ENHANCING RESILIENCE OF VULNERABLE COASTAL AREAS AND COMMUNITIES TO CLIMATE CHANGE PROJECT

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN:

CONSTRUCTION AND OPERATION OF EROSION CONTROL MEASURES AT SENEGAMBIA/KOLOLI BEACH AND TANJI BRIDGE AREA

June 2015

Environmental and Social Impact Assessment of Construction and Operation of Erosion Control Measures at Senegambia/Kololi Beach and Tanji Bridge Area

June 2015

Acknowledgements

Sahel Invest Management International (the Consulting Firm) is grateful to all those who agreed to meet with the Consultants to discuss and share their knowledge and ideas on this study.

The Firm is especially grateful to Gambia Hotel Association for its views and support, and wish to express its appreciation of the patience and support of the various respondents and interviewees particularly the village community of Tanji, and the informal operators within the tourist industry.

Finally, the Firm wishes to express its appreciation to the team that conducted this study (Mr. Momodou A. Cham- Team Leader and Environment and Natural Resources Specialist, Ms. Nancy Njie-EIA Specialist, Mr. Habib Jeng-Engineer, Mr. Ebrima Camara-Socio-economist, and Mr. Abdoulie Manneh-Land Use/GIS Specialist.

DISCLAIMER:

The findings, conclusions and interpretations expressed in this document are those of Sahel Invest Management International, and should in no way be taken to reflect the policies or opinions of the National Environment Agency, UND-CO or of the Global Environment Facility.

ACRONYMS AND ABBREVIATIONS

ANR	Agriculture and Natural Resources
CTS	Continental Terminal Series
DPWM	Department of Parks and Wildlife Management
EDPR	Environmental Discharge (Permitting) Regulations, 2001
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIARs	Environmental Impact Assessment Regulations
EQSR	Environmental Quality Standards Regulations
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GD	Gambia Datum
GEAP	Gambia Environment Action Plan
GTB	Gambia Tourism Board
IUCN	International Union for the Conservation of Nature
LEC	Local Environment Committees
MDGs	Millennium Development Goals
MEWRCFW	Ministry of Environment, Water Resources, Climate Change, Forestry, and Wildlife
MSL	Mean Sea Level
NAPA	National Adaption Plan of Action
NEA	National Environment Agency
NEMA	National Environment Management Act
NEMC	National Environment Management Council
NRA	National Roads Authority
PA	Protected Area
REPO	Regional Programme Officer
SLR	Sea Level Rise
VDC	Village Development Committee

TABLE OF CONTENTS

DISCLAIMER: 4

ACRONYMS AND ABBREVIATIONS 5

LIST OF TABLES 9

LIST OF FIGURES 10

EXECUTIVE SUMMARY 10

CHAPTER 1: INTRODUCTION AND BACKGROUND 13

1.1 Brief Introduction to the Project 13

1.2 Objectives of the Report 13

1.2.1 Objectives of the Report 13

CHAPTER 2: POLICY, INSTITUTIONAL AND LEGAL FRAMEWORK 15

2.1. Applicable National Safeguard Policies 15

2.2 The Institutional Framework 19

2.3. Applicable National Laws - Relevant Regulatory Framework 20

CHAPTER 3: DESCRIPTION OF SUB PROJECTS 23

3.1 Senegambia/Kololi Beach 23

3.1.1 Project Location 23

3.1.2 Project Objectives 24

3.1.3 Sub Project Justification - Support to the Tourist Sector 25

3.1.4 Project Scope of Work, Components and Specifications 25

i. The Design 25

3.1.4.2 The Rock Revetment 26

3.1.5. Project Main Activities 27

3.2 The Tanji Bridge Area 29

3.2.1 Project Location 29

3.2.2 Project Objectives 29

3.2.3 Sub Project Justification – Protection of the Coastal Highway 30

3.2.4 Project Scope of Work 31

3.2.5 Components and Specifications 31

3.2.6 The Project Main Activities 32

CHAPTER 4: THE ENVIRONMENTAL BASELINE CONDITIONS 34

4.1 Senegambia/Kololi Beach 34

4.1.1 The Physical Environment 34
4.1.2 The Biological Environment 44
4.1.2.1 Coastal Wetland Ecosystem 44
4.1.2.2 Fish Resources 44
4.1.2.3 Forest Resources 44
4.1.2.4 Fauna 45
4.1.3 The Social and Economic Environment 46
4.1.3.1 Land Ownership and Settlement Pattern 46
4.2 The Tanji Bridge Area 47
4.2.1 The Physical Environment 47
4.2.1.1 Topography 47
4.2.1.2 The Sand Spit System at the Mouth of the Tanji River 47
4.2.1.3 Nyanya's Beach Bar and Restaurant 47
4.2.1.4 Other Threatened Infrastructure and Service Facilities 48
4.2.1.5 Use of the Sheltered Bay by Fishermen 48
4.2.1.6 Neighbourhood of the Camel Safari 49
4.2.1.8 Air Quality 49
4.2.2 The Biological Environment 50
4.2.2.1 Coastal Wetland Ecosystem 50
4.2.2.2 Fishes and Other Aquatic Populations 50
4.2.2.3 Forest Resources 52
4.2.2.4 The Fauna 52
4.2.3 The Social and Economic Environment 53
Agriculture 53
Fisheries 53
Craft, Petty and Market Trade 53
Resource Use 54
Minerals and Aggregates 54
Fuel wood 54
Tourism 54
CHAPTER 5: CONSULTATIONS AND PUBLIC PARTICIPATION 54
5.1 Objectives of the Stakeholder Consultations 54

5.2 Key Stakeholder Concerns and Views 55
CHAPTER 6: ASSESSMENT OF ANTICIPATED IMPACTS AND MITIGATION MEASURES **62**
6.1 Principles and Method Used in Screening Potential Significant Impacts . 62
6.1.1 Analyses of Potential Impacts: Senegambia/Kololi 66
6.1.1.1 Potential Impacts and Mitigation of the Revetment, Breakwaters and Beach Nourishment 66
6.2.1 Analyses of Potential Impact at Tanji 76
6.2.2.2 Potential Impacts and Mitigation of the Revetment and Dike 76
7: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN **82**
7.1 Matrix On Mitigation Of Impacts Related To Senegambia/Kololi Beach 82
7.2 Matrix On Mitigation Of Impacts Related To Tanji Bridge Area Activities 87
CHAPTER 8:ENVIRONMENTAL COMPLIANCE MONITORING **91**
8.1 Effective Monitoring of the ESMP 91
8.2 Reporting 95
8.3 Environmental Auditing 95
CHAPTER 9:IMPLEMENTATION ARRANGEMENTS **96**
9.1 Stakeholder Analysis - Roles and Responsibilities of Agencies 96
9.1.1 National Environment Agency (NEA) 96
9.1.2 The Integrated Coastal Zone Management (ICZM) Working Group 97
9.1.3 Ministry of Works, Transport and Infrastructure (MoWTI) 98
9.1.4 The Gambia Hotel Association 99
9.2 Institutional Capacity Enhancement Plan 99
CHAPTER 10: CONCLUSIONS AND RECOMMENDATIONS **101**
REFERENCES **104**
ANNEXES **105**
ANNEX 1 – FIGURES **105**
ANNEX 2:LIST OF INSTITUTIONS AND PERSONS MET **115**
ANNEX 3: FIELD KIT CHECK LIST FOR MONITORING **117**
ANNEX 4: DATA USEFUL FOR EROSION CONTROL PROJECTS **118**

