.15"N 16˚ 47, 00.10"W and longitudes 13˚ 15, 18.87N-16˚ 46 45.24"W fig. 4. It is about 800m away from the beach with dimensions of 2000m* 400m and.

Sanyang South mine is located between coordinates 13˚ 14'36.67"N - 16˚ 46"35.28"W and 13˚ 14'10.92"N - 16˚ 4630.79"W. it is about 800m away from the beach with dimensions 150m by 1000m. A separation plants is located at this site.

Hawba sand quarry is located between coordinates 13˚16'56.73"N 16˚ 48 14.30"W and 13˚ 16' 18.93N - 16˚ 48 15.91'' Was shown in fig 5. It is about 150metres away from the beach. It is about 200m wide and 500m long.

Kachumeh abandoned quarry is located between the coordinates 13˚ 14' 15.33"N -16˚ 46'44.85"W and 13˚ 12'27.65 "N -16˚ 46"45.86"W as shown in fig. 4. it is about 500m away from the beach, is 500m wide and extends over a distance of 4000m.

Kartong sand quarry is located between coordinate latitude 13˚ 05'39.06 "N 16˚ 45'5.43"W and longitude 13˚ 05'02.91 "N 16 03-02 "W fig. 6. It is about 400m away from the beach stretches over 1.5km and is about 500m wide.

3. Typology of Mining activities, location of sites and infrastructures

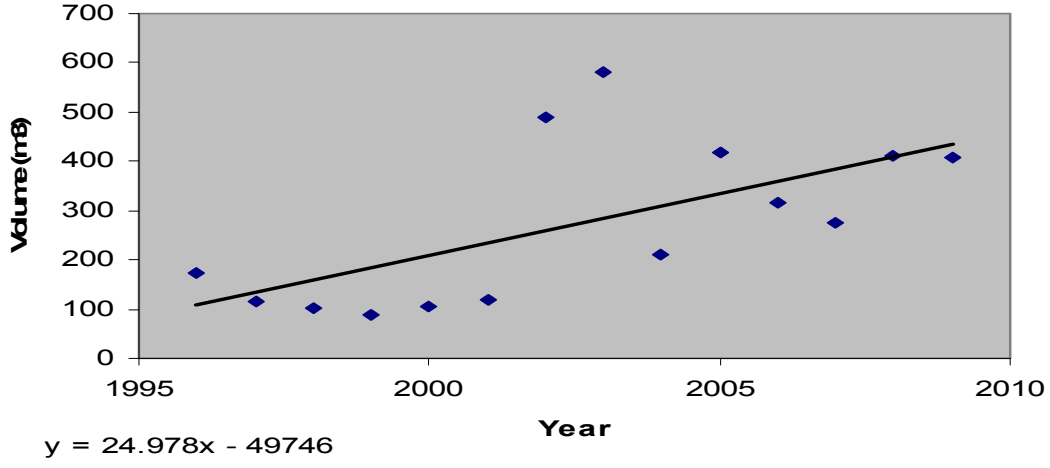
The gravel quarries along the coast have been used during the construction of the Coastal roads running parallel the coastline.

Table 16 : State of mining quarries

Project Name	Period Start-end	Donor(s)	Name and contact of person in charge	References on the web	Remarks
Batokunku	Active		CMG/GAMICO		Operations suspended
Sanyang Central	Active		GAMICO		Being mined
Sanyang South	Active		GAMICO		
Sambuya	2008-todate		Julakay, Solifo		

The above mining and quarrying activities have associated environmental and socioeconomic implications. Some of the high dunes removed at Kartong make the post quarrying sites more suitable for vegetable gardening thus increasing the usable land for agricultural purposes. The pools of water left behind had attracted wide range of birds and hence a bird watching site. On the other hand, implementation of the rehabilitation plans to abandoned quarries had often proven more difficult than anticipated. Attached is a reclamation scheme for Kartong sand quarry which if fully implemented could have numerous benefits for the community.

Figure 11 : The trend for the quantities of sand mined is an increasing one.



Assuming other factors remain constant we can predict there will be an increase in the quantities of sand to be extracted.

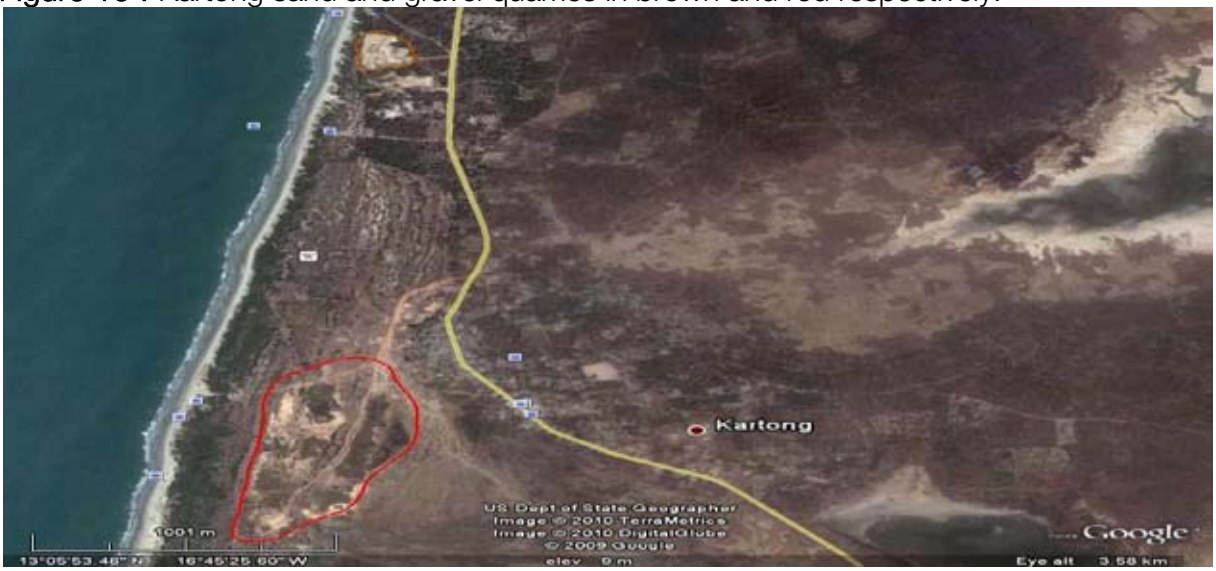
Figure 12 : Brufut abandoned mine

Figure 13 : Batokunku mine

Figure 14 : Sanyang central mine and Kachumeh quarries in blue and red respectively.

Figure 15 : Hawba in red

Figure 16 : Kartong sand and gravel quarries in brown and red respectively.



4. Activities of Oil exploration in progress in the coastal area

No oil exploration activities are currently taking place in the coast.

5. Principal Issues with comments

Some of the principal issues along the coast could be uncontrolled mining and illegal mining. Uncontrolled mining is an issue in the sense that although licensed, mining activities might not be carried out according to plan and there is also no rehabilitation of the mining site when the company has finished mining in the area. This has the potential of increasing degradation of the land and could also lead to flooding during the rainy season. Due to these reasons an Environmental Impact Assessment should be carried out before mining commences. Furthermore an Environmental Management Plan is meant to be submitted by the mining company so that the area can be reclaimed when mining stops.

Illegal mining can also be considered an issue because at times the demand for sand is higher than the supply. This was recently illustrated when the kartong mine was closed. At the time Kartong was the major mine for sand used for construction and its closure drastically increased the demand for sand. However, an agreement has been reached with the Police, the National Transport Corporation and the National Environment Agency to introduce manifests will be given to drivers collecting sand at licensed mining sites.

3.6 COASTAL FISHING

1. Background

Fish farming is an agricultural practice that has been hailed worldwide as a key to food self-sufficiency. Due to the decline in capture fisheries, terrestrial meat production and the rapid increase in human population, fish farming has been on the rise to satisfy the ever increasing protein demand. On a global scale, it provides 11% of the total protein and it employs up to 12% of the world's population.
The Gambia being a tropical country has got the perfect geographical as well as climatic conditions for the culture of aquatic organisms. If properly organized, fish farming in the Gambia can supplement the Agriculture sector in realizing the national dream of food self sufficiency.

2. Fishing methods

Fishing operations along the coast are carried out at two (2) levels based on their capital input, zone of operation and resultant volume of catch: These are
Fin fish artisanal Fishing: This operation is carried out within nine (9) nautical miles off the coast in motorised wooden planked or dug-out canoes using various types of fishing gear such as drift nets, long lines and purse seines. Products are mainly for local consumption. The operation targets mainly pelagic fish species of the herring family such as bonga *Ethmaloisa fimbriata, Sardinella aurita*. Other species include mackerels, and Baracuda, Sharks, and Rays. Semi pelagic fishing gear also target demersal species such as grunts (*Pomadasys jubelini, P. Peroteti*) Croakers (*Pseudotholithus senegalensis, P. Typus, P. Brachygnathus*), Marine Catfishes (*Ariidae*) and in the coastal enclaves, mullets etc.
Shellfish artisanal fisherinjg targets mainly coastal shrimps *Penaeus notialis*, Mangrove oyster *Crassostrea tulipa,* lobsters (*Panilurus*) and cockles (*Anadara*)
Coastal shrimp fishing: Until recently when one was banned by legislation two methods were used in this operation:

- Stow net shrimp fishing.
  This is the oldest method of shimp fishing in the Gambia operating mainly in the Estuary and targeting mainly P. Notialis . A stow net is a bag-like fishing net with 'wings'and tapering backwards to form a codend which retains the catch. Of great concern to fisheries a conservationist is the mesh size of the codend which if less than the 25 mm recommended size may catch undersized fish causing mass destruction to the fish population.

- Drift 'gill' net shrimp fishing. This method was in operation along the mangr4ove shoreline in the estuary until the enactment of the present fisheries Act and Regulation when it was deemed destructive to the aquatic habitat and was banned. In its operation the net is allowed to drift along the mangrove shoreline to catch juveniles that take refuge in the mangroves.

Industrial Fishing. This is conducted beyond nine (9) nautical miles off the coast by fishing trawlers that often pay for licence to operate. Catch volumes were at one time enormous and are mainly destined for export to earn the country the much needed foreign exchange. With the recently phenomenon of dwindling fish stocks catches dropped so considerably low that the few local processing plants relied on artisanal fisheries for the supply raw materials (Fresh fish)

Table 17 : Method-specific catch figures

FISHING METHOD	Encircling Net	Set Bottom Gill net	Drift Gill Net	Stow Net	Purse Seine	Hook and Line	Long line
CATCH (Kg)	1,502,269	3,215,578	1,175,051	1607537	21,329	407,097	1,501,979

3. Impact of Fishing on other natural resources

The impact of coastal fishing on other natural resources began to be felt only recently . On some such as forest it is direct while on some such as wildlife the impact is indirect. In the same way the impacts could be positive or negative. The table below summarises the relationships:

Table 18 : Impact of fishing activities on natural resources.

Natural Resource`	Impact of Fisheries on
Forest	1. Fuel wood consumption in fish smoking 2. Building of dug-out canoes
wildlife	1. Destruction of mangroves (habitat for many water birds) for aquaculture 2. Destruction of Mangroves during oyster harvesting 3. By-catch of endangered aquatic mammals (Eg. Dolphins, turtles, manatees, etc.)
Water	1. Extraction of surface water for aquaculture 2. Harnessing of surface run-off for aquaculture

Table 19 : Principal Projects and Institutions involved in Fishing

Project Name	Start/end period	Donour/(s)	Authority	Name &contact person
Gambia Artisanal Fisheries Development project (AFDP)		ADB /BADEA	Department of Fisheries under Ministry Fisheries and Water Resources	Mr. P.J Ndow (Jnr.) Project coordinator, Department of Fisheries under the Ministry of Fisheries & Water Resources
Sustainable Aquaculture systems Project	March 2009 –march 2011	FAO	Department of Fisheries under Ministry Fisheries and Water Resources	Famara Darboe, Assistant Director of Fisheries 6, Marina Parade, Banjul: E-Mail: darboefams@yahoo.com
Banafa artisanal Fisheries Development Project		USAID	Department of Fisheries under Ministry Fisheries and Water Resources	Mat Jah
Brikama market project		JICA	Department of Fisheries under Ministry Fisheries and Water Resources	Ousman Jobe Principal Fisheries Officer, of Fisheries 6, Marina Parade, Banjul: EMail:omassjobe@yahoo.co.uk
Rice Cum Fish aquaculture trial project	2008-2013	ADB	Department of Fisheries under Ministry Fisheries and Water Resources	Famara Darboe, Assistant Director of Fisheries 6, Marina Parade, Banjul: E-Mail: darboefams@yahoo.com

4. Total produce estimate

Total produce from the aquaculture industry in the Gambia is at a small scale and will not in any way compare other countries in terms of production. However, there is claim that the few private firms operating in the Gambia could harvest up to 3 tons per hectare.

These harvests are difficult to track due to the small nature of the operating farms and the high demand for fish by the Gambian populace. Nonetheless, the President's farm in Kanilai has had a bumper harvest of up to 12 tons worth of tilapia and catfish which are normally sold at local markets at a price lower than the regular market price of fish.

Product estimate for shrimp production at WAA is similarly hard to due to the low density stocking system used and the fact that the produce is entirely meant for the international market. The TTM farm in Sapu is more or less a hatchery base that is expected to serve the highly anticipated aquaculture industry in future, thus the issue of total harvest estimate becomes a tricky one. On the other hand the fingerling production capacity of this farm is reported to be up to 2,000,000 per annum.

5. Outlook future scenario

a. Strengths

- Flanked by the Atlantic Ocean on one side and a river that runs right through the country, the Gambia has enough natural resources to set up a vibrant aquaculture industry.
- Being a small nation with low industrial development, there is low threat of contaminations from factories into aquaculture farms.
- The unique presence of both brackish and fresh water makes culture of diverse products feasible. Twenty percent of the Gambia's land area is covered by the only African river that is yet to be impounded. Proper utilization of this will come a long way in helping set up a vibrant aquaculture industry.
- Abundance of vast and under exploited fish population makes it easy to choose natural stock which can reduce capital costs as well as give room for exportation of aquaculture produce. The River Gambia acts as a spawning ground for diadromous fish species which move inland for spawning purposes, thus the availability of natural fish stock.
- Availability of raw materials which could be used to make fish feed. The Gambia is an agric-dependent nation that produces and exports proteineous crops such as peanut and cotton (proven to be perfect protein sources for cultured finfish). These could be used to make cheaper fish feed thus reducing overall production costs, as fish feed comprises up to 50% of total production costs in aquaculture.
- Peaceful and stable political system/set up. Being a long term project, aquaculture highly depends on a nation's political stability in order to it is an expensive venture that takes many years to succeed in comparison to land agriculture.
- Young and vibrant population avails prospective investors with cheaply abundant human resources available.
- With the decrease in life catches, there is higher demand in fish/fish products thus serving as a catalyst in peoples' interests towards finding alternative means of satisfying fish protein demands.

- The flexible nature of aquaculture policies make it possible to set up farms and eventually industries without any obstacles as one would have encountered in other countries.
- Cheap land Resources availability and encouragement from the government through the Social development fund (SDF), indigenous cooperative banks and other micro-credit facilities to open credit opportunities

b. Weaknesses

- Lack of skilled personnel in aquaculture. There are but a few Gambians that are highly knowledgeable in terms of aquaculture.
- Lack of funds to conduct necessary surveys and venture into nouvelle aquaculture techniques. Reports indicate that River Gambia is highly underexploited, especially mid-country where perennially brackish water could be found. Conducting surveys/researches can help ascertain its potential for the culture of different aquatic organisms.
- Lack of technological set up required for meeting international standards. This dims the prospects of meeting international standards as most international protocols e.g. HACCP cannot be met using lo-tech devices.
- Cultural beliefs/caste system makes people reluctant to venture into fishing activities and may as well prevent them from venturing into aquaculture. Although the literacy rate is increasing, there is still a great need to further create awareness in order to widen people's horizons in terms of development prospects.
- Lack of fishing ports may also dim prospects. The availability of only one sea port in the country may serve as a stumbling block in getting timely export of aqua-produce as well as importation of aquaculture feed, stock etc. Delivery of aquatic organism is very much time conscious due to the transport of life animals.

6. Opportunities

- Generate export earnings to boost the country's economic status. This will compliment the earnings from land agriculture which has been dwindling over the decade.
- Creation of more employment opportunities for the youths. This will be especially helpful to graduates of skills centers who find it hard to land proper job opportunities.
- Improved nutritional standards for the Gambian populace. This is so in the sense that the fish per capita consumption (28kg) for the average Gambian will increase and eventually result in more balanced diets for the locals.
- Possible improvement of local fish species. This of course, can only be realized with a vibrant aquaculture industry that can restock fish species threatened with extinction.
- Supplementing the tourist sector. An advance in the sector can be a powerful tool in terms of tourist attraction e.g. game fishing.

7. Threats

- Possible interference with the tourism sector which is the second most important economic sector, especially with marine aquaculture. This could be caused by the release of waste water from marine aquaculture farms into our pollution-free beaches. Stagnant water in abandoned ponds could also contribute towards environmental degradation.
- Ecological threat to the mangrove wildlife e.g. monkeys and wild birds. The clearing and building of flow-through pond system on river banks and rack construction for crustacean culture could be the greatest contributors to mangrove destruction.
- Environmental impacts may not be within those accepted by environment policies. Being a nation that is very much conscious with environmental degradation, striking a balance between successful aquaculture industries and maintaining a pollution-free environment will be very difficult.
- Climate change impacts may have adverse effects on aquaculture e.g. seasonal/partial drought, excessive rains and salinity rise in the river.
- More research/surveys needed to find out the actual species abundance to ensure the most suitable and sustainable aquaculture systems.
- Formation of cooperate unions by fish farmers to in order to be able to secure better loans and to setup bigger and more profitable farms.

3.7 FISH FARMING

Fish farming was introduced into the Gambia since 1979 in a joint venture by the US Peace Corps and Catholic Relief Services (CRS). This was done with trials for catfish rearing in traditional earthen ponds in CRR. These were followed by other project trials in shrimp production by an NGO (Scan-Gambia) in the late 1980s. However, this project also failed due to poor operational procedures and fund mismanagement. West African Aquaculture (WAA) which is involved in farming wild-caught black tiger prawn for the export market came into being in 2005. Operating on a 4ha area, this farm has been producing on a small scale. Nonetheless, it has been quite stable over the years and exports mainly to the EU market under HACCP rules.

3.8 AGRICULTURE AND LIVESTOCK BREEDING

1. Background

Agriculture accounted for 32% of the GDP in 2004. The major agricultural commodities are groundnuts, rice, maize, millet, sorghum, palm kernels, vegetables, and livestock, along with fisheries and forestry. Agricultural and Natural Resources (ANR) is the dominant sector in the Gambian economy, employing about 70 per sent of the total work force. The main cash crop of The Gambia is groundnuts.

The country is primarily an agricultural country with 80 percent of the population of 1.5 million depending on agriculture for its food and cash income. The farming economy is the

only means of income creation for the majority of rural families most whom live below the poverty line. The agricultural sector is the most important sector of the Gambian economy, contributing 32% of the gross domestic product, providing employment and income for 80% of the population, and accounting for 70% of the country's foreign exchange earnings. It remains the prime sector to raise income levels, for investments, to improve food security and reduce levels of poverty.

About 54% of the land area in The Gambia is good quality arable land (5,500 square kilometres), out of which about 39% (1,880 sq. km) is currently farmed by the 41,000 subsistence farmers in The Gambia. About 810 sq. km. (81,000 hectares) are irrigable, all in the (CRR) Central River Region (56%) and (URR) Upper River Region (44%). About 2,300 hectares of this potential area are currently under irrigation. Crop production is quite diversified. Cash crops such as cotton and groundnuts are grown in the up-land areas and rice in low-land, riverine areas (rain-fed swamps or under irrigation) for both subsistence and cash. Other principal subsistence cereal crops grown are maize, sorghum and millet. When the sector is looked at by gender 51% are women.

2. Climate

The climate is largely semi-arid with one wet season followed by a seven month dry season. The rainy season commences from June and continues to October. Average daily temperatures are 28.2° C in the dry season and 28° C in the rainy season. Low levels of soil moisture prevailing in September and October, can adversely affect crop harvests.

3. Agro-ecological zones

Based on the rainfall pattern, there are 3 major agro-ecological zones in Gambia namely Sahelian, Sudan-Sahelian and Sudan-Guinean zones. The Sahelian Zone has a Sahelian micro-climate with open dry season savannah vegetation. Rainfall is unpredictable and less than 600-mm total annually, with an effective crop-growing season of less than 79 days. Soils have low water retention capacity and this is a high-risk area for long-duration crops. Thus early maturing, short-duration and drought tolerant crops are cultivated in this zone. Cassava, sesame and cowpea are the main crops with millet grown only occasionally because of the risk that birds would consume their crop.

The Sudan-Sahelian Zone lies within the 600 to 900 millimeter rainfall area. With a longer growing season, 79 to 119 days, the up-land areas are well suited to groundnut, cotton and sorghum. The flood plains along The Gambia River and associated lowland valley systems are an excellent rice growing catchment under tidal swamp irrigation.

The Sudan- Guinean Zone lies within the 900 to 1200 mm rainfall isohyets. The growing season is 120-150 days and in normal seasons full crop water requirements are met throughout the growing season. In some lowland areas the long dry season results in increased salinisation of The Gambia River and an emphasis on saline tolerant rice varieties. The principal crops cultivated in this agro-ecology are early millet, groundnut, rice (rain-fed upland and lowland, irrigated lowland, mangrove and mangrove salt-tolerant), maize, vegetable, sesame and cowpea.

4. Livestock production

Livestock production accounts for about 6% of the GDP at current market price. The sector's activities are limited to rearing of cattle, pigs, small ruminants and poultry for the domestic market. In the absence of organized livestock ranching to cater for the demand for beef and milk products in the domestic market as well as the growing tourism industry, the sector offers opportunities for further investment. Similarly, enterprises engaged in chicken production are limited by the high cost of imported feed stuffs, resulting in unsatisfactory supply delivery to hotels and the local consumer market.

A recent agricultural census held in the early part of the first decade reveals that 74 percent of farmers rear poultry. About 40 percent of farmers reported having cattle, compared to 38 percent for sheep and 58 percent for goats. The largest number of cattle is found in Basse (URR) and WRR. Major species of livestock in Gambia include cattle, sheep, goats, horses, donkeys, chickens and pigs. Poultry and small ruminant management activities have a high low productivity rate and high mortality combined with yearly epidemics of Newcastle Disease and PPR (Peste des Petits Ruminants).

Most of the cattle breeds are either zebus or tsetse resistant ndamas (a cross between the zebu & the West African Dwarf).

Table 20 : Vital Statistics of Livestock Units:

	Heads	Growth Rate
	2002	1990-2000
Cattle	327,000	1.1
Sheep & Goats	408,000	-1.8
Pigs	17,000	0.0
Poultry	591,000	0.7

5. State and Trends

The agricultural sector is the most important sector of the Gambian economy, contributing 32% of the gross domestic product, providing employment and income for 80% of the population, and accounting for 70% of the country's foreign exchange earnings. It remains the prime sector to raise income levels, for investments, to improve food security and reduce levels of poverty. When the sector is looked at by gender 51% are women.
The coastal area of The Gambia, like other parts of the country, has a mixed crop-livestock farming system on two distinct ecological zones;

- The lowlands, including the western lowlands and, the eastern and central lowlands,
- The uplands.

Upland crop production tends to be separate enterprise lowland rice farming, managed by different production groups (male or female) who neither do nor pool labour or capital. Relative to other parts of the country, the coastal areas are generally low-lying, characterized by wetter soils which make them suitable for low yielding 'upland' rice compared to the inland regions of the country. The '*tendaco*' rice ecology is most prevalent, being part of the transition zone between pure upland and lowland occurring in the Western Region. Although with the onset of the drought of the 70s and the 80s, this zone became increasingly redun-

dant, the advent of the drought-tolerant NERICA and more rains over the last few years, have greatly boosted the potential productivity of this region.

The coastal areas are also the site of the most intensive horticultural production in the country dominated by small scale women gardeners who produce for the nearby urban communities. Nearly 88 percent of all women farmers in The Gambia are estimated to be engaged in individual or communal horticultural activities. There are also a few commercial farms that mainly target the export market. The sector currently contributes about 4% to GDP on average, and over 65% of the agricultural labour force is involved in the sector, mainly in combination with one or two other crops. Horticultural crops include tomatoes, onions, cabbage, eggplant, okra, green herbs, peppers, lettuce, cucurbits, carrots, beans, citrus fruits, mangoes, cashew, papaya, banana, cucumber, etc. These crops especially vegetables are grown in small plots by smallholder farmers on an individual basis although communal gardening is also being encouraged.

The rapid development of the horticulture sub-sector is given high priority by The Gambia Government in its export-oriented diversification policy, growth of the productive sector strategy and overall socio-economic development effort of the country.

The production of fruit and vegetable in the Gambia is an important source of on-farm income and food for the rural farm families. Women perform the functions of producing vegetable, marketing the produce and feeding the family despite major obstacles. The Private sector acts as the vehicle of economic growth and export development and promotion of the horticulture industry.

The export of high value Gambian fruits and vegetables registered tremendous increases from 1994. The most popular produce exported includes chilies, Green beans, Aubergines, Asian vegetable, Mangoes, Papaya and Limes. The United Kingdom is the main-export market for Gambian horticultural produce accounting for 95 percent of export revenues.

The horticulture sub-sector has recently emerged as one of the Gambia's key growth areas. In addition, nearly 85 percent of the requirement for fresh fruits and vegetables for the tourist population in the Gambia have been met by the sub-sector. Furthermore, nearly 60% of total women farmers are engaged in horticulture activities. Large commercial horticultural farms mainly located along the coast currently employ over 4000 labourers to produce primarily for export markets. Although horticultural development over the last years have been phenomenal, most of this growth has been mainly due to (I) the private sector establishment of commercially oriented, modern, large-scale producing and exporting operation; and, (II) communal village - based women vegetable growing schemes encouraged by donor assistance catering for the local market boosted by a thriving tourist industry and the role of the Government of the Gambia from 1994 in creating an enabling environment, stable macroeconomic conditions, infrastructural development and policies to encourage expansion of horticulture as well as private sector development has been very encouraging.

The introduction of new varieties suitable for both wet and dry seasons coupled with improved production/water control practices has enhanced income, improved nutritional status, foreign exchange and therefore contributing significantly to poverty alleviation as can be seen at Banjulunding, Lamin and Sukuta Vegetable Garden Schemes.

From 1994 to date, with the introduction of projects like the Women in Development Project, Household Food Security Project and the Chinese Technical Mission Intervention, the sub sector has progressed by 130% in terms of yield increase, hectarage and quality of produce.

Table 21 : total exports of selected agricultural products from the Gambia in 2005 and 2006

	2005		2006	
	FOB VAL	M/TONS	FOB VAL	M/TONS
TOTAL VEGETABLES	14,210	429	69,724	
Other nuts fresh or dried nes				
Guavas mangoes and mangos-teens fresh or dried	737	108	-	-
Lemons and limes fresh or dried	4,655	204	21,536	723
Other fruit fresh nes	1,140	15	-	-
	21	0	-	-
TOTAL FRUITS	6,553	327	21,536	723

Source : Central Statistics Department (GBoS)

The performance of the field crop sector during the period 1992/93 to 2002/2003 has been mixed with cultivated area, production and productivity (yield) fluctuating. Out of a total arable area in The Gambia of 558,000 ha, an average of 300,000 ha or about 54 percent of total area are cultivated annually. However, 306,610 ha or about 55 percent of total area were cultivated in 2005.

Despite the overwhelming preponderance of crop farming as the occupation of the majority of the coastal communities, there exist extensive rearing of livestock such as cattle, sheep, goat and poultry in many communities. The free range of livestock management is the predominant form practiced, although, again, a tiny number of well-to-do dairy farmers have established businesses here. The livestock products like meat and milk have a ready market in the surrounding urban markets.

By far the serious threat to agriculture on the coastal areas of The Gambia is the ever-increasing population which has witnessed more than a threefold growth within a relatively short period of time of just twenty years (1983-2003). The needs for residential housing has led to rapid encroachments into hitherto farmlands to a point that many of the larger peri-urban settlements like Sukuta, Brufut, Lamin, busumbala etc, there is hardly any land left for agriculture.

6. Progress / improvements

- The agricultural sector currently contributes about 4% to GDP on average.
- Around 306,610 ha or about 55 percent of total arable area were cultivated in 2005.
- Despite the overwhelming preponderance of crop farming as the occupation of the majority of the coastal communities, there exist extensive rearing of livestock such

as cattle, sheep, goat and poultry in many communities. The livestock products like meat and milk have a ready market in the surrounding urban markets.

- Women play a major role in small ruminant production, representing 52% of the owners of sheep , 67% of the owners of goats and 43% of the owners of both sheep and goats.

- The livestock production system in Gambia contributes about 25% of annual agricultural GDP and 5% of total national GDP. In previous years e.g. from 1980 the economic contribution of the livestock sector to the Gambia's GDP has progressively increased from 4% to 5.5% with the monetary value realized by the sector increasing from D18.1 million in 1982 to D28.3 million in 1996

- The horticulture sub-sector has recently emerged as one of the Gambia's key growth areas. In addition, nearly 85 percent of the requirement for fresh fruits and vegetables for the tourist population in the Gambia have been met by the subsector. Furthermore, nearly 60% of total women farmers are engaged in horticulture activities. Large commercial horticultural farms currently employ over 4000 labourers to produce primarily for export markets. From 1994 to date, with the introduction of projects like the Women in Development Project, Household Food Security Project and the Chinese Technical Mission Intervention, the sub sector has progressed by 130% in terms of yield increase, hectarage and quality of produce.

The envisioned transformation of rural livelihoods is expected to occur through the formulation and implementation of intervention strategies in five key priority areas, viz.:

- agricultural research and technology development; NEPAD – Comprehensive Africa Agriculture Development Programme

The Gambia: National Medium–Term Investment Programme (NMTIP)

- delivery of agricultural knowledge and information services;
- water control and management;
- commercial support services for finance and marketing; and
- Natural resources management, including biodiversity.

Government policy also envisages institutional reforms in the Agriculture and Natural Resources (ANR) Sector11, and lays specific emphasis on effective knowledge and skills improvement.Radical reform of the ANR extension services is stipulated through the establishment of unified, polyvalent small farmer extension services.

The policy emphasizes promotion of commercial support services, and strengthening of rural infrastructure. Government's role in input supply, credit and marketing will mainly be that of facilitator. The policy will promote microfinance through diverse private and non–government sources, encourage village level savings and loans associations and improve regulatory framework, secure better inter linkage between microfinance institutions and establish a credit guarantee fund.

7. Key pressures/problems

Agriculture, despite still being the mainstay of the Gambian economy, is still highly underdeveloped. In the first place, it is still mainly rain-fed, hence highly unreliable and subject to unpredictable production patterns. Consequently, it is a high-risk investment area which keeps away potential serious investors from putting their monies into the sector.

- the very fragile and nutrient-deficient nature of most Gambian soils, coupled with the devastating impacts of endemic drought, is a major problem confronting the sector.
- Unsustainable farming practices; overcropping on the same for years without fallow, cultivation on marginal lands, or slopes, water catchments zones etc.
- The absence of and/or inadequate of critical factors of production- good land, capital (machinery, fertilizers, storage facilities/protection etc) entrepreneurship, marketing outlets, entrepreneurship (knowledge and skills of farmers)
- Serious encroachments into good agricultural lands for human settlements, particularly in the coastal areas which are experiencing the most in-migration from both rural Gambia and from outside the country. The proportion of Gambia's urban (i.e coastal) population jumped from 37.1 % to 50.3 % from 1993 to 2003.
- Absence of linkage to key sectors such tourism, trade and local technology (technical infrastructure) which undercuts the gains from the agricultural sector due to bottlenecks arising therefrom-low production/productivity, poor quality and inefficient local markets etc.

8. Impacts

The impacts of changes in the dynamics of the coastal zone of The Gambia on the agricultural sector have been quite profound. The influx of large populations to the coastal areas of The Gambia has led to severe environmental degradation such as the development of squalid housing in unplanned settlements, the all-year prevalence of mosquitoes due to the proliferation of their of breeding places, and severity of coastal erosion as sand dunes and surrounding vegetation continue to be destroyed through overexploitations.

9. Responses/ innovative approaches

- Relative to other parts of the country, the coastal areas are generally low-lying, characterized by wetter soils which make them suitable for low yielding 'upland' rice compared to the inland regions of the country. The '*tendaco*' rice ecology is most prevalent, being part of the transition zone between pure upland and lowland occurring in the Western Region. Although with the onset of the drought of the 70s and the 80s, this zone became increasingly redundant, the advent of the drought-tolerant NERICA and more rains over the last few years, have greatly boosted the potential productivity of this region.