LIST OF TABLES

Table 1: International Agreements and Conventions Ratified by Gambia

Table 2: Volumes of Amour Required for the Revetment

Table 3: Project Main Activities at Senegambia/Kololi Beach

Table 4: Design Requirements for the Revetment

Table 5: The Requirements for the Stone Gradation for the Revetment and Dike

Table 6: Project Main Activities for Tanji Revetment and Dike

Table 7: Monthly Mean Rainfall (mm) – Yundum WCR

Table 8: Monthly Mean Relative Humidity (%) – Yundum WCR

Table 9: Monthly Mean Temperatures (^{o}C) Yundum WCR

Table 10: Historical and Projected Climate Change Assessments for a Suite of Meteorological Parameters from a Variety of Sources

Table 11: Health Human Resources Situation As at 2013

Table 12: List of Health Facilities

Table 13: Population Distribution of the Peripheral Villages to the Proposed Project Site

Table 14: Status of the Main Fish Stocks

Table 15: Summary of Stakeholder Consultations

Table 16: Significance Evaluation Matrix of the Potential Impacts at Senegambia/Kololi Beach

Table 17: Significance Evaluation Matrix of the Potential Impacts at Tanji Bridge Area

Table 18: Potential Impacts and Corresponding Mitigation Measures for Senegambia/Kololi Beach Activities

Table 19: Potential Impacts and Corresponding Mitigation Measures for Tanji Activities

Table 20: Monitoring Programme for the ESMP Implementation

Table 21: Cost of Implementation of the ESMP

Table 22: Capacity Enhancement Plan for Effective ESMP Implementation

LIST OF FIGURES

Figure 1: Location of Senegambia/Kololi Project Site

Figure 2: Tourist Arrivals – 2009 to 2014

Figure 3: Figure Location of Breakwaters, Revetment and Beach Nourishment in the Senegambia/Kololi Project Site

Figure 4: A cross section of the Breakwater at Senegambia/Kololi Beach

Figure 5: Cross Section of the Revetment

Figure 6: Project Location in the Tanji Bridge Area

Figure 7: Eroded section of the river bank after backfilling with gravel; the NAWEC pole was less than a meter away from the erosion

Figure 8: Water pipe located along the road corridor close by the Bridge

Figure 9: Location of the Revetment and Dike

Figure 10: The Cross Section of the Revetment

Figure 11: The Cross Section of the Dike

Figure 12: Photo of gully by the fence of Galaxy Entertainment Park created by storm water arising from the highway and Kololi

Figure 13: Sand bags on the beach at Senegambia Beach Hotel

Figure 14: The Discharge Point of the Senegambia Storm Drain

Figure 15: The Seawall at Kairaba Beach Hotel

Figure 16: The Collapsed Frontage of the Holiday Beach Club Hotel

Figure 17: Stalls and bars of fruit sellers and juice pressers on the sand cliff at Holiday Beach Club Hotel

Figure 18: Frontage of the Kololi Beach Club; note the fallen coconut trees

Figure 19: Remnants of the foot bridge that tourists used to get into the sea

Figure 20: Nesting Ground for Grey headed Gull, Caspian Tern and Royal Tern on the large island of Bijol

EXECUTIVE SUMMARY

This Environment and Social Impact Assessment (ESIA) report is based on the assessment of the proposed construction of erosion control measures in Senegambia/Kololi and at the Tanji Bridge, near the mouth of the Tanji River.

Specifically the beach fronts of the Senegambia Beach Hotel, Kairaba Beach Hotel, Holiday Beach Club Hotel, and the Kololi Beach Club have experienced massive beach erosion over the years (at a rate of about 20m/year) putting some of the infrastructure and facilities at risk.

Given the importance of this area as regards tourism the Government decided to address the problem by constructing erosion control measures in the form of four offshore breakwaters; a 1.2km long rock revetment; and by nourishing the beach with 94,000 m^3 of sand over the entire stretch of the beach fronts of these hotels. The nourishment will consist of widening or restoration by importing sand and spreading it over the site.

At the Tanji Bridge the proposed intervention involves the construction of a revetment to protect the part of the Kombo Coastal highway which is under threat of being cut as a result of the erosion of the river bank towards the road.

This highway is the most important road linking the coastal communities in Kombo South to major urban centers such as Serekunda, Brikama, and indeed the capital city, Banjul. The road has greatly improved communication between Banjul and the coastal areas in the South, and will initiate a rapid development in tourist facilities in these areas.

In the Tanji Bridge area, two problems have been identified which need to be addressed; the first is the erosion of the riverbank that is approaching the highway, whilst the second is the flooding along the river bend right after the two bridges (on the seaward side). Thus the proposed works will involve:

i) Constructing a 70m long revetment to protect the river bank, and thus prevent the erosion that threatens the highway

ii) Building a dike to address the flooding along the river bend right after the two bridges

The study has determined that the implementation of the works at all stages will have varying levels of negative impacts, but these will be mitigated through this Environmental and Social Management Plan (ESMP) to strike a balance between development and environmental protection.

However, it is important to note that effective implementation of the ESMP is, to a large extent, dependent on the level of preparedness and competence (in terms of technical skills, and availability of the required equipment and materials) of the implementing institutions.

Among other issues, the study revealed serious capacity weaknesses at all the important institutions whose roles are critical to the successful implementation of the planned interventions. The responsible institutions are under resourced, and are presently overwhelmed by their current responsibility. The key handicaps are:

i. Inadequate expertise in environmental management, and low capacity in EIA at all levels of government

ii. There is limited pollution discharge monitoring and analysis being carried out due to lack of equipment

iii. Inadequate capacity to conduct general environmental monitoring exercises also due to lack of equipment

Strengthening the legal infrastructure is also necessary to back up the NEA (as the principal Agency to monitor the ESMP implementation) and its partners. With the required regulations the Coastal and Marine Environment Unit (CMEU) within the NEA could be more effective to ensure compliance with particularly, regulations that deal with coastal protection and use of coastal resources. The existing legal and institutional infrastructure should therefore be critically reviewed, and recommendations for improvement made to include, among other things:

- New framework law, normative acts and regulations
- Purchase of equipment
- Capacity building and human resources development

To ensure that the mitigation measures in the ESMP are fully implemented, training and capacity building of personnel, and sensitisation on the issues are essential in addition to constant monitoring. Total cost of the ESMP implementation is indicated in below.

Estimated Cost of ESMP Implementation

Activity/Item	Budget ($US)
ESMP mitigation measures	170,000
Monitoring ESMP implementation	60,240
Environmental auditing	10,000
Capacity building	154,200
Total ESMP implementation Budget	**394,440**

CHAPTER 1: INTRODUCTION AND BACKGROUND

1.1 Brief Introduction to the Project

The National Environment Agency (NEA) has received some resources from the Global Environment Facility (GEF) under the four-year ***Enhancing Resilience of Vulnerable Coastal Areas and Communities to Climate Change Project***, part of which it intends to use to enhance the livelihoods of coastal communities vulnerable to the risks of climate change.

Given the economic importance of Gambia's coastal area (characterized by a rapidly growing population and expanding development of tourism and fisheries infrastructure, among others) the Government has not lost sight of the importance of preserving vital ecosystems for biodiversity, even beyond the profits from these key sectors that also depend on environmental conditions. The coastal area is subjected to degradation of its natural origin, and suffers extreme pressures from residents.

As the human population continues to increase along this area, sea level rises and coastal erosion accelerates, the need to understand the social and ecological consequences of protection in all its forms, on coastal ecosystems is increasingly urgent. By polluting, plundering and devastating the environment, the resident population aggravates the erosion and degradation of natural areas at risk. But in order to act effectively against the negative impacts of climate change, while benefiting from the opportunities it offers, Government has concluded that local communities living on the coast must now take full control of the situation in order to select and apply appropriate measures in terms of adaptation.