- Effective and relevant policies are being formulated to tackle the numerous constraints and challenges that this sector faces.

- Plant breeding activities have mostly been conducted by the National Agricultural Research Institute (NARI), which is the sole institution in the Gambia with a

mandate to do crop research. The majority of the varieties used in the country are old improved varieties or traditional varieties. Improved materials have not yet been found that combine acceptable consumer quality and higher yield than local varieties.

- The breeding approach used relies mostly on introductions of new germplasm from International Agricultural Research Centers (such as WARDA, IITA, IRRI, CIMMYT, ICRISAT and others) and evaluating their local adaptation to farmers' conditions in the country. Hybridization was used on a limited scale to generate segregating materials for rice and maize but no varieties have been released from these so far. Plant breeding activities were mainly centred on the major arable crops in the country.

- Development of Oyster cultivation in Gambia has been a priority for the government for some years now. The Department of Fisheries has conducted research studies on the mangrove oyster of West Africa Ostrea (Crassostrea) tulipa which indicates great commercial potential though the market has not yet been adequately identified.

10. Opportunities

Without doubt, and provided the constraints identified under this section are addressed, there are tangible opportunities for the growth of the agricultural sector in the coastal zone of The Gambia. The region has comparative advantages for intensive horticultural farming, for both the domestic and the external markets. Indeed, a few large farms such as Radville are already reaping huge profits by exporting tropical produce like mangos, aubergines, beans etc, to their own supermarket chains in Europe. This should be promoted, in tandem with many other enterprises such as fishing, sand mining and salt mining on sustainable basis. Of course tourism will continue to be the most vibrant coastal economic activity, therefore there is an urgent need to expand more responsible forms that integrate it with these enterprises.

The livestock sub-secor has great potential for ranching to cater for the demand for beef and milk products in the domestic market as well as the growing tourism industry. Consequently, the sector offers opportunities for further investment. Indeed, it has been established that investment in small ruminants and poultry has the fastest rate of profitable returns to poor rural communities, thus making it an important poverty-alleviation tool.

11. Outlook (possible future scenarios)

The main government goal is to make The Gambia a middle income country by the year 2020, as articulated in The Gambia Incorporated Vision 2020. The strategy for the attainment of the Visions' objectives has been articulated in the Draft Agriculture and Natural Resources Sector Policy (2001–2020), and the SPA II/PRSP. The medium–term specific policy goals of the sector are, among others, to:

- Achieve national food self–sufficiency and security through the promotion of sustainable diversified food production programmers with emphasis on cereal production to contain the growth of imported rice
- Increase the sector's overall output, especially of domestic food and export products, in order to ensure food security and enhance foreign exchange earning capacity to finance other aspects of the development process
- Create employment and generate income for the majority of the rural population who are dependant on primary production, particularly women, youth and producer associations
- Diversify the production base to facilitate the production of a wide range of food and export crops, in order to reduce the fluctuations and uncertainties in household incomes and export earnings
- Reduce disparities between rural–urban incomes, as well as between men and women, curb the rural–urban drift and accelerate the pace of development of the rural sector
- provide effective linkages between the agriculture and natural resources sector and other sectors of the economy particularly the tourism sector so as to enhance their mutual complementarily on a sustainable basis
- Ensure the judicious and sustainable exploitation of the country's natural resource base so as to conserve and improve biodiversity, and enhance its productivity consistent with consideration of the needs and rights of future generations.

The envisioned transformation of rural livelihoods is expected to occur through the formulation and implementation of intervention strategies in five key priority areas, viz.:

- Agricultural research and technology development; NEPAD – Comprehensive Africa Agriculture Development Programme, The Gambia: National Medium–Term Investment Programme (NMTIP)
- Delivery of agricultural knowledge and information services
- Water control and management;
- Commercial support services for finance and marketing; and
- Natural resources management, including biodiversity.

Government policy also envisages institutional reforms in the Agriculture and Natural Resources (ANR) Sector11, and lays specific emphasis on effective knowledge and skills improvement.

Radical reform of the ANR extension services is stipulated through the establishment of unified, polyvalent small farmer extension services. A new cooperative legislation will limit government's role to regulation, monitoring and supervision of farmer groups; and a greater role for the private and non–government sector is envisaged in rural financial services. It is expected that through farmer empowerment, the smallholders will drive the agricultural research agenda, and access the extension service through diverse providers. The government's support for agricultural diversification away from groundnut farming will continue, and lay emphasis on promoting non–traditional commodities.

The policy emphasizes promotion of commercial support services, and strengthening of rural infrastructure. Government's role in input supply, credit and marketing will mainly be that of facilitator. The policy will promote microfinance through diverse private and non–government sources, encourage village level savings and loans associations and improve regulatory framework, secure better inter linkage between microfinance institutions and establish a credit guarantee fund. The policy supports incentive schemes for private sector investment in agriculture. Strong support is envisaged for rural roads, which would help reduce transaction costs of inputs and outputs and increase smallholder access to markets, and enhance agricultural productivity and profitability.

3.9 OTHER TYPES OF PRODUCTION IN THE COASTAL AREAS

1. Sand Mining

Sand mining has been the most significant non-agricultural industrial activity in the coastal areas of The Gambia.

2. Industrial Ilmenite Mining

A major physical activity on the beaches of the southern coastline of The Gambia is the Ilmenite mining centred at Batokunku & Sanyang sites.. A low environmental impact strategy was adopted which involved processing the mineral sands into a concentrate that were shipped to established processing plants abroad. Apart from ilminite, Zircon, another heavy metal, was also mined.

PART IV. ETAT DES MILIEUX LITTORAUX

4.1 CHARACTERIZATION OF CLIMATE

1. Background: Wind Conditions, temperatures, precipitation, evaporation-evapotranspiration.

Wind is air in motion. The uneven heating of the earth's surface produces it by the sun. Since the earth's surface is made of various land and water formations, it absorbs the sun's radiation unevenly. Speed and direction are two factors necessary to specify wind.
In the Gambia the windiest time of year occurs towards the end of the dry season and the lowest conditions on average occur during the wet season. Yundum revealed the above graph in June a maximum wind of 7.4 meters/second (m/s) and Banjul recorded a maximum of 3.5 m/s in September.

Figure 17 : Monthly highest wind gust m/s for Banjul & Yundum for 1999 - 2008

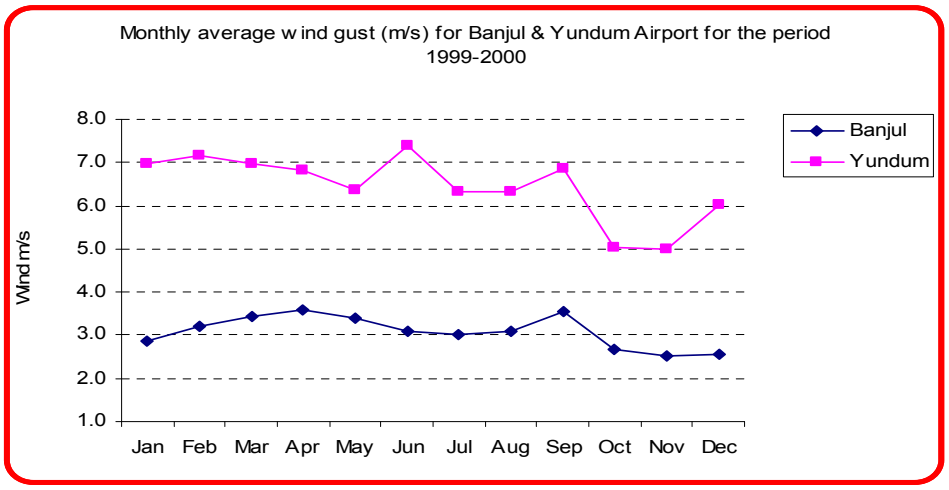
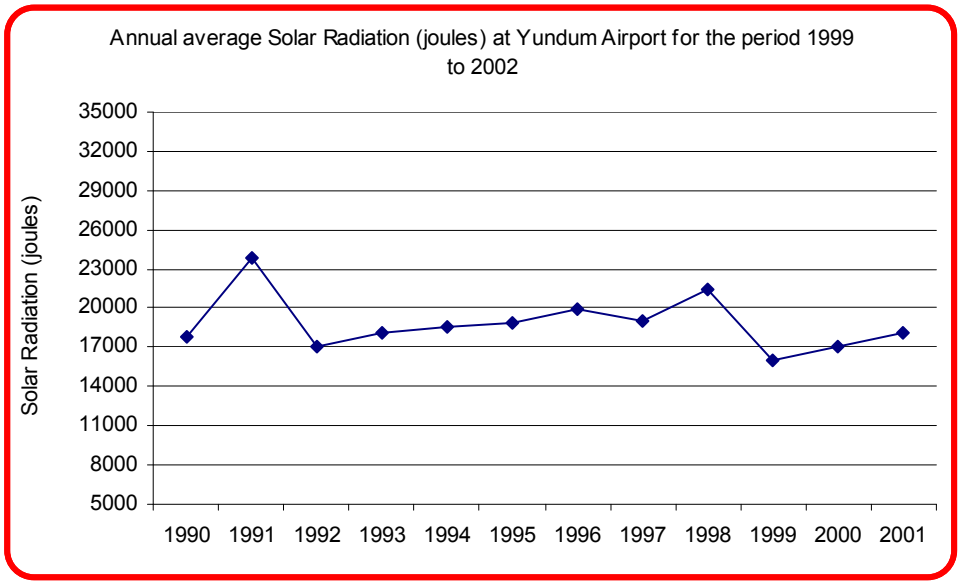


Figure 18 : Annual average Solar radiation for Yundum for 1999 to 2002



The results of the evaporation data stated below in figure 6 reveals that, Banjul records a highest value of 150.67 millimeters (mm) in 1991 with a lowest value of 112.23 mm in 2000. Yundum records a highest value of 180.3 millimeters (mm) in 2007 and also record a lowest value of 155.1 mm in the same period with Banjul as shown clearly in figure 7.

Figure 19 : Annual average total Evaporation for Banjul for 1990 to 2000

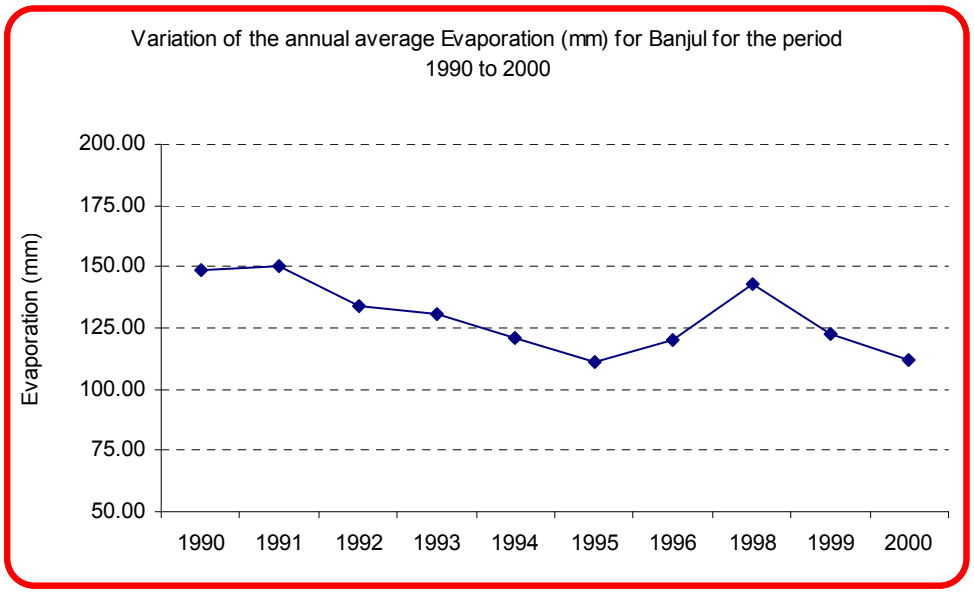
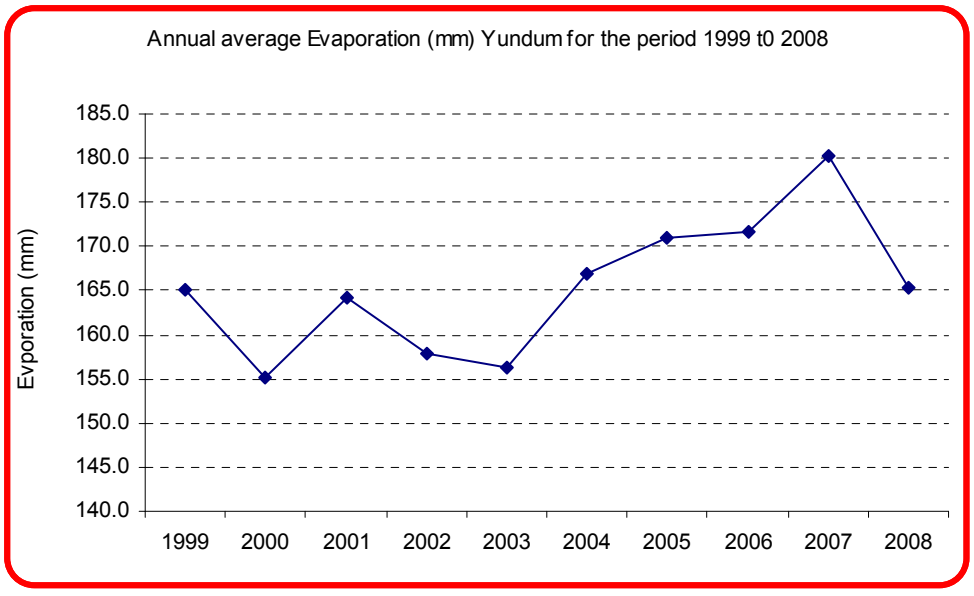


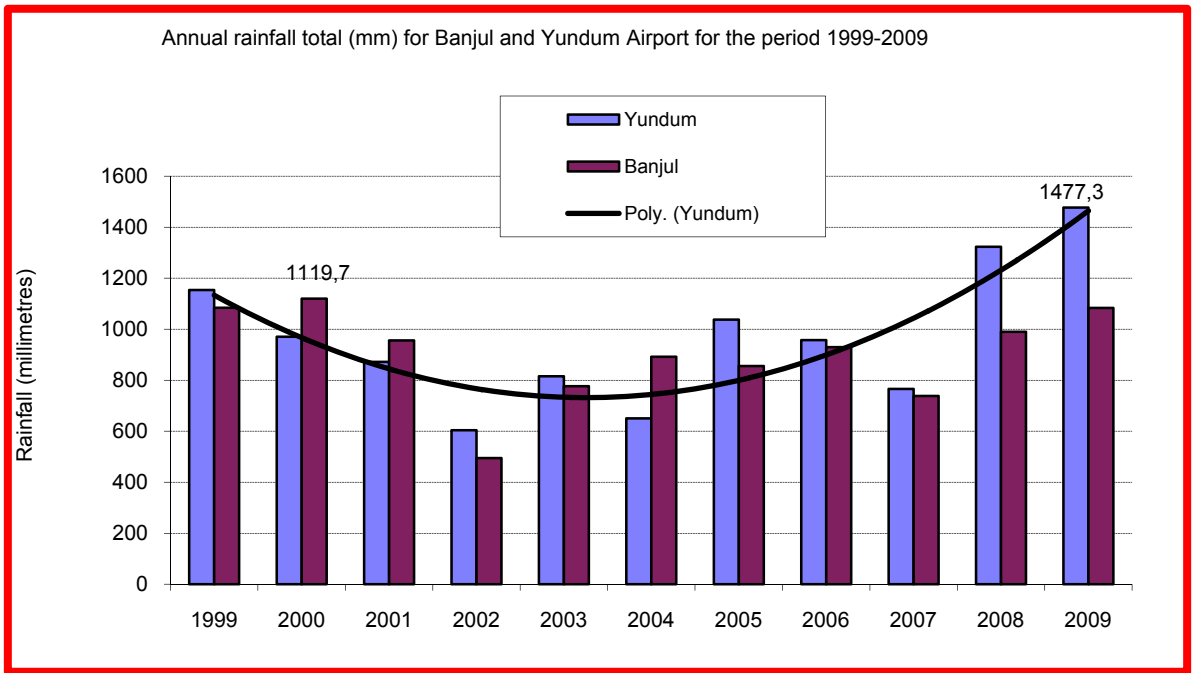
Figure 20 : Annual average total Evaporation for Yundum for 1999 to 2008



The annual rainfall varies from one year to the other and from place to place as is generally the case, rainfall variability increases with decreasing annual rainfall and local disturbances as associated with convective rains. This variation of precipitation for the last fifty eight (58) years indicates the existence of both dry and wet years.

Yundum Airport opened in 1946 and situated at the Western Region at Latitude 13 21^{0}N, Longitude 16 35^{0}W. Rainfall data is available in Banjul since 1886 with Latitude 13 27^{0}N and Longitude 16 34^{0}W.

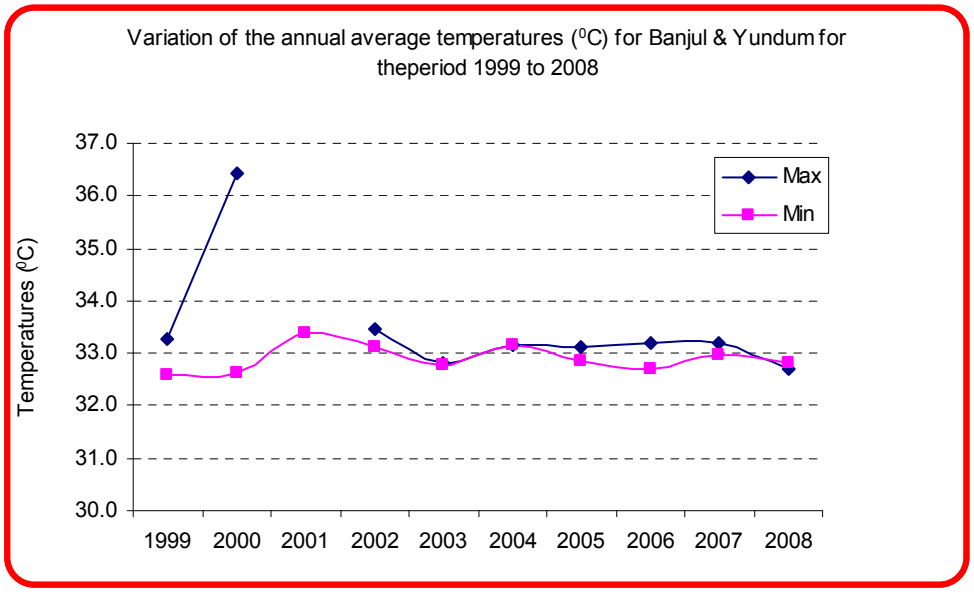
Figure 21 : Variation of the rainfall at Banjul & Yundum for 1999-2009



Statistical analysis of rainfall data at Yundum Airport and Banjul in figures 1 shows a variation of the rainfall pattern. The results indicated that, Yundum Airport recorded the highest total rainfall of 1477.3 mm in 2009 and the lowest total recorded was 650.3mm in 2004. However for the same period, Banjul recorded the highest total rainfall of 1083.4mm in 2009 and the lowest total recorded was 604.0 mm in 2002. The results from figure 1 for the past ten years (1999-2009), reveals that, 2009 rainfall was abundant as compared to other years.

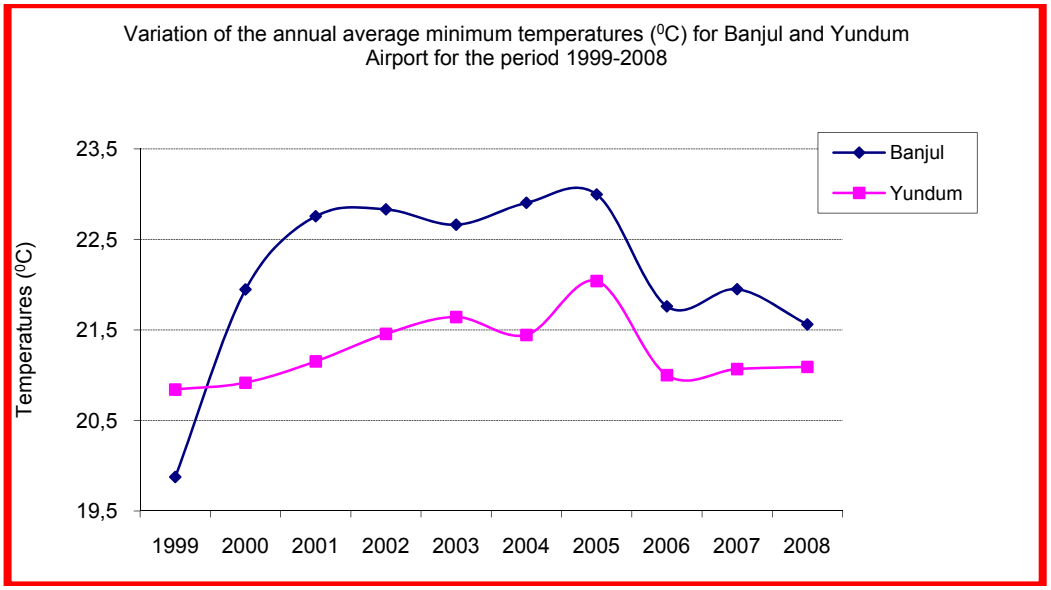
Due to the tropical latitude of The Gambia, temperatures are generally high, but they vary in time with the season and in space with the proximity or remoteness from the ocean. Temperatures are lower in the costal areas than in the inland areas due the quasi-permanence of the trade winds from the ocean.
The results in figure 2 indicated that, Banjul recorded the highest maximum temperature of 36.4^{0}C in 2000 and the lowest total recorded was 32.8^{0}C in 2003. However for the same period, Yundum recorded the highest maximum temperature of 33.1^{0}C in 2001 and the lowest total recorded was 32.6 in 1999. However it is observed that, despite Banjul's proximity to the sea, Yundum is cooler. Some of the factors could be attributed to congestion in Banjul and Yundum benefiting from the coolness of the forest, hence forest is located at the western sector.

Figure 22 : Variation of the annual average maximum temperatures at Banjul & Yundum for 1999-2008



The graph below shows variation of the minimum temperature for Banjul and Yundum. Banjul indicates a highest value of 23.5 degrees Celsius (^{0}C) in 2005, whilst Yundum recorded a highest of 22.0 ^{0}C for the same period. In 1999, Banjul recorded a lowest value of 19.9^{0}C and Yundum recorded a lowest of 20.8^{0}C. However for Banjul, a difference of 3.7^{0}C between the maximum and the minimum value is observed, this indicates a large variation for Banjul.

Figure 23 : Variation of the annual average minimum temperatures at Banjul & Yundum for 1999 - 2008

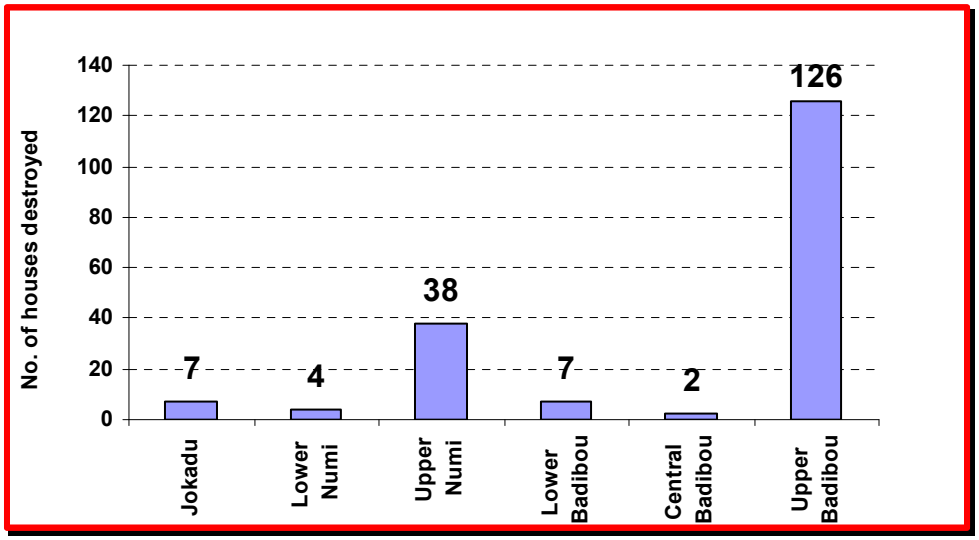


2. Exceptional events in the last 56 years

Flood

Flooding is one of the most damaging natural disasters; victims were subjected to food in-security, decline in crop productivity, and pollution of water supply, favorable conditions for breeding mosquitoes. These increase the risk of health hazards for the said communities. Stated below in graphical form are places destroyed in 2004.

Figure 24 : Places affected by heavy rains and no of houses affected in 2004



3. Unseasonal rainfall

Although unseasonal rains, depending on time of occurrence can serve late sown crops to complete their cycles, thus is generally a threat to most human activities in The Gambia. Analysis from the monthly mean records 1951- 2007 (57 year) indicated that, the highest amount of unseasonal rains is recorded in November (figure 6). When it occurs, Banjul and the Western sector are more vulnerable (figure 7).

Figure 25 : Monthly total unseasonal rainfall (mm) for the period 1951 to 2007 for The Gambia

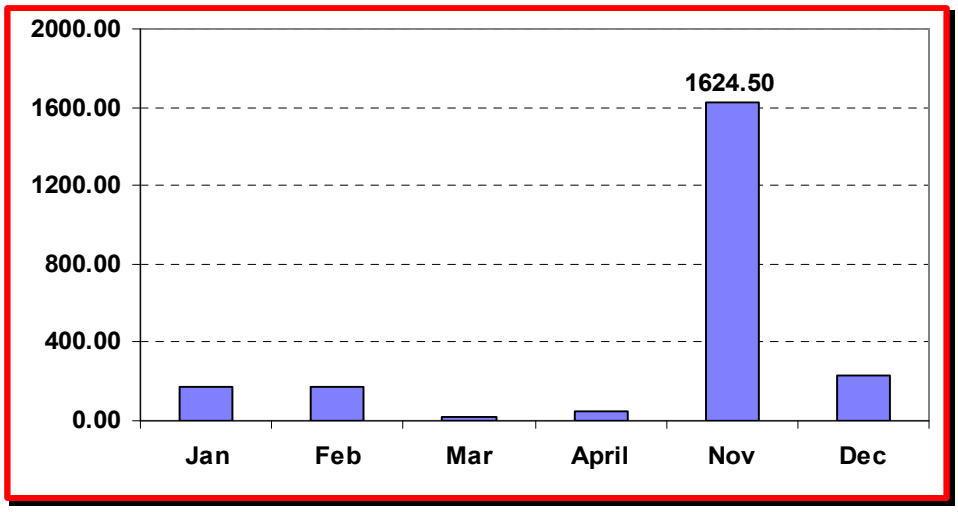
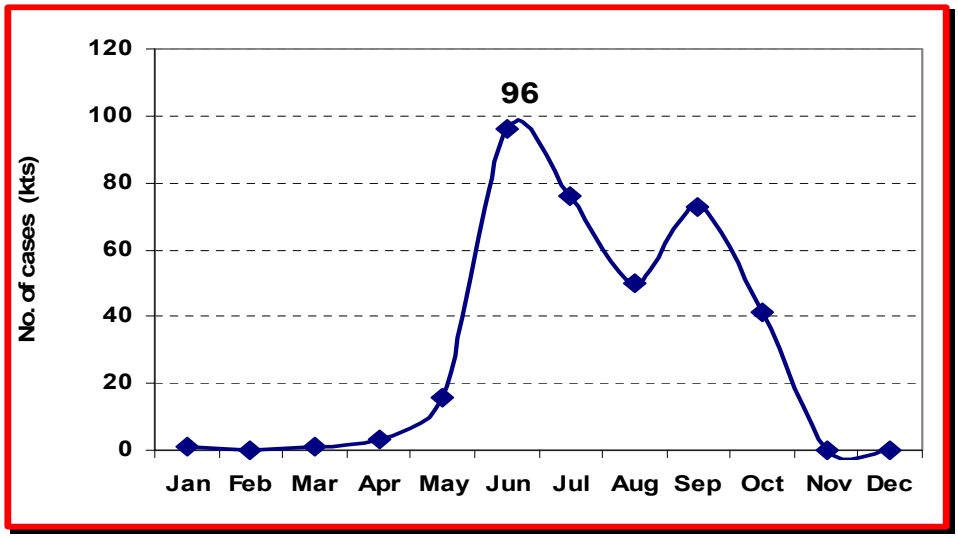


Figure 26 : Annual total unseasonal total rainfall (mm) for the Gambia for the period 1951-2007



4.2 GEOLOGY, GEOMORPHOLOGY AND PEDOLOGY

1. Background

The coastline of the Gambia stretches for about 80 km and is bounded by Senegal respectively on the north at Buniadu and the south at Kartong. It is hereby divided into segments based on geology figure 1. Like the Geology of the country as a whole, the geology of the coastal area of the Gambia comprised essentially of sedimentary rocks. Nevertheless, four distinct formations exposed along the coast are identified with and described herein:

The Essau formation generally consists of white, medium to fine-grained quartz sand. It is of a marine facies that is distributed along the beaches with dating between 1.27-1.43 ka (China Complete Plant Survey, 1995). It is 5-20 m thick and is the predominant formation on the beaches along the coastline with widths ranging from a few meters in the South Bank to about two kilometers in the North Bank (see the map attached).

The second most common formation found around the coastal areas is the Yundum formation. It consists mainly of sandy mild clay ranging in thickness between 2 - 6 m and 59-12 ka. It is fluvial, pluvial and alluvial. The mineralogy is comprised of between 70 – 80 percent quartz, about 10 – 25 percent clay mineral kaolinite with minor feldspar, limonite, and lithic fragments (China Complete Plant Survey, 1995).

The Sapu formation outcrops around Bijilo and Brufut areas. It comprised of brown ferrogenous quartz sandstone. It is of an older fluvial facies caused by laterization. It is fluvial that has been subjected to subsequent weathering and leaching. It is 3-12 m thick and 2400 ka (China Complete Plant Survey, 1995).

Farafeni Formation consists of grey symmict sand, silt, clay and cockle shells. It is a fluvial and marine and is 5.4 ka with thicknesses between 1-5 m.
The Geomorphology of the coastal area is characterized mainly by erosion and accretion, which to an extent is influenced by the geology of the area and vice versa.

The Pedology of the coastal area had been defined in a technical study conducted between 1972-1976 by the land resources division, Ministry of overseas development in United Kingdom under the conducted a detailed technical study of an agricultural development framework and the soils of the Gambia.
This study classified the Gambia into twenty- four soils association (genetic groupings)
From

- Soil Association1-12 are continental terminal soils
- Soil Association 13 is intermediate (Collovial/ Alluvial)
- Soil Association 14-23 are the Alluvial (Hydromorphic)
- Soil Association 24 is the coastal sand dunes.

The coastal zone is classified under soil association 24 which is the coastal sand dunes
This associations has two major soil types/series

2. Description of segments

The coastline had been divided into four segments S_1-S_4 respectively representing segments 1-4 with the northern-most segment referred to as S_1, followed by S_2 just south and so on.
The coastal zone of segment S_1 (13° 35' 21.99''W, 16° 32' 47.79''N to 13° 29' 07.91''W-16° 32' 41.13''N) comprised essentially of the Essau formation. The width of this rock unit is about two kilometers. It is in direct contact with the older Farafeni and Yundum formations. The coast here is N-S orienting with streams cutting through the generally sandy and clayey Essau and Farafeni formations respectively.

The morphology of S_1 is dominated by a crescent shaped beach, typical of a beach under recession and probably under attack from Atlantic waves (TAMS Consultants, 1998).
Segment S_2 bounded by coordinates 13° 25' 30.73''W, 16° 43' 42.90''N to 13° 23' 30.17''W-16° 45' 56.97''N, on the South Bank of the River estuary. S_2 starts from Banjul and ends at Bijilo. From Banjul to Cape point the Essau formation is in direct contact with the Farafeni formation that stretches landwards for kilometers. The orientation of this part of S_2 is in the east-west orientation and is subjected to easterly littoral drift induced by the north-west Atlantic swell and assisted by tidal currents (TAMS Consultants, 1998).

The main geomorphological features in this area are the barrier spits and island systems which, according to Jallow et al 1996, are formed by long-shore sediment transport from Cape St. Mary eastward towards the River Gambia. Erosion and accretion are common features in and around these areas resulting in a constantly changing coastline. The most likely causes for this erosion and accretion are the very oblique wave attack, the presence of protruding points, and the declining capacity of the Gambia River (TAMS Consultants 1998).