In this regard it plans to finance several pilot projects in different parts of the country (in collaboration with the local communities) including the construction of erosion control measures on the beach in the Senegambia and Kololi area in the West Coast Region (WCR). It is for this reason that NEA wishes to conduct an environmental and social impact assessment (ESIA) of this planned investment, which will be reviewed for approval by the Government before the project is implemented.

1.2 Objectives of the Report

1.2.1 Objectives of the Report

The rationale for carrying out an ESIA before the structures (i.e. revetments, offshore breakwaters and beach nourishment) are built at the two locations, it is essentially to evaluate the potential environmental and social risks and impacts at these selected sites.

The impact assessment process will examine ways to prevent, minimize, or mitigate adverse environmental impacts, and to enhance positive impacts throughout the implementation process. The general framework for the assessment and management of

environmental and social safeguards of development projects in the country is provided in the national laws.

The resultant Environmental and Social Management Plan (ESMP) will provide a structured guide to NEA and its partners in ensuring that their collective and individual commitment to preventing environmental degradation and social risks is achieved at all stages of implementation of the works. The Plan will ensure compliance with the relevant policies, including the Gambia Environment Action Plan (GEAP) and its attendant legal frameworks (NEMA, 1994; EIA Guidelines 1999; EIA Procedures 1999; and the recently adopted EIA Regulations, 2014. The Plan shall also indicate the roles and responsibilities of all the relevant stakeholders, with the NEA assuming the role of monitoring compliance with the recommendations in the ESMP, and in accordance with the various national environmental laws.

1.2.2 Approach and Study Methodology

1.2.2.1 Documentary Review

The approach used in developing this study report is a combination of literature review, interviews and field visits to the respective project sites. Literature reviewed included designs and proposals similar to this one which has provided much insight into the potential positive and negative impacts of such projects to enable predictions with reasonable accuracy of the potential impacts of the planned measures at Senegambia and Tanji Bridge

1.2.2.2 Field Assessment

Field trips to proposed sites were conducted, paying particular attention to the socio-economic, physical and environmental characteristics of the various sites, including their respective development-environment situation and relationships. The visits provided insights into the relationship among resources, resource users, institutions, as well as the socio-economic and cultural setting.

1.2.2.3 Stakeholder Consultations

Relevant stakeholders met included staff and representatives of the hotels most likely to be affected by the works (Senegambia Beach Hotel, Kairaba Beach Hotel, Holiday Beach Hotel, and Kololi Beach Club). Others included the village head of Tanji and members of the Village Development Committee (VDC), the proprietor of Nyanya's Bar and Restaurant (Madam Nyanya Gaye), and the manager of the Eco tourism Camp within the Tanji Bird Reserve, Ms. Haddy Jaw.

Other institutions and stakeholders who are expected to play major roles in the project were also consulted to determine their status of preparedness to implement the study recommendations. They included the NEA, Department of Parks and Wildlife Management (DPWM), National Roads Authority (NRA), Gambia Tourism Board (GTB), etc. Representatives of the informal/self-employed operators were also consulted as well as tourists and foreign visitors. A summary of the views and concerns raised during the consultations is in Table 15; the list of institutions and persons met is in Annex 2.

CHAPTER 2: POLICY, INSTITUTIONAL AND LEGAL FRAMEWORK

2.1. Applicable National Safeguard Policies

i. Gambia Environment Action Plan (GEAP) Phase II (2009- 2018)

The GEAP is the first integrated environment and natural resources management policy document of the Gambia. It provides the framework for environmental policy planning and natural resources management on a continuous basis. Now in its second phase (GEAP II -2009 -2018), GEAP Phase I was adopted in 1993 and implemented from 1994-2000.

It is far-reaching and ambitious, and highlights challenges associated with massive beach erosion threatening the tourist industry and related communication links, which are vital to the Gambian economy and livelihoods of coastal dependent communities.

The GEAP also recognizes the absence of a dedicated institutional structure for the sustainable management and protection of the coast and its resources. Lack of inadequate information on the dynamics of the area constitutes another important challenge for the management of the coastal zone.

To address the coastal challenges, the GEAP will put in place a process to establish an appropriate institutional framework that will be provided with strong legal backing for the regulation of this area.

ii. Agriculture and Natural Resources (ANR) Policy (2009-2015)

The Agriculture and Natural Resources (ANR) Policy (2009 – 2015) provides the agricultural and natural resource sector with a policy framework to chart the nature and scope of its interventions in poverty reduction, and achievement of the Millennium Development Goals (MDGs) of the country.

This wide-ranging policy guidance notes that '*Gambia has exceptional natural conditions which support a diverse fisheries resource base. Nourished by huge influxes of nutrients from the river, marine waters of the Gambia are rich in species (over 500 marine species) abundance and diversity. …….The fisheries sub sector therefore has the potential to contribute immensely to the social, economic and cultural advancement of the Gambia.'*

Noting the significance of mitigation in sea and river defense risk management, the policy also makes strong reference to the high rates of removal of mangroves and how this has resulted in the loss of not only the existing value of the tree but in addition, its functions of controlling salt intrusion from the sea.

iii. Fisheries Sector Policy (2009-2013)

The main objectives of the Fisheries Policy include an increase in fish supplies of at least 30 per cent over present levels to meet food security needs of the country, particularly the vulnerable populations; providing artisanal fisheries with appropriate advice; providing data and information on a continuous basis to improve policy, planning and investment in

productivity in the sector; and providing appropriate legislation, guidelines and practices with adequate monitoring.

However, of relevance to climate change, the policy recognises the need to protect wetlands and the coastal zone as habitat for other aquatic species. It also recognises the need for the management and protection of mangrove habitat for fish breeding, as well as coastal erosion control. This is where partnership and collaboration between the Departments of Fisheries, Forestry and Wildlife become crucial for ensuring the ecological integrity of the coast.

iv. The Wildlife Sector Policy and Strategy (2013)

The Wildlife Policy provides the vision for the sector for the next 20 years in accordance with the principle of maintaining environmental sustainability and socio-economic transformation as enshrined in Vision 2020. The Policy aims at increasing the proportion of protected areas to 10 per cent of national land territory in recognition that biodiversity resources are crucial as live-support systems for many Gambians, and the resources contribute significantly to the betterment of living standards of many communities.

In this regard a network of three national parks and four nature reserves, including the proposed Jokadu Protected Area, have so far been established bringing the total area under protection to over 41,000 ha. This area is likely to increase as the Gambia strives to further protect a wider spectrum of ecologically significant habitats, including the coastal zone as required in the Convention on Biological Diversity and the Ramsar Convention. Apart from rehabilitating wildlife habitats and sanctuaries, the establishment of a network of protected areas will significantly contribute to general environmental protection.

Additionally, the expansion of Protected Areas (PAs) including wetlands as a source of livelihoods for people and habitat for water birds and other aquatic animals is in line with the provisions of the Ramsar, Biodiversity and Bonn Conventions.

v. Forestry Policy (2006-16)

The current Forest Policy (2006-16) envisages that 30 per cent of the total land area should be covered by forests, including mangrove forests, to among other things control river bank erosion, and that 75 per cent of this should be sustainably managed either by communities or the state.

The Forest Act (1998) which is under review (the 2010 draft Forest Bill is still to be approved) considers the Gambian Forest Management Concept (GFMC) as the model management concept for the sustainable management of forest reserves. The model aims to provide a comprehensive framework for enhanced implementation of sustainable forest management through community forestry.

vi. The Gambia National Water Policy (2006)

Within the Gambian National Water Policy, national food security is a primary consideration and the Policy contains provision for balancing the available water with agricultural demand. The document is rigorous in relation to water resource management and clearly highlights the likelihood of future climate change-driven flood risks across the

Gambia River Basin; noting that some 20 per cent of the country's surface area comprises water, wetlands and tidal creeks.