Between Cape Point and Bijilo section of S_2, stretching over 10km, the Essau formation with its width reduced to less than a 50m is in direct contact with the Yundum formation

which extends for kilometers landward. This section of the coast line is NE-SW orienting and is characterized by active erosion from the direct wave action affecting the cliff sides (Jallow et al. 1996).

At Bijilo, an outcop of the Sapu formation stretching for about 7 kilometers parallel to the beach, is encountered. It has a small strip of the Essau formation seaward and an extended Yundum formation landward. The Sapu formation here is NE-SW orienting and experiences extensive erosion Jallow et al 1996.
At the southern most section of S_2, accretion from the large supply of sand formed a sand spit at the mouth of the Tanji River (Jallow et al, 1996).

The segment at Solifor Point S_2 bounded by cordinates 13° 21' 40.00''W, 16° 47' 47.49''N to 13° 19' 49.14''W-16° 48' 19.79''N has minimal Essau formation. For a distance of about 5 kilometers the coast comprises essentially a protraction of in the Yundum formation in a circular shape.

Figure 27 : Accretionary sand pits around Tanji River.

Segment S4 Beyond Solifor point bounded by coordinates 13° 19' 55.17''W, 16° 48' 27.10''N to 13° 05' 03.54''W-16° 45' 00. 65''N, the Essau formation is encountered up to Kartong. It is in direct contact with the Yundum formation and orients in the N-S direction. The morphology up to Kartung Point is triangular shaped strand-plain. This dynamic section consists of sand spits and ridges running parallel to the coast. The accretion in this section is even more pronounced, forming strand plains (source).

These raised beaches according to White et al. 1988 consist of yellowish medium to fine sands with distinctive black tones due to heavy mineral content have been formed through an Aeolian process. Most of the sand quarries are located around these dunes**.** These quarries have both negative and positive impacts on the coastal zones. Sand dunes mined to an appropriate depth serve as suitable vegetable gardens. On the other hand, areas mined beyond the appropriate depth can be an eye-sore as well as breeding ground for mosquitoes. Vegetation cover in these sites is seriously affected by mining.

4.3 HYDROLOGICAL AND HYDROGEOLOGICAL CHARACTERIZATION

1. Background

Freshwater resources in The Gambia occur in a variety of environments, but a reductionist, yet physically-based simplification, leads to two broad classes of water resources: 1) surface water; and 2) groundwater. The River Gambia and its' tributaries are sources of surface water. The main river Gambia is tidal for the whole of it's length in the country. The tidal ebb is such that when high tide is recorded in Banjul, at the mouth of the river, the previous high tide has just reached Bansang, 315km from the mouth and the one before that would have reached Gouloumbo 526km from the sea only a few hours before.
The Water level fluctuations are fast and attain a magnitude between 2.0m in Banjul to 40mm in Fatoto

For surface water resources, the country counts on a few ephemeral coastal streams and two transboundary rivers. Between 1974 and 1979 about 11 recorder stations were established on the main river and of it's tidal tributaries to record automatically the water level variations on a continuous basis with automatic water level recorders

River Flows
The flow along the river Gambia is highly seasonal at it's up most part in Senegal and Guinea, with the highest flows occurring around the end of the rainy season in September and October.
However within the Gambian territory no flow measurement is possible due to the tidal nature of the River. The flow that run into the main River Gambia is measured only at it's entrance into the country at Gouloumbo in Senegal.

Based on the above the total renewable surface water resources of the country are estimated to be 6.5km^3/yr, of which 5.5km^3/yr (85%) come from the upper Gambia River Basin spread over Senegal and Guinea. Several attempts to measure flows within the Gambia have been made by a British firm - Howard Humphreys as part of the study of the River and another by a British Hydraulic Research Station in the seventies and early eighties.
.
In recent decades, monthly flow at Gouloumbo range from 800 to 1m^3/s. One effect of this high seasonality is a 100 to 160km excursion of the salt and fresh water interface (i.e. salt front) within the estuary creating perennially saline, seasonal and perennially freshwater zones. With regards to the tributaries only three are of importance to this assignment that is Tanji, Kotu and Allahein streams. Flow data is not available at these sites.

2. Exceptional historical event (Floods)

a. Flooding

Generally, there are two types of flooding, riverine flooding (when river burst their banks) and flash floods occurring mainly due to poor drainage in urban or semi-urban centers after continuous heavy rains.

River floods occur in connection with prolonged and/or copious precipitation over a large area. A flood wave builds up in the water system and moves downstream. If the discharge

capacity at any one point is exceeded, the river overflows. The sources of this kind of flood are always a stream. It is usually related to the conditions existing in the area and is therefore fostered by waterlogged.

Whilst flash floods occur due to poor drainage after local torrential rain of great intensity, it is often in connection with thunderstorms. In general, they are largely unrelated to the current state of the ground in the area, reaching their discharge peak within minutes or at most within a few hours and usually dissipate again almost as quickly. Flooding caused by flash floods is not always linked to bodies of water. On even terrain the water does not run off fast enough and accumulates on the surface. Flash floods are a great danger to life and limb particularly in the Grater Banjul Area.

Over the past ten years, Gambia has experienced a number of natural disasters. These situations disrupt the daily life of the affected population, and as a result basic necessities such as food, shelter, clothing and medical care are required to stabilise the situation.

Surface conditions including geology, topography, forest cover and soil moisture status are known to play decisive roles in the generation of floods (Linsley et al., 1982; Amara, 1993; Iorgulescu and Jordan, 1994; Hall. 1998). The 1999, 2003 and 2004 floods in URD and CRD coastal zones may be rare but not exceptional as shown by historical records maintained by the British colonial administration (Amara, 1993)

In spite of the availability of orthophotomaps, the principal investigator on climate change and water resources issues is not aware of the existence of hypsometric information downstream of Gouloumbo. One cannot therefore make an accurate assessment of the area liable to flooding from a 100-cm sea level rise. It is reasonable however, to assume that all or part of the current swamp area will be inundated.

b. Frequency of occurrence

Floods occur more or less at regular intervals, along the rivers (riverine floods) and also far away from them (flash floods). In the Gambia, records of floods date back to pre-independence era, notable among them was that of 1948 affecting the city of Banjul, Yundum and Busumbala villages. These were not river related floods instead they were caused by poor drainage and blockages of runoff valleys after heavy torrential rains.

Some of these records were 1954, 1955 and 1956 but the magnitudes were lesser than 1948. In recent years, 1988, 1999, 2002, 2003, 2004, 2008 and 2009 floods mainly flash floods which have become an annual event in the GBA particularly along the runoff valleys, depressions and where there are poor drainage systems.

River related floods occurred inter annually depending on the amounts and frequency of rains within the catchment areas, but they are largely confined to URR and part of CRR. The frequency of occurrence is low. However, in 1999, 2003 & 2004 it has been happening concurrently affecting mostly the URR and some part of CRR.

In conjunction with sea level rise, shallow water tables, water logged soils, and coastal erosion are also adding to flood risk in settlements, such as Old Jeshwang, Ebou Town, and Faji-kunda etc, that are steadily encroaching unto wetlands.

3. Water tables

Regarding groundwater resources, The Gambia sits on top of one of the continent's major sedimentary basins referred to as the Mauritania-Senegal-Gambia-Guinea Bissau-Guinea (MSGGGB) Basin. This is characterized by two main aquifer systems, a shallow sandstone aquifer (SSA) and deep sandstone aquifer (DSA). In places, the shallow SSA occurs as distinct phreatic and semi-confined aquifer (SCA) units. The phreatic aquifer is found at depths ranging from 4 to 30 meters below ground level (mbgl), whilst the SCA occurs between 30 and 50 mbgl. A Department of Water Resources Study dating from 1983 that estimates SSA reserves at 0.1km3 is probably on the low side. The deep sandstone aquifer (DSA), which occurs at depths below 250m, is estimated to hold reserves in the order of 80km^3.

One to two meters groundwater level/head fluctuations, depending on annual recharge of between (1.5 to 3.0km^3/yr), is observed in the SCA and phreatic aquifer (Source: Department of Water Resources).

All or most of phreatic and semi-confined aquifer recharge occurs through direct infiltration. Vertical leakage and lateral inflow from Senegal account for roughly 10% of the SCA recharge. Lateral inflow is the only known mechanism for DSA recharge. Where geological and hydrodynamic conditions allow for interaction between phreatic aquifer and surface water, groundwater contribution to surface water flow can be relatively substantial between January and May.

With regards to the groundwater quality, it is generally of good quality except for the fact there is an overall low PH of 5 of all preatic groundwater and some pockets of iron concentration detected in Burreng, Dongoro, Pakaliba in the Jarras, Bulock, Kankurang, Bajagarr, Sibanor, Bambara, Jifanga and Bukafonneh, in Fonis, Bansang Fulladu, Dumbutu Kiang, Kuntaur Fullakunda in Niani, Kekuta Kunda in Badibu and Omorto in kombo East.

With regards to saline intrusion, all the coastal Zone aquifers of distance between 0 – 2km away from the main River banks are considered the saline risk zones and this extend upstream from KMC to Kuntaur 254km inland.

4. Principal coastal zone water projects

At the level of Department of water Resources, there is no water project in the coastal zone. With regards to NAWEC however, there were plans for Gunjur Water Supply Project and the Kotu Ring Project. The latter is a priority project for the supply of water to Kotu, Kololi, Sukuta Sanchaba, the Tourism Development Area, Kerr Serign, Bijilo, Brusubi Housing Development, and Brufut. These are areas of high demand, rapid urban growth and development. The project is for the drilling, development, and installation of boreholes for drinking water supply, the extension of the Sukuta Water Treatment Plant, pumping facilities, elevated storage tanks, transmission and distribution mains, and telemetry and control systems.

There is of recent the Ballast Nedam water project which includes drilling of ten boreholes around Brikama Nyambai forest, development, and installation of boreholes for drinking water supply, the construction of a new treatment plant , pumping facilities, elevated sto-

rage tanks, transmission and distribution mains, and telemetry and control systems drill ten borehole.

5. Physical data available

The following physical data is available at the Department of Water Resources

- Surface Water levels and salinity for Banjul wharf
- Depth groundwater levels for GBA
- Groundwater Quality GBA (Temperatures, PH, EC)
- Transitivity values for aquifers in the Kombos
- Flows data of Kotu Stream, Tanji/Madyana & Allahein River/Darsilami
- Flood events in years.

4.4 CHARACTERIZATION OF THE COASTAL MARINE MILIEU

1. Background

The Coastal Zone of The Gambia extends from Buniadu Point and the Karenti Bolong in the north to the mouth of the Allahein River in the south . The Gambia has 71 Km of open ocean coast and about 200 km of sheltered coast along The Gambia River and is bounded on both sides by Senegal. The sheltered coast is dominated by extensive mangrove systems (66900 ha: 15000 ha of high mangroves and 51900 ha of low mangroves) and mud flats.

2. Coastal characteristics

The subsurface geology of The Gambia consists almost entirely of nearly flat-lying sedimentary beds, dipping gently and also thickening gradually to the west (Whyte & Russel 1988). During an earther high stand of the sea, rias formed along the lower portion of the River Gambia, the Nigie Bolong, and the Allahen and Tanji Rivers. Today this area is characterized by depostional strand-plan ranging in width from 200 to 400 m in the Batokunku area and from 500 to 800 m in the Sanyang and Kartong areas. Therefore, beach erosion in response to sea level rise will not be a problem in these areas.

Most of the beaches consist of medium to fin, white, well-sorted sand comprised of nearly pure quartz grains. Other beaches are characterized by concentrations of cockle (Acra seneliss) shells, resulting in well-sorted yellow sand. Beaches are often bounded by rocky headlands, composed of sandstone and laterite rock. Large block of sandstone or laterite lie scattered in the near-shore, as at Sanyang. These blocks also occur as offshore island such as the Bijilor Islands.

The Banjul spit is considered to be a Holocene-age feature. The upper 4 m consists predominantly of sand, with isolated bands of clay. At 4 m depth a compact fine to very fine sand occurs, and below 7 to 8 m of clay dominates. Therefore, the capital city has been constructed on a low-lying barrer landform that is entirely composed of erodible sedimentary materials.

The coast line is divided into 9 coastal cells on the basis of their geomorphic characteristics and vulnerability to sea level rise impacts. Some of these delineations are based on the UNEP/OCA PAC Report. (Quelennec 1988).

I) study of currents
II) tides

3. Tides and tidal currents

The tide is mainly semi-diurnal and has a daily inequality.
Characteristic water levels at Banjul are:

MHWS=	CD +1.7 m
MHWN =	CD +1.3 m
MLWN=	CD +0.6 m
MLWS =	CD +0.3 m

The tidal current is northward directed during rising tide and southward during falling tide. The tidal currents along the coast are weak, with the exception of the Banjul area where flow velocities in the order of 1 m/s do occur. These large velocities are the result of the filling and emptying of the tidal basin of the estuary of the Gambia River.

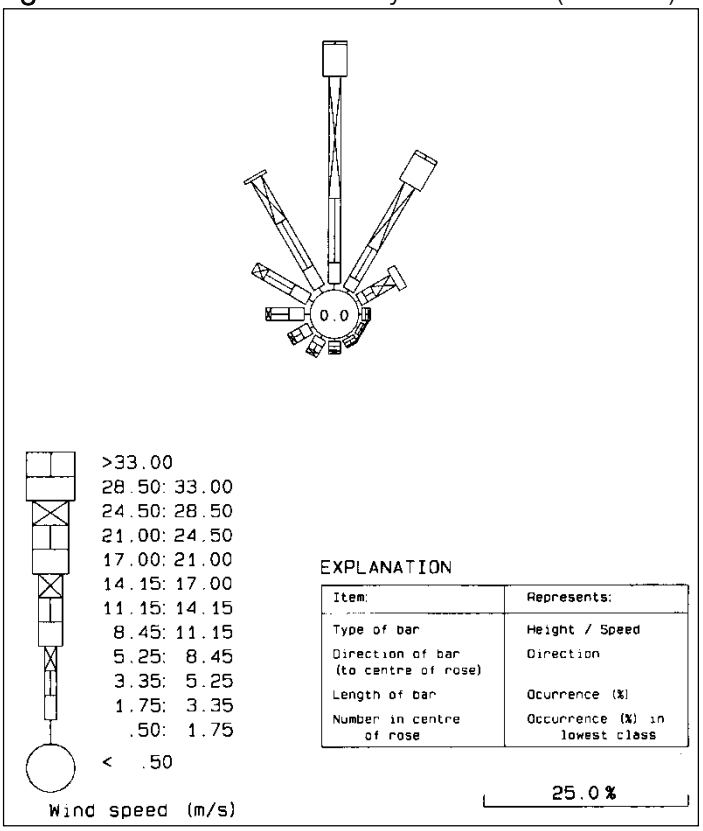
For the Banjul area DHI/Portconsult (1993) has carried out flow computations on a detailed grid. Flow patterns and characteristic flow velocities during different stages of the tide are presented in the report of DHI/Port Consult.

In addition, float track reports are available for the Banjul area (Gitec, 1979). These float track measurements were carried out with drogues at a depth of 0.5 m below surface in the period December to March (dry season).

III) Swells

Swell is waves that have left the area in which they were generated. They originate from storms at the Atlantic Ocean.

Figure 28 : Wind rose for all-year climate (offshore)



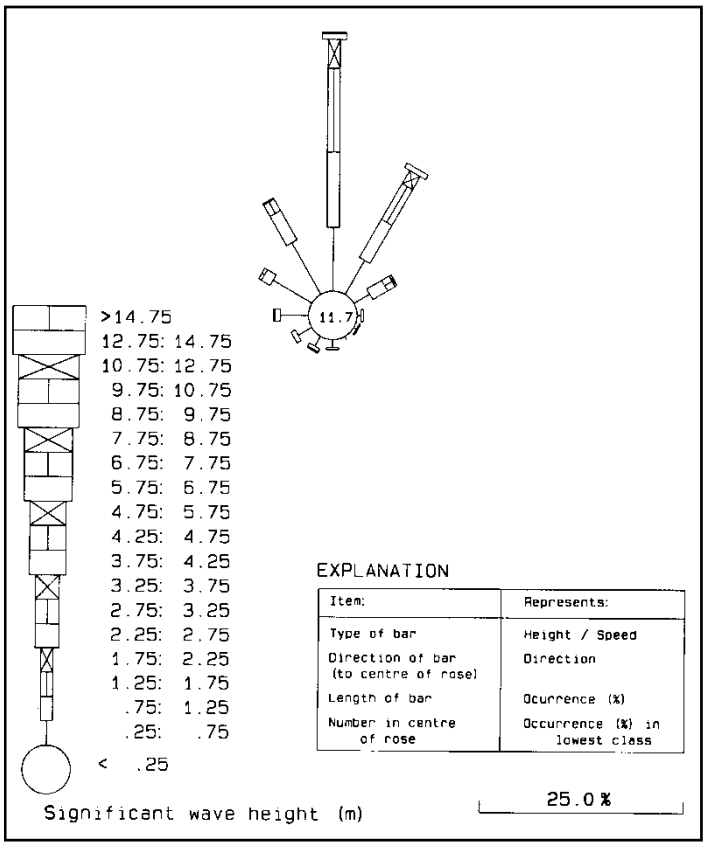
4. Offshore wave climate

Five years of offshore wave data (period 1/1/94 to 31/12/98) from the Global Wave Model of the British Meteorological Office (BMO), for the location 13.8 N, 18.1W, which is about 160 km West of Banjul.

A distinction is made between sea waves and swell waves. The sea waves are generated by the local winds. Swell are waves that have left the area in which they were generated. They originate from storms at the Atlantic Ocean.

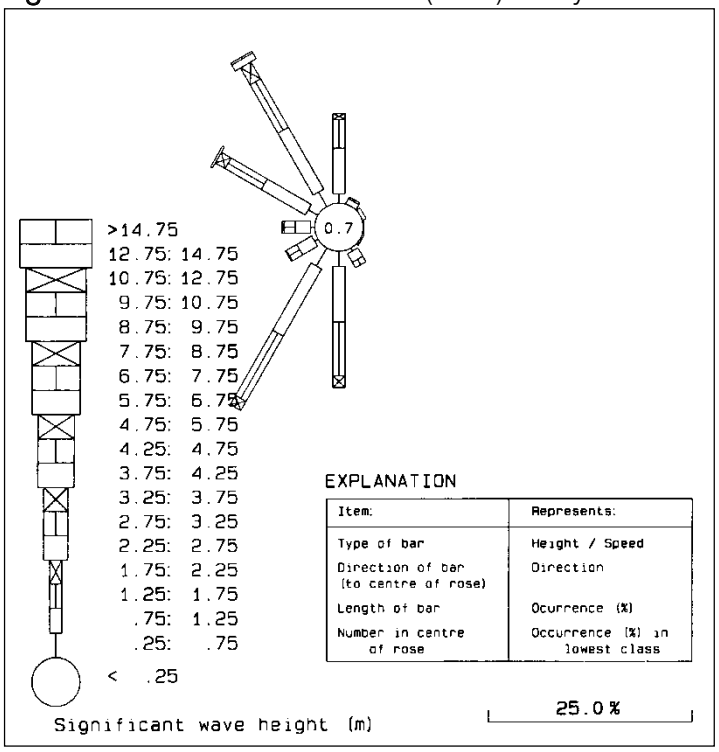
The all year wave rose for the sea waves is presented in Figure 1 The all year sea rose indicates a dominance of waves from northerly directions at open sea. The northerly waves are generated mainly in the period October to May, while in the months July and August the sea waves come predominantly from westerly directions. This can be explained on the basis of the predominant wind directions in these periods.

Figure 29 : Offshore wave rose (sea) – all year climate



The all year swell rose indicates that at open sea the highest swell comes from directions between north and west. However, also swell from southern to south-western directions occurs a considerable percentage of the time. From the monthly data it can be concluded that the swell from north-west is dominant in the period November to March (dry season), while the swell from south - south-west dominates in the period May to September (wet season).

Figure 30 : Offshore wave rose (swell) – all year climate



IV) Continental shelf.

The Gambia, with a continental shelf of 3,855 km2, is considered to have a rich fishing zone.

Bathymetrics and type of sea floor temperatures of the waters

Table 22 : Principal Institutions and Projects involved in the coastal and marine milieu

Project name	Period Start-end	Donor(s)	Authority	Name and contact of person in charge	References on the web	Remarks
Coastal Protection Project (CPP)	2003 - 2005	African Development Bank (AfDB) and Government of The Gambia	National Environment Agency (NEA)	Executive Director (NEA)	www.nea.gm	The Topographic and Bathymetric survey As-built documents are only available in hard copies

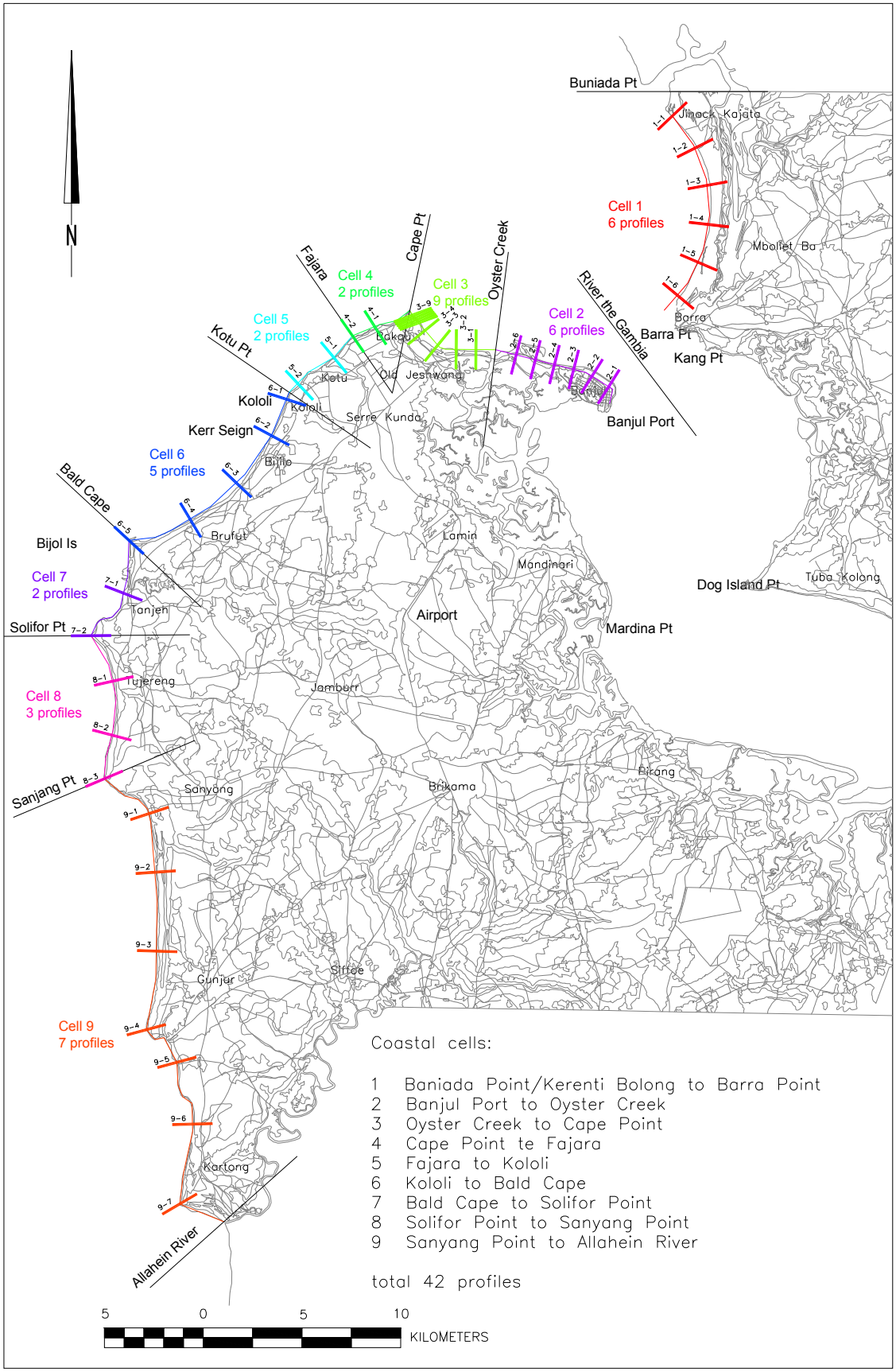
- Fishing (fish processing), oyster harvesting. Fish landing sites Bakau, Tanji, Brufut, Gunjur, Sanyang and Kartung.
- Sports fishing: Denton Bridge, tributary boat/yatching.
- Banjul Ferry Terminal, Barra Ferry Terminal (G.P.A).
- Tourism: Beach leisure
- Rice growing in wetland area/Denton Bridge – Steam corner
- Sand mining Kartung
- Heavy minerals exploitation (elminite, Zircon and Uranium) Sanyang.
- Horse ridding
- Salt production – Denton Bridge.
- Weather observation station: Banjul hinterland opposit. Christian cemetery
- Christian cemetery in use and eroded Banjul Muslim cemetery

Coastal cells division/demarcation Ref: CZM handbook Royal Haskoning.
Coastline: Buniadu point – Allahein 81 km.
Cells nr 1 – 9
Coastal cells are demarcated into 9, from Buniadu point – Allahein River.

Coastal Cells

- Buniadu Point/Karanti Bolong to Barra Point
- Banjul Port to Oyster Creek
- Oyster Creek to Cape Point
- Cape Point to Fajara
- Fajara to Kololi
- Kololi to Bald Cape
- Bald Cape to Solifor Point
- Solifor Point to Sanyang Point
- Sanyang Point to Allahein River

Fig 31 : showing 42 coastal profiles



4.5 LAND BIODIVERSITY

1. Background

This report on coastal environment aims to present a picture of the status and trend of the coastal environment system. A report of this nature is a necessary support for sustainable development; as it will provide credible environmental information.

It follows that the foregoing focuses on specifically the land biodiversity along the 81 km coastline which extends from Niumi to Kartong. These natural habitats at one time have had diverse range of species in both fauna and flora which gradually got disappeared or extinct by the ever growing human encroachment on the environment for gathering means of live-lihood.

2. State and trend

In The Gambia, three thousand- three hundred and thirty five (3,335) different species have been recorded. This includes; Plasmodiums-1, Oomycetes-4, Arachnids-7, Insects-784, Crustaceans-6, Molluscs-10, Echinoderms-1, Fishes-627, Amphibians-33, Reptiles-74, Birds-566, Mammals-125, Fungi-78, Ferns-12, Cycads-1, Conifers-1, Flowing plants-1,005 (Emms and Barnett,2005). About 13 species of animals have become extinct over the last few years and a similar number is threatened with extinction (NBSAP)

The state of the land biodiversity along the coast of this length has had lot of formulations which enhances the existence of enrich flora and fauna particularly in those days that it had not been drastically touched by man.

Then sand dunes of various types were not of rare scene plus flat and long stretch of sandy beaches with its magnificent greenery. In this ecosystem you can have trees of various kinds' importance to socio-economic gains and sheltering the multitude of fauna and avi-fauna were one of the pleasant sites of this stretch coast environment.

Compare to the past, recent demands on land and its resources particularly the forest re-sources not overlooking the fauna and flora as has negative effects on the environment more so, these coastal environments. Due to high demand for human settlements and the need for farming a good number of plant and animal species has been ravage in the process of communities resolving their quests for their needs.

This is example nary in the amount of forest cover cut down daily to serve the need for con-struction in our homes and as fuel. In this case, a lot of bird and other animal species be-come lost for example the roan antelope, lion etc.

Table 23 : General Coastal Biodiversity Species

Name	Hotspot	No. of spp recorded
Marine Turtle	Jinack, Brufut, Gunjur and Kartong	4
Water Bird	Bijol islands,Allahein river mouth,Bolon fenyo, lasso warf, Wafinjago,Kotou creek,	119
Mangrove	Tanbi, Kotou, NNP,TBR,Allahein river	6
Leopard	NNP	1
Snake	Buniadu-Kartong	41
Monitor	Buniadu to Kartong	1
Hyaena	NNP	1
Mongoose	NNP,Gunjur, Kartong	6
Otters	Tanbi, Kotou, NNP,TBR,Allahein river	1
Tortoises	Gunjur	1
Warthog	NNP	1
monkeys	Tanbi, Kotou Creek, NNP,TBR,Allahein river	4
Antelope	NNP,ANR	2
Ferns (Weed)	Buniadu-Kartong	12
Water lilies (Floaters)	Kartong Excavation, water logged rice field	2
Portulacaceae(seabed)	Buniadu to Kartong	4
Butterflies	Gallery Forest(105ha) ANR	122
Zannichelliaceaw (seagrass)	Allahein river,Barra fish landing site,Jerreh kungoto	2
Dragonflie and damselflies	NNP, TWNP	78

Table 24 : Coastal Vegetation types

Major Coastal Vegetation Type	Brief information
Permanent Shallow Marine Waters	Between Barra point and Buniadu point the coastal profile is of a gently shelving sand embayment with a predominantly northerly. There is considerable movement of sediments in the vicinity of Buniadu point where sand bars extend up to 2km to the west. Much of this sand deposition is the result of erosion further south along the shoreline of Jinack Islands
Sand Shores	There are sand shores between Barra point and Buniadu point
Estuarine Waters	The mansarinko bolon (Niumi National Park) is the main water body and rises as 2 streams 12km inland and Tanbi is located at the mouth of the River Gambia and has developed through the combination of deposition of fluvial and marine sediments. The habitats associated with these water bodies include mangrove forest, intertidal mudflats and salt marsh.
Inter tidal Sand and Mud Flats	.The north tip of jinack Island forms an estuary for a number of bolons with seasonal fresh water flow. The bolons are tidal to their entire dry season length. Their combine outflow meeting the northerly currents arising from the river Gambia have resulted in a sand bar formation off Buniadu point. In Tanbi, mudflats occur along the Mandaniri Flat and in the area to the south of the Bund road. These flats are utilized by water birds for feeding.
Intertidal forests	Mangrove forest dominate the Tanbi South of the Banjul High way and covers approx. 4,800ha, while Nuimi National park has approx. 800ha of mangrove forest
Coastal lagoons	A single lagoon occur (NNP) at buniadu point on the north shore of Jinack island occupying an area of 2ha while in TWNP, a chain of lagoons runs between cape point and Oyster Creek bridge, and a single lagoon occurs on the east of Toll Point.
Intertidal marshes (TWNP)	Intertidal salt marshes with typical halophytic assemblages of species are common in the fringe of the mangrove complex and in the upper reaches of some of the bolons including Cape Creek. In summer of 1999, these areas were also flooded due to the high level of rain that was experienced.
Shallow marine waters	The 11km between cape point and Banjul experiences an east going littoral drift and a gently shelving coastal profile with waters less than 6m occurring up to1km offshore
Sub tidal aquatic beds	The sea grasses Cymodocea nodosa and Halodule Wrightii occur in beds offshore, but the extent is not known(TWNP)
Sand beaches	The entire strip between Cape point and Banjul(TWNP)
Rocky shores	It is along the shore line of Brufut towards Gunjur

Appendix 3 : Reptile species recorded on the coast

SCIENTIFIC NAME	COMMON NAME
Chilonia mydas	Green turtle
Lepidochelys olivacea	Ridlrys turtle
Caretta ceretta	Loggerhead turtle
Knixys belliana nougeyi	Bills hinged turtle
Pedidius subniger	West African mud turtle
Crocodylus nilocticus	Nile crocodile
Tarentola ephippiata	Fig- tree gecko
Hemidactylus brooki angulatis	House gecko
Agama agama	Rainbow lizard
Chamaeloe senegalesis	Senegal chameleon
Mabuya affinis	Brown-flanked skink
Mutuya perotettii	Red-flanked skink
Varanus niloticus	Nile monitor
Varanus exabthematiccus	Bosc's
Python sebae sebae	Rock python
Python regius	Royal python
Lamphrophis fulinosus	House snake
Lycophideion semicinctum albo.	Wolf snake
Philothamnus irrgegularis	Common bush snake
Atractaspis atterima	Black burrowing viper
Psammonphis elegans	African beauty snake
p.philipsii	Olive grass snake
Naja malanoleuca	Forest cobra
n. nigricallis	Spitting cobra
Dendroaspis viridis	Green mamba
Bitis arietans	Puff adder
Causus rhombeatus	Night adder
Typhlops punctatus	Spotted blind snake

3. The Socio-Economic Importance of Wetlands

The communities around wetlands mostly composed of primarily subsistence farmers and fishermen, and resultantly they are dependent on natural resources for the maintenance of their livelihoods. The wetlands areas are of considerable importance and this subsistence economy such as: wet season rice cultivation and dry season market gardening. Various materials are also derived from the wetland environment ranging from mangrove poles for roofing to grasses for thatching and fence construction.

The uses of these natural resources by the local communities place them on a vantage position in the management of wetlands and parks. In this light, their continued/ or sustainable dependence on these natural resources can significantly increase if the demand and deterioration in the utilization processes are well managed. The recognition of the ecological value of these wetlands and a better understanding of its functions enables a more balanced position to be taken in the management of their resources.