The policy includes strong reference to both climate change and flooding, and clearly raises the issue that these will come more to the fore in the future in the face of climate change and sea level rise.

vii. National Adaptation Plan of Action (NAPA) on Climate Change (2007)

The NAPA is the Gambia's action plan for climate change adaptation. The plan provides a detailed description of the country from a biophysical perspective and includes fisheries, the sensitive nature of the mangrove ecosystems to climate change, as well as to arrange for water related adaptation challenges.

From all indications, the coastal zone is clearly recognized as being most vulnerable to climate change due to its high population density combined with sea level rise (SLR) predictions. Emphasis is placed on the complexity of separating natural variability from human influences in the coastal environment.

viii. The Local Government Policy

The Local Government policy creates the environment for the decentralization of institutional functions from the headquarters (in Banjul) to the regional setting; institutions such as the NEA have Regional Offices. NEA's Regional Offices are headed by Regional Environment Program Officers (REPOs) supported by Regional Environmental Inspectors (REIs), who oversee the implementation of the GEAP.

Other national institutions and NGOs equally have representatives at the regional level and together these groups of specialist institutions make up the Technical Advisory Committee (TAC)[1] to advice the Regional Governors on issues related to their respective institutions at the regional level.

The TAC has sub committees, including the ANR Sub-committee which, at the regional level effectively represents the EIA Working Group at the Region. At the district and village levels is the Multi-Disciplinary Facilitation Team (MDFT), and community-based groupings including the Village Development Committees (VDCs). In the implementation of the ESMP developed from this study, the ANR sub-committee in the WCR will be expected to effectively participate.

[1] The TAC comprises all the Ministerial and Departmental representatives at the Regional levels, each of them supervising the implementation of its departmental mandate. The TAC advises the Regional Governors on technical issues in the region and it has sub committees dealing with sectoral issues, one of which is the ANR subcommittee which effectively acts as the EIA Working Group at the Regional level. The REPO and REI service the ANR/EIA Working Group on environmental matters.

The Multi-Disciplinary Facilitation Team (MDFT) is a sub set of the TAC and comprises extension workers from similar line ministries as the TAC, and NGOs operating in the village or general area. Since they each represent a specific line Ministry in the village, they have specific sectoral knowledge or skills, and as a team they provide direct support and guidance to the community based organizations such as the Village Development Committees in the villages during the project cycle.

2.2 Related International Conventions and Agreements

The most important of these International Conventions and Agreements to which Gambia is Party that are relevant in this project are listed in **Table 1** below.

Table 1: International Agreements and Conventions Ratified by Gambia

AGREEMENT	FOCAL POINT	FOCUS AREA
UN Convention on Law of the Sea **(UNCLOS**)	Department of Fisheries	Fisheries and continental shelf
UN Convention on Biological Diversity **(UNCBD)**	Department of Parks and Wildlife Management (DPWM)	Biodiversity Conservation
Convention on Wetlands of International Importance (**RAMSAR Convention)**	DPWM	Wetlands
Convention on the Conservation of migratory Species of wild Animals **(CMS Convention)**	DPWM	Migratory species
UN Convention to Combat Desertification **(UNCCD)**	Department of Forestry	Desertification
UN Framework Convention on Climate Change (**UNFCC)**	Department of Water Resources	Climate change
Kyoto Protocol to the UN Convention on Climate Change **(Kyoto Protocol)**	Department of Water Resources	Climate change
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
Convention on the Prevention of Pollution from Ships **(MARPOL Convention)**	GPA	Marine pollution.

Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter from Ships. **(LONDON Dumping Convention)**	GPA	Marine waste dumping

2.2 The Institutional Framework

The following institutions are expected to play important roles in the implementation of this study recommendations:

i. Ministry of Environment, Water Resources, Climate Change, Forestry, and Wildlife (MEWRCFW)

The Ministry of Environment, Water Resources, Climate Change, Forestry, and Wildlife (MEWRCFW) is the oversight Ministry for the NEA, and it oversees implementation of the environment policies adopted by the NEMC. The Ministry is headed by the Minster who is supported by the Permanent Secretary and his staff.

Another important institution is the NEMC. Chaired by the President of the Republic it was created by NEMA as the main policy-making body for environment and natural resources management in the country, and it includes certain Cabinet Ministers as members, and others that the President may co-opt.[2] The Council oversees the implementation of the GEAP process under the coordination of the NEA. The Executive Director of the NEA serves as Secretary to the Council.

The NEMC is supported by the NEA through a Technical Advisory Committee and multi-sectoral Technical Working Groups (TWGs) which include the ANR and the Environmental Impact Assessment (EIA) Working Groups.

ii. The National Environment Agency (NEA)

The NEA is operating under MEWRCFW. Like the NEMC, it was created in 1993/94 as the implementing arm of the NEMC. NEA carries out the task of coordinating multi-and cross-sectoral environmental and natural resource management issues through the framework of networks and TWGs organized along programmatic lines. These TWGs have a consultative role only, mainly acting as “clearing houses” for the respective programs, ensuring coordination among the member organizations. They are also a conflict resolution forum, as well as for institutional policy harmonization.

They each have a broad membership base drawn from institutions with complementary mandates for environment and natural resource management. Memberships include Ministries, NGOs, and the private sector operators involved in the area of environmental

[2] The following Ministers are the NEMC members: Environment and Climate Change; Fisheries; Agriculture; Health and Social Welfare; Finance and Economic Affairs; Trade, Industry and Employment; Local Government and Lands.

[3] The following are some of the members of the ICZMWG: Fisheries; Technical Services and Infrastructure; Local Government and Lands. For the full list see Chapter 9.

management. There are eight Working Groups, including the Integrated Coastal Zone Management Working Group (ICZMWG), the Environment Impact Assessment (EIA) Working Group, etc.

NEA has other cross-sector Working Groups that advise it and other government departments on specific environmental and natural resources issues as per their respective mandates. These include, among others:

- The Environmental Quality Standards Working Group
- The Waste Management Working Group
- Environmental Legislation

iii. The Ministry of Local Government

Headed by the Permanent Secretary under the Minister, this institution oversees all the local government authorities in the country, including the Brikama Area Council where both projects are located. At the local decentralized level will be the TAC, which will be assisted by the ANR/EIA Sub Committee in the implementation of the project (see Chapter 2.1 (viii) for details).

iv. The Gambia Tourism Board

The Gambia Tourism Authority (GTA) was established in 2001 in accordance with the provision of the Gambia Tourism Authority Act. Now renamed Gambia Tourism Board (GTB) by the GTB Act, 2011, the institution is mandated with the responsibility of planning, managing and monitoring all aspects tourism policies and activities. In addition it is responsible for managing physical developments in the TDA, which was created exclusively for the development of hotels and other tourism facilities and infrastructure.

2.3. Applicable National Laws - Relevant Regulatory Framework

The following national laws and regulations will guide the implementation of these sub projects:

i. The National Environment Management Act (NEMA, (1994)

The NEMA, 1994 was promulgated as the primary legislation in environmental management, providing a structured institutional and legal framework for sound management of the environment and natural resources in the country.

The Act established the National Environment Management Council (NEMC) and the NEA. It empowers the NEA to instruct the seizure or closure of an activity which negatively affects the environment, and to carry out inspections, studies, and monitoring to ensure compliance with established environmental legislation and conventions. It establishes also the Technical Advisory Committee (TAC), the Technical Working Groups (TWG), and Local Environment Committees (LEC).

Specifically, Part V of NEMA provides for certain projects listed under Schedule A to be considered for environmental impact assessment. According to the EIA Procedures investment in the following seven sectors would trigger environmental assessments; these are large scale agriculture projects; infrastructure (roads); industry; large scale fisheries and aquaculture projects; mining; solid waste disposal; and tourism.

The exclusive responsibility for the management, control and regulation of the coastal zone is within the regulatory regime of NEA; NEMA contains special provisions regarding management of coastal zone, rivers and wetlands that empowers it to make regulations and guidelines for management of these areas. However, the regulations pertaining to these have still not been developed.

ii. Environmental Impact Assessment Regulations (EIARs), 2014

The EIA Regulations were passed in 2014 to elaborate on the requirements of Part V of NEMA including the EIA procedure, environmental impact statements, review of studies, decisions on applications for environmental approval, environmental monitoring and auditing of projects. There are also provisions on strategic environmental assessment of programs and policies, offences, appeals and delegations of powers.

Schedule B of these Regulations indicates that this Project falls under screening list Class A, meaning a full study is required, due to major changes in land use within 150m of the high water mark. Thus, this study and the resultant ESMP is in compliance to the EIA Regulations.

iii. Environmental Quality Standards Regulations (EQSR, 1999

The EQSR established an Environmental Quality Standards Board with the primary responsibility of proposing environmental quality standards to the NEMC, and to periodically review the standards. The standards set by this law apply to ambient air, saline waters, surface fresh waters, and groundwater.

iv. Environmental Discharge (Permitting) Regulations (EDPR), 2001

Pollution Control is established under part VIII of NEMA, and it prohibits the discharge of materials, substances and oil into the environment. It therefore provides for the formulation of the Environmental Management Discharge Permit Regulations. The EDPR require the registration of processes with the potential to pollute.

The purpose of the permitting system is to control discharges from industries and other establishments, including households operating or carrying out processes potentially harmful to the environment. NEA may refuse to issue permits to these processes to discharge their wastes if their potential to pollute could exceed the limits of the Environmental Quality Standards.

v. National Parks and Wildlife Bill, 2013

This legislation provides for the establishment, control and management of National Parks and Nature Reserves and other categories of Protected Areas (PAs). The legislation also provides for the conservation and enhancement of wildlife ecosystems, biodiversity, and of objects of aesthetic, pre- historic, historical, geological, archaeological and scientific interest in national parks and nature reserves.

vi. The Fisheries Act, 2007 and Fisheries Regulations, 2008

The Fisheries Act and its supporting Regulations provide national legislation and operational regulations for the conservation, management, sustainable utilisation and development of fisheries and aquaculture in the Gambia.

The Gambian fisheries sector will need to consider the ramifications of a changing climate including, the potential for a shift in commercial species composition as water temperature increases, and the climate proofing of fish landing and processing infrastructure in response to rising sea level.

vii. National Road Authority Act, 2007

The National Road Authority (NRA) Act established the NRA, which is responsible for the administration, control, construction and maintenance of all roads in the country. It also empowers NRA to develop, implement and update a road construction and maintenance management system for routine and periodic road construction activities.

It empowers the Authority to advise Government on all road and bridge matters. However, it is silent on coastal flood control and infrastructure protection.

viii. The Gambia Tourism Authority Act. No.9 of 2001

The Gambia Tourism Authority (GTA) Act was enacted to empower the Authority to be responsible for the Tourism Development Area (TDA) be it a piece of land, whether or not it is covered by water, historical monument, wildlife, forest or any other natural phenomenon, flora, fauna that has been declared by the President under section 58 of this Act to be reserved for the development of tourism.

The primary function of the Authority is to market Gambia as an attractive tourist destination, and to develop all aspects of the tourism industry in the country, including to develop and upgrade the TDA. According to the Act, the coastal zone and associated infrastructure, (fauna and flora), if declared a TDA, falls within the jurisdiction of the GTB.

However, as custodian of fish landing sites, the Department of Fisheries has authority over all fisheries centers located in the coastal area, including one hundred metres of the land on either side of the centers even though they are within the TDA.

ix. Local Government Act, 2002

This Act establishes five Administrative Regions and two Municipalities (Central River Region, Lower River Region, North Bank Region, Upper River Region, West Coast Region, City of Banjul and Kanifing Municipality). Each of the Regions has at least one Area Council with designated jurisdictions, which have very wide powers of regulation, supervision, inspection and management.

Specifically the Act makes provisions for decentralized administrative structures viz: i). the functions, powers and duties of local authorities; ii). development in the decentralized governments; iii). local government civil service, traditional authorities and the co-ordination of local government authorities. Part V of the Act establishes a Village Development Committee (VDC) for each village or cluster of villages.

The relevance of the Act to the coastal zone is in the area of geography and demography, which need to be taken into account in boundary demarcation. However, in the medium to long term, climate change induced sea level rise (SLR) has the potential to change the landmass of the Gambia, and this may therefore have a bearing on future local authority boundaries and the growth and distribution of economic centers.

x. Physical Planning and Development Control (PPDC) Act, (1990)

This Act provides the guiding legislation for national hierarchy of land use and development control planning in the country. It is worthy to note that the legislation pre-dates mainstream awareness of climate change and associated impacts from the sea and the River Gambia.

Consequently, efforts should be made to start reviewing the national land use planning and development control in relation to SLR, coastal erosion and flooding.

xi. The National Waste Management Bill (2007)

The National Waste Management Bill, drafted since 2007 is expected to address the implementation problems associated with waste pollution and management. The Waste Bill defines waste as follows:

- any substance which constitutes a scrap material or an effluent or other unwanted surplus substance arising from the application of any process
- any substance or article which requires to be disposed of as being broken, worn out, contaminated or otherwise spoiled
- anything which is discarded or otherwise dealt with as if it were waste shall be presumed to be waste unless the contrary is proved
- any substance or object, which is disposed of or is intended to be disposed of or is required to be disposed of

In view of the importance of this piece of legislation, it is strongly recommended that the Bill be passed as soon as possible in order to protect and safeguard the integrity of the environment.

CHAPTER 3: DESCRIPTION OF SUB PROJECTS

3.1 Senegambia/Kololi Beach

3.1.1 Project Location

Annex 1- Figure 1 shows the location of the project site. The Senegambia/Kololi Beach is a narrow strip of beach situated along the coastline between Kololi Point and Bald Cape in the Kombo North District of WCR. The specific project area is located along the beach front of Senegambia Beach Hotel, Kairaba Beach Hotel, Holiday Beach Hotel, and Kololi Beach Club within the Tourism Development Area (TDA). The area is also in close

proximity to the Bijilo Forest Park as well as a number of other tourism-related facilities such as Cabana Restaurant next to Senegambia Beach Hotel, and Swiss Tavern Restaurant next to the Kololi Beach Club.

In 2003, an extensive beach nourishment was carried out at this stretch of beach as part of the Coastal Protection Project. A total amount of 1 million m^3 of sand was supplied, creating an average level of +4.0m Gambian Datum (GD) over a length of approximately 1.5 km, starting from Kololi Point.

3.1.2 Project Objectives

The Coastal Protection Project mentioned above was the outcome of a comprehensive feasibility study carried out in 2000 along the Gambian coastline, aimed at outlining an appropriate protection strategy to mitigate the massive erosion (at certain locations erosion was at 2 meters per year) of the beach front from Banjul to Kololi Point. The study recommended nourishing this stretch of beach (extended the beach by about 70 meters); the protection measures were designed in such a way that no retreat of the coastline should occur in the protected area for a period of 25 years.