The Wetlands functions include: fish breeding, nursery grounds, regulation of saline intrusion and the protection of the coastal zone. Other functions that could be tapped include the development of tourism, recreational and educational services among others.

However, with the human growth rate of The Gambia is excess of 4.2% and increasing environmental degradation resulting from inappropriate techniques such as the excessive use of fire, over grazing by livestock, the dependence on natural regeneration to meet both fuel and timber wood requirements, etc, the sustainability of land, the land use practices is being called into question. The diverse activities which people engage in and the seasonality of many of these operations often require a co-operative effort which is a critical component in the maintenance of the community spirit and social stability. This traditionally balanced form of resource utilization is the hub of most Gambian rural communities and the breakdown of this system for environmental reasons will result in a corresponding deterioration of the socio-cultural values also. To maintain the vitality of a community it is imperative that the trend of urban drift which is leaching off the youths in search of wider prospects is reduced by opening incentives and opportunities at the community level.

The recognition of the ecological value of the wetlands and a better understanding of it functioning enables a more balanced direction to be taken in the management of their resources. In assessing the value of the wetland the diverse ecological and economical functions which they serve at both the local and national level must be adequately incorporated into any balance sheet. In the case of wetlands their functions include fish breeding and nursery grounds, regulation of saline intrusion and the protection of coastal zone. Additional functions that could be tapped include the development of tourism, recreation and educational services.

However, the Department of Parks and Wildlife Management in its endeavors to protect The Gambia's biodiversity has carried out series of activities to understand the functions of continental wetlands. This includes water bird census from 1998 to 2004, rice and mangrove survey 2005 to 2006, Ramsar study, IBA study on wetlands of high ecological values etc.

Table 25 : Main Wetland Types Found in the Gambia

Marine and coastal	Inland Waters	Artificial waters
Shallow marine waters	Permanent rivers	Irrigated land, Rice fields
Sub tidal beds	Seasonal rivers	
Rocky shores	Riverine floodplains	
Sand beaches	Fresh water mashes	
Estuarine water	Seasonal freshwater lakes	
Inter tidal mud flats	Freshwater swamp forest (gallery)	
Salt mashes		
Mangrove forests		
Brackish lagoons		

4. Progress/ Improvements

The need for the conservation of biodiversity as has been spotted earlier in the Banjul declaration, the government of the government carried out pivotal role by creating the department of parks and wildlife mandated with conservation of the biodiversity together with forestry, NEA among others.

These institutions have speared no time and relentlessly work hand in glove to put a close watch on the environment. Through this giant steps progress has been registered in several quota to slow down the devastation of this environment and it indispensable resources ban on the use of ken saw and also several sensitization programs took place, such sensitizations as deemed by global partners such as WWF, UNDP etc had helped people realized the positive site of living amicable with the environment.

For instance, for easy management both co-managed (Tanbi, Niumi and Tanji) and community owned managed (Bolon fenyo) protected become created. In this light, beneficiaries become trained in the ways to economical and sustainable utilize these resources as in bee-keeping, oyster harvesting, and wild fruit collection, fuel wood and timber collection strategies were all put in place through the various policies designed.

This has helped greatly reduce the land degradation influences like setting up bush fires, indiscriminate sand mining, fuel wood collection, mangrove poles collection, illegal hunting, rhum palm and timber production, honey collection and over grazing. Tree planting by the communities also took place which all helps the environment to restore some of its potentials as before.

This is evident in the amount of avifauna and fauna flourishing in these zones due to lesser hunting activities.

5. Key pressures/ Problems

Progresses though have been substantial made with regards to reviving the coastal ecosystems. There are also factors that still exert tremendous pressure on the environment as way of dwindling progressive achievements. These pressures ranging from increase human settlements on the coast to indiscriminate sand mining leading to coastal erosion and environmental degradation among others. Resolving the need for more food production and human settlements recently has set heavy toll on the animal and plant life in this environment (coastline).

It is not a rare scene to have the environment burnt down annually by wild fires, whose cause perhaps are through illegal tree felling,(as in charcoal burning), honey collection, farmland clearing, traditional hunting practices the effects of which are to expose the valuable soil to forces of erosion like wind and rainfall.

Other negative human impacts on the environment particularly on this coastline are the indiscriminate sand mining, construction on the beach, motoring on the beach; turtle egg collection, poor hunting techniques.

These human activities that are ongoing as mentioned above have really sound contrary to the progressive improvement.

6. Impacts

The impacts as of socio-economic and ecology of these contravening circumstances are all inclusive and an open secret.'' Socio economically, activities like indiscriminate tree felling for both construction and farming had helped coastal communities to expose a larger portion of the land. Exposing the land do not only cause erosion in these areas but also bring about the migration of animals.

Thus, the human encroachment on the coastal environment has invariably led to the satisfaction of his needs and reduces forest cover and its resources. It also brings about pollution and similar hazards like flooding and lack of attractive fauna and flora for ecotourism.

As can be seen from above, these are the encompassed influence that seemingly poses to trigger adverse climatic effects. In addition, as are the becoming the global environmental concern, the continuous deforestation encourages too much sunlight which eventually causes sea-level rise.

7. Responses/ Innovative Approaches

In response to need for effective conservation of the natural resources especially of the coastline strategic of various types have been used to create awareness amongst the attendant communities of these coastline.

These strategies includes; (i) training members of these communities in oyster collection, (ii) in community and co-manage protected area control, selective hunting targets, and other forest resources to avoid their misuse to the determent to the land.

There generation become successful to some extent in reducing the wanting destruction of the forest land (coastline) especially through wildfires caused by the charcoal burning, honey producers; and even farmland preparation. Likewise it is all supported by sound environmental policies that live up to careful and lasting use of these indispensable reserves from close monitoring. This frequent assessment of the activities in their areas will continue.

8. Opportunities

With the sound coordination in monitoring and rehabilitation of the coastline, notwithstanding, the coastal environment, there are great opportunities as to retain our prestigious natural endowment without letting it go with desertification. The rehabilitation will be achieve through creating more protected areas, replanting or reintroducing resistant tree species on the coastline that with time, will help to shield the coast both from strong wave actions and sand mining. The extensive sand mining when controlled and replace by tree planting will give a great opportunity to maintain the luring coastline and its teeming biodiversity. It will further facilitate the expansion of the flora and fauna since some of those species said to be extinct through migration might be fetch back and the whole ecosystem revived.

9. Outlook (possible future scenarios)

By the way, the misuse of the land and forest resources can set serious consequences not only to animal and plant lives but also to human lives. As have been stated earlier, there are lots of negative conditions which are bound to prevail once the numerous vegetation types gave way to desertification. The consequences as from continues land degradation can have harmful effect on environment as in the depletion of plant and animal lives mentioned earlier. In turn, this may also gave rise to growing environmental hazards like: over flooding, coastal erosion, atmospheric pollution etc.

Thereby the sure way to prevent the threatened natural phenomena is by replacing the almost defunct vegetation and wisely uses the supporting land available. It is becoming a national concern and the world at large to carefully handle the ecosystems on which our lives are dependent. More awareness should be created to among people (communities) much more of this coastline (zone) to take to the judicious use of resources for now and posterity.

4.6 MARINE BIODIVERSITY (INCLUDING MANGROVES)

1. Background

The Gambia with a coastline of about 80 km along the Atlantic Ocean, from the mouth of the Allahein River in the South (130º 4' N) to Buniadu point in the north, has several coastal and marine habitats of high ecological importance. There are different types of coastal and marine habitats including coastal environments, living reefs, offshore environments and coast associated habitats which can be broadly classified as coastal and marine habitats of higher ecological value, marine fisheries zones and protected/reserved areas.

2. Coastal and Marine Habitats of High Ecological Value

There are several coastal and marine habitats of high ecological importance in The Gambia especially along the coastline although there has never been any comprehensive assessment to determine their ecological importance. However, according to a report by UNEP (1996), nine (9) sites of high ecological importance have been identified along the southern coastline. These include the: (i) Toll point to cape creek (camaloo corner). Amosaic of habitats types including coastal lagoon, mangrove, saltpan, coastal scrub and grassland,

and freshwater ponds which form the camaloo corner; (ii) Oyster creek mangrove swamp (to Mandinari point): mangrove swamp with fringing salt pan and grassland, some relic patches of woodland; (iii) Tanji Bird Reserve: coastal lagoons, stabilized sand-dune with woodlands, scrub and grassland components, freshwater swamp, river with fringing mangrove and saltpan dry woodland, offshore islands with surrounding shallow reef; (iv) Brufut wood: Relic patch of riverine woodland; (v) Solifor Point: Coastal woodland/scrub, inshore reef, and laterite cliffs; (vi) Tujereng Lagoons: Coastal lagoon with mangrove saltpan fringe, also stabilized dune with grassland/scrub/woodland compex; (vii) River Kakima Delta-kachuma forest: outflow of the River Kakima. A mosaic of lagoons, mangrove, saltpan and stabilized dune vegetation, backed by a relic fringe of high coastal woodland (dominated by Rhun palm); (viii) Dua Dula to Kartong: Coatal forest (Rhun palm zone) merging to scrub-

grassland in stabilized dune complex towards Kartong; and, (ix) kartong point to Allahein river mouth: coastal scrub/grassland on stabilized dune system, lagoon complex, river estuary and mangrove fringe. Also Folonko crocodile pool at Kartong village with relic patch of riverine forest – very small (less than1 ha).

Fisheries resources are provided from two sources, the river covering an area of 2,000 km2 and the ocean covering the continental shelf to an area of 5,000 km2. The estimated total biomass of dermersal and pelagic fish resources in Gambian waters is as follows: Dermersals 22,000 tons and Pelagics 156,000 tons giving a total figure of 178,000 tons (Fridtjof Nansen, 1995). The total fish potential from the maritime fisheries is estimated at about 88,000 tons with pelagic and demersal fish resources constituting 78% and 21% respectively. Total annual fish production is around 38,000 tons in 1996, clearly indicating a surplus potential. Information on the size of the river fish resources and annual fish landings from the river fisheries are not available. Certain fish species, such species include the lobster (Palinurus spp), shark, catfish (*Arius heudeloti*) and the white grouper (*Epinephelus aetheus*) are threatened as a result of unsound human exploitation strategies

3. Status and trends of Marine biodiversity

The coastal zone of The Gambia is the scene of large areas of ecologically sensitive areas. These include the area of mangrove swamps between Toll Point to Cape Creek as well as the Oyster Creek and Stink Corner mangrove swamps, which form in large part the Tanbi Wetland National Park, which is a currently RAMSAR site. Further south, the Tanji/Karenti Bird Reserve is protected area. Furthermore, Brufut wood, Solifor point, Tujereng lagoons, the River Kakima delta in Kachuma Forest, Bolong Fenyo Community Wildlife Reserve in Gunjur, the Dau Dula to Kartong coastal forest and the Allahein river mouth are the most sensitive areas of the south of the coast.

4. Seagrass fields

Some sea grass fields can be found in the shallow waters before Tanbi Wetlands National Park, upon which the manatees feed. However no detailed information is available on the extent of the seagrass fields (Carr et al 2000)

5. Endangered Species

Among the important marine mammals, the West African Manatee (Trichechus *senegalensis*), is found in almost all the creeks (bolongs) in the Nuimi National Park (Gaye et al 2009) It is tolerant of both salt and freshwater with a temperature range of 25-35ºC. Being primarily nocturnal where it is subject to disturbance, it is difficult to gauge its abundance but due to considerable hunting pressures until quite recently it appears to have declined to a critically low level. There are may be movement between the River Gambia and the Delta du Saloum Biosphere Reserve but no details are known. However, some fishermen recently disclose the occurrence of the species in Bakindik koto, Mbankam and Jamagen in Lower Niumi, Toubab Kolon in Upper Niumi and Memeh in Jokadu.

Humpback Dolphin: The dolphin is known to utilize the inshore waters also on the coastal strip of Niumi and presumably moves into the bolongs also (dolphins have been reported in the Mansarinko and Niji bolongs though sufficient details to permit identification were not available). Within the Delta du Saloum, numerous sightings have been made of this species well within the delta complex (Mairetg 1980 in Gaye et al 2009). The estuary of the River Gambia especially the area around Dog Island (15 Km) south east of Barra point) is frequented by the humpback dolphins. There appears to be some seasonality to the movement of the humpback dolphin as few sightings have been made over the period from January to May. During October to December numerous sightings of dolphins were reported off Jinack Island with schools of up to 40 humpbacks seen (Paul Murphy 1997). The dolphins are not actively persecuted though animals incidentally taken in fishing nets are generally consumed.

Clawless Otter: Clawless otters are reported to be present within Niumi National Parks (DPWM files) though no evidence of the species was noted during past surveys. Given its general nocturnal activity and its ability to range over both terrestrial and aquatic habitats it is most probable that they still occur.

Green Turtle (*Chelonia mydas*), occur on the coastline of Jinack Island, where they probably feed on the offshore sea grass beds. They also use the 11km of beach of Jinack Island as a breeding site (Ramsar Wetland Study The Gambia, 1997). Due to the rapid development of tourism infrastructure along the coast of The Gambia coastline from Banjul to Tanji, most of the nesting site for turtle has been lost. However further south of the coastline from Batokunku to Kartong stills remains a good nesting site for the green turtle in the Gambia because of the less disturbance in those areas.

6. Mangroves

Mangroves can be defined as a tropical swamp forest growing in salt or brackish water. Mangroves are usually found in the tidal zone in sheltered places such as estuaries and coastal lagoons. In the Gambia mangroves border the river all the way up to Kaur – 150km upriver – which is about as far as the river is influenced by salt sea water? In the coastal area the mangroves are comparatively low, but upriver they usually consist of trees 15 – 20m high.

Those species that make up the mangrove forests need special adaptations to be able to grow on an unstable soil that the tide threatens to wash away and to be able to survive the constant changes in water level and salinity. Common adaptations are seeds that germinate while the fruit is still attached to the mother plant (vivipary), leathery leaves to minimize evaporation, stilt of prop roots to give a better foothold and breathing roots and air channels to provide the underground parts with oxygen. Mangroves are extremely important in preventing erosion. They also have been utilized by certain national rare species e.g. Sitatunga, African Clawless Otter and West African Manatee.

7. Threats to Marine Biodiversity

Mangroves and other wetland ecosystems throughout The Gambia are threatened by both anthropogenic factors such as conversion to other land uses, overharvesting wetland prod-

ucts, etc as well as natural factors such as mangrove die-back. This has led to the decline or disruption of the ecological values provided by these ecosystems such fish breeding grounds, resulting in the loss of some species (NBSAP, 1997)

The Gambian coastal and marine biodiversity is seriously threatened by coastal erosion, sand mining and pollution. The rate of erosion of The Gambian coastline has been estimated to be 1-2 metres per year amounting to a land loss averaging 2.5 -3.0 ha of land per year or 200,000 - 300,000 m3 per year (Delft hydraulics, 1992). Sand mining is the biggest catalyst of erosion and associated environmental impacts in the coastal area. On the other hand, discharge of untreated effluent from industries such as the Gam Tan factory into nearby tributaries e.g. Lamin bolon (tributary) is believed to be contributing to the drastic decline of marine mammals such as the West African manatee (Trichechus senegalensis) and most of the crustaceans.

8. Strategies

- Promote integrated coastal and marine management
- Control coastal erosion, sand mining and marine pollution
- Control the introduction of alien species into the marine environment
- Protect the mangrove habitats along the shores of the River Gambia.
- Rehabilitate the degraded mangrove areas
- Develop a wetlands policy
- Create awareness about the importance of wetlands and methods for their wise use.
- Carry out a survey of wetlands to assess their size and distribution, composition and uses.

4.7 LAND POLLUTION

1. Background

Land is a very important environmental medium for human development and growth. Land pollution would undoubtedly affect human development and growth in many ways. The possible sources for land pollution could be indiscriminate dumping of waste; be it municipal, industrial or household wastes, liquid or solid wastes. Pollution control is crucial to nation building including health, economic development, health and ecological systems. Positive approach is required by government and all partners in development to conserve and protect the land.

2. State and trend

Some work has been done towards estimating waste quantities but this probably falls far short of achieving a realistic estimate. Work concerned with estimating and monitoring quantities of household waste are summarised as follows:-

Brown and Root report of a study conducted in 1991, estimated the quantities of household waste produced in the Banjul City Council and Kanifing Municipal Authority areas from per capita production rates that they estimated from known rates in other comparable countries. An adjustment was made to account for the workforce that commutes daily to Banjul City. They also estimated the quantity of waste from hotels from "per bed" published figures for western style hotels.