However, the nourishment gave rise to an unexpected accelerated erosion of the beach (about 20 meters per year), and after six years the entire volume of sand disappeared completely from the seafront of these hotels. In fact the shoreline retreat continued almost with the same rate as before the nourishment in 2003.

This Project's main objective therefore is to arrest the erosion, and to increase the adjacent beach so that the nearby hotels and other infrastructure of economic importance will be saved. The planned works are expected to achieve the following objectives:

i. Protect the hotel premises from erosion for the next 30 years

ii. Establish a stable beach (with a minimum width of 30m and a minimum height of 1.5m) in front of the hotels

iii. Maintain the beach width/height over a 30 year period with minimum maintenance costs

iv. Adapt the construction and function to a general sea level rise of 25cm expected to occur within the next 30 years

v. Reduce the visual obstruction from proposed structures to the sea to a minimum

vi. Secure safe bathing conditions

vii. Secure free passage along the beach

viii. Reduce impact at the adjacent beach stretches to a minimum

3.1.3 Sub Project Justification - Support to the Tourist Sector

The importance of this sub project essentially is to support the tourist industry, particularly as it relates to the beach (sand), sun, and the sea. The Gambia's tourism sector plays an important role in the country's economic development; it is the biggest foreign exchange earner after agriculture, and the second largest employer (see Annex 1- Figure 2).

Tourist arrivals in the country averaged 98,933 between 2009 and 2014, providing substantial foreign exchange earnings to the Gambian economy. The sector contributed approximately 17.7 per cent and 15 per cent of GDP in 2008 and 2011 respectively, (Euromonitor International, 2012). Annex 1- Figure 2 shows the annual tourist arrivals in the Gambia for the period 2009 to 2014. Over the period, tourist arrivals declined from 141,569 in 2009 to 94,297 in 2014 representing a decrease of 33 per cent with remarkable decline recorded in 2010 of 69,359 tourists also indicating a 51 per cent decline.

The sector is also a major factor in the job market, offering an alternative source of income generation, infrastructural development and investment attraction. It provided employment opportunities and created 89,000 jobs in 2008 (14.4 per cent of total employment, or 1 in every 6.9 jobs), and in 2011 created 73, 500 jobs, including those indirectly supported by the industry, representing 10.9 per cent of the total workforce.

In addition, the industry is expected to create at least 88,300 jobs annually by 2018, with its GDP growth expected to grow from -0.2per cent in 2008 to 3.7 per cent per annum.

3.1.4 Project Scope of Work, Components and Specifications

The scope of this sub project involves three different types of interventions viz:

i. Construction of four detached offshore breakwaters, each with a length of 80m (at the crest level)

ii. Building of a revetment to secure the beach and protect the shoreline

iii. Carrying out beach nourishment to reclaim part of the area lost, and to reduce further sand loss

3.1.4.1 The Offshore Breakwaters

Four detached offshore breakwaters are planned to be placed parallel to the shore in deeper water (at about 150m) from the shoreline. The main purpose of the offshore breakwaters is to reduce the rate of shoreline change or erosion by decreasing the wave energy reaching the shore through dissipation, refraction, or reflection of incoming waves. The conditions of lower wave energy created enhance the deposition of sediments in the lee of the structure creating beaches that may grow seaward and, in some cases, attach to the detached structure.

The Design

The design for the breakwaters proposes 3 layers of quarry rocks of minimum density of 2,650kg/m^3, namely an Amour layer, a Filter layer and internal area or Core. The core consists of quarry runs of diameter of 0.1m and average weight of 8kg per stone. The Filter

layer sandwiched by the core and Amour consist of rocks of average size and weight of 0.59m diameter and 600kg respectively. The external Amour layer consists of rocks of average diameter and weight of 1.17m and 4200kg respectively. The total amount of rocks required for the breakwaters are summarized below:

Amour Layer - 27, 100 m^3
Filter Layer - 34, 400 m^3
Core Layer - 17, 800 m^3

The breakwaters will be located 150m from mean sea level (MSL) in series, stretching from Kololi Beach Club to Senegambia Beach Hotel, a distance of about 1.2km**.** With a distance of 100m between each of them, they will be 150m long and 4m wide. Annex 1-Figure 3 shows the positions of the breakwaters and the revetment whilst Figure 4 shows the cross section of the breakwaters.

i. The Crest Level

The breakwaters are designed to have a crest level of +2.2m to ensure that currents generated by overtopping behind the breakwaters are less than 0.1m/s. This will also ensure that the currents behind the breakwaters will flow in a channel of roughly 1m deep and 2m wide.

As the overtopping at the breakwaters are higher during the design conditions, currents generated will not cause any erosion at the roundheads and the overtopping is therefore not a problem in the design case.

ii. Toe Stability

The nominal diameter of the Toe will be 0.54m (for the most shallow case). This is smaller than the filter stones and therefore ensures maximum toe stability. Considering the large toe of both filter and armour layer some flattening will not affect the stability of the breakwater. The nominal Diameter on the rear side is designed to be 0.5m with larger stone sizes to ensure stability on the rear side.

3.1.4.2 The Rock Revetment

The revetment will be made of large boulders (riprap) which are either placed in a distinct structural design, or simply piled up to a sufficient height. They are proposed to be built on the beach in front of the hotels behind the offshore breakwaters to provide additional protection for the adjacent areas from waves reaching the shoreline. The length of the revetment will measure 1,200m (Figure 3).

For the design of the revetment, it is assumed that the water level is +1m MSL and that the maximum wave height is 0.8m and a wave period of 14s. For a 5 year return period therefore, it is designed to have an armour density layer of 2650kg/m^3 and a slope of 1:1.5.

A crest level +3m MSL is chosen in order to reduce the overtopping to an acceptable level. The volumes of armour and filter stones needed for the revetment are listed in Table 2 below, whilst Figure 5 shows the cross section of the revetment.

Table 2: Volumes of Amour Required for the Revetment

	Revetment
Armour layer [m^3]	4,400
Core layer [m^3]	12,500
Sand fill [m^3]	23,000

Source: NIRAS Study, 2015

3.1.4.3 Beach Nourishment

As shown in Figure 5**,** both the front and back of the revetment will be nourished. Whilst the back will require only 23,000 m^3 of sand, 74,000 m^3 will be needed for the front**.** Over the entire stretch the nourishment will consist of widening or restoration by importing sand and spreading it over the site. The material will be taken from suitable burrows either from offshore or inland. The restored beach will, after reaching its equilibrium profile, have a minimum width of approximately 30 meters. However, from which ever source the materials come from the need for an EIA is of course obvious.