Brown and Root also estimated the amount of waste collected from the number of municipal collection vehicles operated. They assumed the weight of each load and assumed that each vehicle made two trips per day. The results of these estimates for Banjul and Kanifing were:-

Waste produced = 85 tonnes per day
Waste collected = 30 tonnes per day

While this calculation gives an indication of the order of magnitude, it cannot be considered accurate as most of the factors used in the calculation were assumptions based on the consultant's experience and not necessarily relevant to The Gambia.

However, these figures could be an under-estimation of waste generation, but could also serve as useful information for proper planning of any waste management scheme; even though consideration must be made for changes in some of the population indicators including waste generation and population proliferation.

The amount of waste generated far out weighs the collection rate and this could undoubtedly lead to serious environmental problems and degradations.

The use of improper waste trucks and compounded paucity of resources and trained human resources has led the whole idea of waste management overwhelmingly difficult and far fetch in terms of achieving its objectives.

Population growth and change in lifestyle have contributed immensely to waste generation and management problems. Another trend that would affect tonnage is increased use of packaging, especially plastic packaging materials, which may be associated in The Gambia with an increase in the amount of imported products. In order to properly control and management waste, these factors mentioned above need to be taken into consideration.

3. Characterization of solid and hazardous waste disposal systems.

Solid waste management in the Greater Banjul Area including the coastal areas is handled by municipalities (Banjul City Council and Kanifing Municipal Council and the Brikama Area Council). Open/crude/indiscriminate waste disposal system; the municipal landfills are the only method of disposal practiced by all the Councils. However, Medical Research Council has an incinerator for the disposal of their clinical wastes. The Municipal landfill disposal sites do not have any facilities, environmental controls, or development and operations plan for mitigating environmental impacts, and yet a wide range of wastes are deposited in them, which include domestic/household wastes, commercial waste, industrial waste, construction waste, and hazardous wastes including most of the clinical wastes.

4. Important sources of pollution and the associated problems/impacts.

Unauthorised landfills and dumps can cause land pollution and the subsequent underground water pollution. Gas migration and leachates could expand to the surrounding areas thereby expanding the total pollution area. Temporary waste storage areas and unauthorized dumps could also serve as sources of land pollution but on a smaller scale. Particular disposal problems exist in relation to clinical waste, oily sludge from Kotu Power station and other electricity generation power stations around the country, and mechanical garages/workshops, used batteries, sundry chemicals, pesticides, and old vehicles.

There is limited monitoring of waste generation at present, and few data are available on waste quantities and composition. Monitoring of waste disposal sites is undertaken by the Public health Department, but there are no formal standards.

5. Progresses /Innovative approaches

In order to improve environmental quality, the National Environment Agency is concentrating more on industrial and other point sources which are known or believed to discharge gaseous, liquid or solid wastes which affect environmental quality. Environmental discharge permits are applied for to the NEA for discharge authorization. Industries also register with the Agency likewise any institution dealing or handling hazardous wastes and other wastes. In granting an environmental permit, the NEA specifies the substances to be controlled, the allowable quantities or concentrations, the monitoring to be undertaken and environmental management measures to be implemented. Basically allowable pollution levels have to be set on the basis of what is required to maintain ambient environmental quality standards in the receiving medium, and on the basis of 'best practices' approaches used in other countries. Strict monitoring at waste disposal sites also needs to be instituted.

Improvement notices and prosecutions have paid dividend especially with the introduction of the Anti-littering regulations in June 2007. Marked achievements have been registered where enforcement has been coupled with sensitization of the populace. Notwithstanding the achievements, more sensitizations are needed especially in growth centers and the rural areas.

4.8 MARINE POLLUTION

1. Background

Marine pollution has been a problem along the coastline of the Greater Banjul Area from time immemorial. Before the introduction of the Sewerage system in Banjul, human excreta used to be discharged into the mangrove swamps without being treated. The creeks around the discharge sites provide flourishing breeding for the shellfishes/oyster and a source (Oyster) for economic activities for our women folks.

The sewerage system is meant to improve marine pollution, discharge sewage directly into The River Gambia without being adequately treated. The capital cost of maintenance of the

sewerage system in the Gambia is very high because of the flat terrains which normally require many lifting stations. The capital cost also requires large initially outlays. Cost recovery is always a problem because there are more defaulters for sewerage tariff payment than for water supply because it is difficult to disconnect the defaulter from the sewerage system or plugging/blocking would create an environmental hazard.

The Kotu sewerage system is discharged into a stabilization pond by means of a gravity sewers and it serves mainly the tourism industries and commercial cesspool emptier activities.

2. Status/trends and impacts

Bucket latrines were used in Banjul before the introduction of the sewerage system. The bucket latrines had a lot of problems, ranging from spilling, health hazards, and the contamination of all the environmental media.

The introduction of the sewerage system in the eighties was intended to remedy the menace of the bucket latrines. However, this system could even be more threatening if the operations are not technically guided, and properly managed. The sewerage system has a very high operational and maintenance cost as compared to the on-site system (e.g. Ventilated improved pit latrine; VIP). VIPs do not rely on water and you do not need high technology to build it. Locally available materials could be utilized for its construction.

The Banjul sewerage discharges its effluent into The River Gambia and it has a lot of problems. The sewage pumps are in poor condition and the pump station needs rehabilitation. The sewers remain surcharged when pumps do not work and solids settle and consolidate. The sewerage system is actually compounding environmental hazards in the event gravity sewers get blocked creating surcharges or in the event the pump stations become non-functional resulting in wastewater overflows. NAWEC does not have adequate sewer cleaning, jetting and Roding equipment. Some sewers are suspected to have collapsed at varying locations. The sea outfall is also not performing as designed; notwithstanding several attempts to rectify the situation. Any rehabilitation work on the outfall will be expensive involving diving and dredging.

The Master Plan engineering company had carried out a detailed analysis for a proposed sewerage for Kanifing Municipality and found to be very costly. They also suggested that a cost effective stabilization pond be built in the swamps west of Banjul for the Banjul sewerage to replace the outfall at sea. In consideration of the outfall and the suggested stabilization ponds in the swamps could still leave the marine environment prone to pollution.

Indiscriminate dumping of solid waste into creeks and other water bodies is also becoming a common feature along the coastal Greater Banjul Areas, especially in Banjul. One visible sign of serious marine pollution could be seen along the Bund Road where the creek and swamp waters have change color and a lot of mangrove plants dying. The number of recreational, sporting, and picnic activities have also increased along the beaches, and such activities cannot go without the generation of waste. Therefore, marine pollution could occur if proper monitoring and control measures are not put in place.

CONCLUSION

Coastal erosion has been identified as one of the most devasting environmental problems in the coastal zone of the Gambia, and it has serious implications for the economy of the entire country. It has already destroyed tourist facilities, infrastructure, and historic and cultural sites. It has posed serious threats to the highway linking Banjul to the rest of the country. Coastal land lost due to erosion poses similar threats to components of the natural ecosystems such as the mangrove forest areas and wildlife parks.

Over the past decades, the coastline of the Gambia as in many other places has been developed intensively and presently is occupied up to the very limits of the sea. This occupation includes residential, commercial and fish landing facilities and following the tourist boom of the 1970's, a significant number of beach hotels.
Viewing the dynamics of the coast in relation to the littoral drift regime and the effects of sea level rise and mining activities, over the years the sea has encroached at several places to such an extent that valuable structures and socio- cultural heritages are threatened or already even damaged. As such the experienced erosion problems can be intimately linked to the socio-economic pressure on the coast

The coastal zone is the most heavily populated part of the country. It also has many ecologically sensitive areas, and contains most of the economic development infrastructure especially in the tourist industry. Present-day coastal wetlands are at risk of being gradually inundated resulting in the loss of mangrove and salt marsh vegetation. Absolute numbers and species of fauna associated with mangroves are expected to drop. People whose livelihoods are linked to the vitality of coastal ecosystems are at significant risk of losing their livelihoods.

It is projected that about 92 km square of land in the coastal zone of the Gambia will be flooded and covered by the sea as a result of only 1 metre rise in the present water level of the sea. About 50 % or 47 km square of the total land loss due to the increase in the water level of the sea will be on the mangrove systems and other areas of the coast protected from the coastal erosion (the sheltered coast). Similarly with one metre rise in the present level of the sea, the whole of the capital city Banjul will be flooded and lost to sea. This is because greater part of the city is one metre lower than water level of the sea at present. The mangrove systems on St. Mary's Island, Kombo St. Mary and on the low lying areas in the Lower Nuimi from Barra to Buniadu will also be flooded and lost to the sea.

In conclusion, The Gambia's marine and coastal environment has international importance for sound environmental management and requires continuous appropriate management to ensure their conservation. The effective administration of conservation and environmental protection requires enforcement of the legislation in hand, enhanced and strengthened consultation procedures, the provision of appropriate expertise to stakeholders and adequate resourcing.

RECOMENDATION

Accepting that the science of coastal dynamics is quite complex, future interventions will require close involvement of several disciplines of science and engineering.

As there is one Gambian institution with sufficient expertise to tackle the emerging problems in the coastal zone all by itself, in this regard, there is the need to formulate effective, participatory approaches and strategies for addressing coastal management issues.

To have surveys, researches, assessment methods and procedures for prioritization protection of valuable ecosystems and living resources including worldwide endangered species and their habitats.

All developments should be in line with Governments sustainable development policy and in line with international codes and standards

Explore possible areas of regional cooperation and consensus on a plan of short to medium term for coastal erosion protection and conservation actions.

The construction activities within the coastal strip, especially the destruction of sand dunes, are known to aggravate sea erosion. It has already been recommended to the Gambia Tourism Authority that the concessions should not be granted for new hotel development within 150 meters of the high water mark. Further, the practice of some hoteliers of discharging storm water through drains into the sea, which is known to aggravate erosion, should be stopped and the drainage system of the tourism area should be better planned and implemented by all concerned parties. In addition, the hoteliers to adhere to development recommendations even within their premises, e.g., swimming pool construction, which usually results in massive excavation of sand.

Stabilization objects in the form of creeping plants and trees should be grown on the reclaimed areas especially from Banjul Point (Seafront of the State House) to the seafront at the Radio SYD area.

A robust legal and institutional framework to provide the Coastal Zone Management Unit with the requisite legal mandate in monitoring and enforcing relevant coastal zone management regulations needs to be established. At this point, the NEA needs a legal framework that will lend itself to a permanent build up of capacity and funding to address coastal degradation and protection.

A mechanism to be in place for continuous monitoring and interventions/maintenance of damages to the coastal protection works as soon as they occur. In this regard, there should be in place an annual budget for such interventions.

- Sensitization of the populations on key issues and themes is necessary.
- Environmental laws should be enforced.
- Sewerage systems should only be recommended where on-site disposal system would not function well such as in the case of clayey soils, lack of space for septic tanks and very high groundwater table and swamps.

- Liquid waste should be well treated before discharged into water bodies and faulty sewage pumps should be replaced in order to prevent marine pollution and surcharges in to the environment.
- Regular monitoring of stabilization ponds to prevent environmental and marine pollution should be instituted.
- Recreational, picnic and sporting activities should be controlled and sensitization on "clean-beach" initiative should be launched coupled with the enforcement of the anti-littering regulations.

APPENDIX

Appendix 4 : List of Issue writers and Institutions

Names	Institutions
Momodou B Sarr	National Environment Agency
Ndey Sireng Bakurin	National Environment Agency
Momodou J Suwareh	National Environment Agency
Dodou Trawally	National Environment Agency
Salimina Jobe	National Environment Agency
Aji Binta Kinteh	National Environment Agency
Famara Drammeh	National Environment Agency
Bulli M Dibba	National Environment Agency
Sheikh Alkinky Sanyang	National Environment Agency
Mohammed Leroy Gomez	National Environment Agency
Abubacarr Kujabi	National Environment Agency
Ahmed Hydara	National Environment Agency
Ismaila Bojang	National Environment Agency
Alieu Nyang	National Environment Agency
Malick Bah	National Environment Agency
Ndenneh Nying	National Environment Agency
Bubacarr Z Jallow	National Environment Agency
Adam Ceesay	National Environment Agency
Mohammed Jabang	National Environment Agency
Philip Armstrong	National Environment Agency
Adama Cham	National Environment Agency
Aruna Jobe	National Environment Agency
Babucarr Cham	National Environment Agency
Saikou Kolley	Department of Water Resources
Fatou Sima	Department of Water Resources
Momodou S Jallow	Department of Water Resources
Baba Ceesay	National Council for Arts and Culture
Fatou Beyai	Gambia Tourism Authority
Dawda Darboe	Department of Lands
Ismaila Kah	Department of Physical Planning
Edrissa Ceesay	Gambia Bureau of Statistics
Famara Darboe	Department of Fisheries
Abdoulie Sawo	Department of Parks and Wildlife
Kawsu Jammeh	Department of Parks and Wildlife
Alpha O Jallow	Department of Parks and Wildlife
Matarr Cham	Soil and Water Management Services
Kebba Manka	Soil and Water Management Services
Isatou Cham	National Roads Authority
Francess Coker Singateh	National Roads Authority
Jerreh Barrow	Geology Department
Nfansu Nyassi	Geology Department
Sulayman Chune	Freelance

Appendix 5 : List of Marine Species

SCIENTIFIC NAME	COMMON NAME
Chelonia mydas	Green turtle
Lepidochelys olivacea	Ridlrys turtle
Caretta caretta	Loggerhead turtle
Knixys belliana nougeyi	Bells hinged turtle
Pelidius subniger	West African mud turtle
Crocodylus niloticus	Nile crocodile
Sousa teuzii	Atlantic Hump-backed Dolphin
Tursiops truncatus	Bottle-nose Dolphin
Stenella clymene	Clymene Dolphin
Trichechus senegalensis	West African Manatee
Puffinus puffinus	Manx Shearwater
Puffinus assimilis	Little Shearwater
Oceanites oceanicus	Wilson's Storm-petrel
Hydrobates pelagicus	British Storm- petrel
Oceanodroma leucorhoa	Leach's Storm- petrel
Tachybaptus ruficollis	Little Grebe
Phalacrocorax carbo	Great Cormorant
Phalacrocorax africanus	Long-tailed Cormorant
Anhinga rufa	African Darter
Pelecanus rufescens	Pink-backed pelican
Pelecanus onocrotalus	Great White Pelican
Botaurus stellaris	Eurasian Bittern
Ixobrychus sturmii	Dwarf Bittern
Tigriornis leucolophus	White-crested Tiger Heron
Gorsachius leuconotus	White-backed Night Heron
Nycticorax nycticorax	Black-crowned Night Heron
Ardeola ralloides	Squacco Heron
Bubulcus ibis	Cattle Egret
Butorides striatus	Striated Heron
Egretta ardesiaca	Black Egret
Egretta gularis	West Reef Heron
Egretta garzetta	Little Egret
Egretta intermedia	Intermediate Egret
Egreta alba	Great White Egret
Ardea purpurea	Purple Heron
Ardea cinerea	Grey Heron

Ardea melanocephala	Black- headed Heron
Ardea goliath	Goliath Heron
Scopus umbretta	Hamerkop
Mycteria ibis	Yellow-billed Stork
Ciconia nigra	Black Stork
Ciconia abdimii	Abdim's Stork
Ciconia episcopus	Woolly-necked Stork
Ciconia ciconia	White Stork
Leptoptilos crumeniferus	Marabou Stork
Plegadis falcinellus	Glossy ibis
Bostrychia hagedash	Hadada Ibis
Threskiornis aethiopicus	Sacred Ibis
Platalea alba	African Spoonbill
Phoenicopterus ruber	Greater Flamingo
Phoenicopterus minor	Lesser Flamingo
Haliaeetus vocifer	African Fish Eagle
Vanellus vanellus	Northern Lapwing
Vanellus spinosus	Spur Winged Plover
Vanellus tectus	Black-headed Plover
Vanellus senegalensis	Wattled Plover
Pluvialis squatarola	Grey Plover
Calidris ferruginea	Curlew Sandpiper
Actitis hypoleucos	Common Sandpiper
Larus cirrocephalus	Grey-headed Gull
Larus canus	Common Gull
Sterna caspia	Caspian Tern
Sterna maxima	Royal Tern
Sterna sandvicensis	Sandwich Tern
Halcyon leucocephala	Grey-headed Kingfisher
Halcyon malimbica	Blue- breasted Kingfisher
Ceryle rudis	Pied Kingfisher

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