3.1.5. Project Main Activities

Table 3: Project Main Activities at Senegambia/Kololi Beach

No.	Main Activities	Objectives
Site Preparation Phase for Breakwaters, Revetment and Nourishment		
1	Site clearance: use of heavy-duty equipment and machinery; removal of old and ruptured sand bags, concrete blocks; demolish sea wall; removal of coconut trees and other vegetation, etc.	To clear the area and prepare ground for construction work to begin
2	Transport debris and waste to waste dump site	To clear the work area and manage generated waste
Mobilization, Equipment and Material Transportation		
1	Locate Camp site	To be the base for the works (consisting of offices, stores, toilets, etc.)
2	Transport of material for stockpiling (basalt boulders, aggregates), equipment and heavy machinery to work site	Stockpiling of materials for easy access and movement to construction site
Construction Phase		
The Breakwaters		
1	Excavation; placement of rocks;	To prepare the bed to receive the base of the breakwaters
2	Excavation; placement of sand fill by tipper trucks from land quarries, etc.	To prepare the bed to receive the base of the breakwaters

3	Concrete mixing, etc.	To provide the required strength to hold the boulders and aggregates together
Revetment		
1	Excavation; placement of sand fill by tipper trucks from land quarries	To prepare the bed to receive the base of the revetment
2	Transport of material and aggregates), equipment to site the beach side	Stockpiling of materials for easy access and movement to construction site
Beach Nourishment		
1	Placement of sand fill by tipper trucks from land quarries, or dredgers from sea etc.	To create a beach both in front and behind the revetment
Operational Phase – Mainly Routine Monitoring and Maintenance		
Breakwaters		
1	Inspections: the structural state of the protection works: "above water inspection;" "walk over survey"	To evaluate the effectiveness of the breakwaters, in order to take timely actions in case of unwanted developments
2	Inspections: environmental loading conditions - water levels, currents, wave climate, wind climate, rain, live loads, external loading of the structure, wave run-up, etc. The effect of the structure on the environment, bathymetry, topography, etc. Visual observations of the shoreline by means of walk over surveys Topographic survey of the dry beach Bathymetric survey of the wet beach and foreshore	To evaluate the effectiveness of the breakwaters in order to take timely actions in case of unwanted developments
Revetment		
1	Inspections**:** the structural state of the protection works: "above water inspection;" "walk over survey"	To evaluate the effectiveness of the revetment, and to monitor the shoreline development in order to take timely actions in case of unwanted developments
	Inspections: water level, current, wave climate, wind climate, rain, live loads, external loading of the structure,	To evaluate the effectiveness of the revetment, and to monitor the shoreline development in order to take timely actions in case of unwanted developments

	differential head, wave run-up, etc.; Internal response of the protection (structure), pore pressures, accelerations, soil stress, etc. The effect of the structure on environment, topography, etc. Visual observations of the shoreline by means of walk over surveys Topographic survey of the dry beach Bathymetric survey of the wet beach and foreshore	
Nourishment		
1	Inspections: Visual observations of the shoreline by means of walk over surveys Topographic survey of the dry beach Bathymetric survey of the wet beach and foreshore	To evaluate the effectiveness of the nourishment, and to monitor the shoreline development in order to take timely actions in case of unwanted developments

3.2 The Tanji Bridge Area

3.2.1 Project Location

Tanji is situated along the coastline between Bald Cape and Solifor Point. The area is in the Kombo South District of WCR, it and falls within the TDA. The project location is at the mouth of the Tanji River, which is in close proximity to Tanji village, the Tanji Bird Reserve, as well as the Tanji Fish Landing Site. The site is accessible through the main Kombo Coastal highway. Figure 6 in Annex 1 shows the location of the site.

3.2.2 Project Objectives

The main objective of this sub project is to protect the coastal high way from being destroyed due to the erosion of the adjacent river bank, which is close by. The coastal morphology of the mouth of the Tanji River is in dynamic equilibrium with the wave induced longshore sediment transport from south and north and the sediments brought to the area

by the river run off. Reefs and shoals are found some hundred metres north and south of the river mouth. The river mouth swings back and forth between these two shoals, depending on which wave direction is dominating either the southerly or northerly.

In 2011 the river mouth was located in the middle of the shoals, and in January 2014 it had moved northwards. This trend causes serious erosion north of the bridge. The Tanji River has a catchment area of 145 km^2 and a total sediment supply to the coast of 10-30,000 m^3/yr. rendering the area west of the bridge liable to flooding.

A nearby Restaurant also, is located right next to the Tanji Bridge; it has been experiencing massive erosion of its beach front after the earlier coastal protection works were carried out in 2003. In addition the works also aim to adapt the construction and function to a general sea level rise of 25cm, expected to occur within the next 25 - 30 years.

3.2.3 Sub Project Justification – Protection of the Coastal Highway

This highway is the most important road linking the coastal communities in Kombo South to major urban centers such as Serekunda, Brikama, and indeed the capital city, Banjul. The road has greatly improved communication between Banjul and the coastal areas in the South, and will initiate a rapid development in tourist facilities in these areas.

The Tanji River bank is eroding, advancing towards a certain section of this main road, where the most critically eroded point was only a meter away from a NAWEC electricity pole before restoration works were carried out by NEA/NRA/NDMA. (Photographs of threatened NAWEC pole and water pipe are figures 7 & 8 respectively).This pole connects the power supply grid from Kotu Power Station to the other parts of Kombo South. In addition the main water pipe is located right opposite the point of erosion, and needs to be protected.

Because of the social and economic importance of various activities and facilities located along this coastal highway (fishing, fuel stations, tourism related facilities, private residences, etc.), Government is determined that the erosion threatening the road should be controlled. Specifically, there are five fisheries centers located along this highway from Tanji, where fishing activities take place, and their contribution to the national economy is important.

The fisheries sector is a critical entry point for poverty alleviation, providing a source of revenue and foreign exchange earnings for the country, and also contributes importantly to food and livelihood security, particularly for the poor. The sector is the third largest food provider - after agriculture and livestock - and plays a significant role from a nutritional standpoint, being the main supplier of animal protein in the diets of most Gambians. Fisheries and related activities (processing and marketing) also provide income to the poor: fish-related activities represent an important source of income for coastal fishing communities, and are an important complement activity (and safety net) for rural communities inland.

3.2.4 Project Scope of Work

In the Tanji Bridge area, two problems have been identified. The first is the erosion of the riverbank that is approaching the highway, whilst the second is the flooding along the river bend right after the two bridges (on the seaward side).

Thus, the following interventions listed below are proposed to address the above problems:

iii) Constructing a 70m long revetment to protect the river bank, and thus prevent the erosion that threatens the highway

iv) Building a dike to address the flooding along the river bend right after the two bridges

3.2.5 Components and Specifications

As shown in Annex 1- Figure 9 the revetment is to protect the river bank from further erosion and thereby securing the highway; the dike is to secure the river bend and the nearby properties from being flooded, especially during heavy rain. The revetment is built next to the main channel, so the river maintains its current shape. Furthermore, it should prevent the river from making a new bend that in time, will reach the highway.

The dike (also shown in Figure 9) starts at the present highway bridge and stops once the level of the surrounding area reaches level 1.5m. This will ensure that the area behind the dike is not flooded especially in case of a water level of up to 1.5m, which is the level where the area, between the present river channel and sea, will be liable to flooding.

3.2.5.1 The Revetment

The design of the revetment ensures that the finer material is not washed away through the armour layer. If the river bank consists of very fine material a geotextile could be needed to secure the river bank from being washed through the filter and armour layers; (the cross section of the revetment is shown in Figure 10, Annex 1). The filter layer is extended under the armour layer to secure the armour stones from sinking into the river bed.

Table 4 lists the design requirements for the revetment. The filter layer is also designed to ensure that fine material is not transported through the revetment. The toe of the revetment is constructed with the same size stones as the revetment itself to secure the stability of the toe. Furthermore, the toe is extended up to 2m so that any deformation to the toe due to erosion does not affect the stability of the revetment.

Table 4: Design Requirements for the Revetment

	Revetment	Dike
M_{a50} [kg] (armour)	58	58
M_{f50} [kg] (filter)	2	2
M_{c50} [kg] (core)	-	Clay
$d_{a,n50}$ [m] (armour)	0.28	0.28
$d_{f,n50}$ [m] (filter)	0.09	0.09

$d_{c,n50}$ [m] (core)	-	< 2 · 10−6
Crest level [m WGS84]	1.5	1.8
slope [-]	1:1.5	1:1.5
Length[m]	70	110

Source: NIRAS Study, 2015

Note: Stone sizes. $Ma50$ and $Mf50$ is the weight for the stones in the armour layer and filter layer, respectively. $Da,50$ and $Df,n50$ is the nominal diameter for the stones in the armour layer and filter layer, respectively.

The stone gradations for the filter layers must fulfil the requirements listed in Table 5.

Table 5: The Requirements for the Stone Gradation for the Revetment and Dike

	Revetment		
	$D_{n,15}$ [m]	$D_{n,50}$ [m]	$D_{n,85}$ [m]
Armour layer	0.22	0.28	0.35
Filter layer	0.0045	0.07	0.125

Source: NIRAS Study, 2015

3.2.5.2 The Dike

The cross section of the dike is shown in Figure 11, Annex 1. The size of the armour and filter stones are determined in the same way as for the revetment. The dike however needs an impermeable core made from clay to ensure that water does not penetrate through the dike.

The top level of the dike is set to 1.8m. This is the level of the core, so that no flooding will take place behind the dike for water levels lower than this. For water levels above 1.5m the water will start to flow over the area between the sea and the river channel, indicating that a crest level of 1.8 m is high enough. Again the toe is extended to secure the stability of the construction. Table 5 above lists the key parameters for the Dike as well as the revetment.

3.2.6 The Project Main Activities

Table 6: Project Main Activities for Tanji Revetment and Dike

No.	**Main Activities**	**Objectives**
Site Preparation Phase for Tanji Revetment and Dike		
1	Site clearance using heavy-duty equipment and machinery; removal of vegetation and concrete	To clear the area and prepare ground for construction work to begin
2	Transport debris and waste to dump site	To clear the work area and manage generate waste
Mobilization, Equipment and Material Transportation		
1	Locate Camp site	To be the base for the works (consisting of offices, stores, toilets, etc.)

2	Transport of material (basalt boulders and aggregates), equipment to site by the road side	Stockpiling of materials for easy access and movement to construction site
Construction Phase		
Revetment		
1	Excavation; placement of rocks	To prepare the bed to receive the base of the revetment
2	Excavation; placement of sand fill by tipper trucks from land quarries	To prepare the bed to receive the base of the revetment
3	Mixing of concrete/aggregates	To provide the required strength to hold the boulders and aggregates together
Dike		
1	Excavation; placement of rocks	To prepare the bed to receive the base of the dike
2	Excavation; placement of sand fill by tipper trucks from land quarries	To prepare the bed to receive the base of the dike
3	Mixing of concrete/aggregates	To provide the required strength to hold the boulders and aggregates together
Operational Phase - Mainly Routine Monitoring and Maintenance		
Revetment		
1	Inspections: the structural state of the protection works: “above water inspection;” “walk over survey”	To evaluate the effectiveness of the revetment in order to take timely actions in case of unwanted developments
2	Inspect: environmental loading conditions - water levels, currents, wave climate, wind climate, rain, live loads, external loading of the structure, wave run-up, etc. The effect of the structure on the environment, bathymetry, topography, etc. Visual observations of the shore line by means of walk over surveys Topographic survey of the dry beach Bathymetric survey of the wet beach and foreshore	To evaluate the effectiveness of the revetment in order to take timely actions in case of unwanted developments
Dike		

1	Inspections: the structural state of the protection works: "above water inspection;" "walk over survey"	To evaluate the effectiveness of the dike in order to take timely actions in case of unwanted developments
2	Inspections: environmental loading conditions - water levels, currents, wave climate, wind climate, rain, live loads, external loading of the structure, wave run-up, etc. The effect of the structure on the environment, bathymetry, topography, etc. Visual observations of the shore line by means of walk over surveys Topographic survey of the dry beach Bathymetric survey of the wet beach and foreshore	To evaluate the effectiveness of the dike in order to take timely actions in case of unwanted developments

CHAPTER 4: THE ENVIRONMENTAL BASELINE CONDITIONS

4.1 Senegambia/Kololi Beach

4.1.1 The Physical Environment

4.1.1.1 Topography

Typical ground levels in in the Senegambia/Kololi area range between 4m Gambian Datum (GD) along the beach to 20m along the Bertil Harding Highway. This explains why storm water run-offs have currently caused serious erosion along the slopes leading to the beach as evidenced by the gullies that have been created, following the slope towards the sea. Figure 12 shows one next to Galaxy Entertainment Park.

However, most of the hotels and other facilities within the TDA (including the Senegambia/Kololi Area) are built above the future flood risk level of 2.2m GD. Despite this however, the general area remains highly vulnerable to erosion, the impacts of which are clearly visible.

4.1.1.2 Geology

The surface geology of the Gambia is entirely Upper Tertiary and Quaternary. The Upper Tertiary consists of the Continental Terminal Series (CTS), which is an undifferentiated complex of Oligocene, Miocene and Pliocene age. The CTS, with a thickness of 100 to 200m, is composed of poorly consolidated sandstone, argillaceous sandstone and clay stone, showing lateral discontinuity. This unit is dissected by rivers, and locally covered by Quaternary and Holocene sediments of fluviatile and marine origin.

During the Early Pleistocene the CTS was affected by profound lateralisation, causing the so-called Ironstone Crust. This crust often tops hills and plateaux in the Eastern and Central part of the country. In the western part of the country laterite occurs near the surface. The laterite along the coast can be distinguished from the Iron Crust Formation in the eastern part of the country on several characteristics. The laterite at the coast is softer, less dense, contains significant quantities of kaolin clay and includes more quartz grains.

Outcrops of laterite can be found at several locations along the coastline, such as at Bakau and Fajara. Here it is responsible for the presence of coastal escarpments. The capes and hard points, found further south along the coast, also owe their existence to the presence of laterite rock at or near the present sea level.

The coastal wetlands (the River Gambia and its estuary plus other coastal rivers) consist of Pleistocene and Holocene formations. These include the Pleistocene alluvium of undivided sand, silt and clay, and the Holocene marine fluvial (typically of the River Gambia estuary) of undivided sand silt, clay salt and organic deposits.

The present coastline consists of the Coastal Beach Complex, including the surf zone and older raised beaches that lie behind the present beach. The deposits are of Holocene age and consist predominantly of fine to medium fine sands, with significant amounts of heavy minerals (ilmenite, ritual and zircon).

4.1.1.3 Climatic Conditions

The Gambia's climate is of the Sudano-Sahelian type and is characterized by two distinct seasons: a short and hot rainy season from June to October and a long dry season from November to May. Much of the summer rainfall comes as severe storms from July to September, causing localized flooding and erosion of drainage channels.

4.1.1.4 Rainfall, Humidity and Temperature

Tables 7 – 9 indicate the monthly and yearly mean rainfall, temperature and humidity respectively over a ten year period recorded at Yundum, the closest national metrological station (the only place where these data can be recorded) to the proposed project sites.

It will be important to note here that the two project sites are about 12km away from each other; that climate data recordings are not reflected separately for each of them, but rather the available data refers to the entire area served by the Met Office at Yundum. Consequently these Tables will not be repeated under sub 4.2, (Tanji).

Table 7: Monthly Mean Rainfall (mm) – Yundum WCR

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly Mean
2005	0	6.6	0	0	1.1	72.5	199.2	324	307.1	127.3	0	0	148.3
2006	0	1	0	0	0	43.3	136.4	420.7	327.5	28.5	0	0	159.6
2007	0	0	0	0	5.9	14.8	180.7	263.5	283.5	17.6	0	0	127.7
2008	0	0	0	0	0	82.2	419.7	477.9	223.8	119.4	0	0	264.6
2009	0	0	0	0	45.4	361.6	654.2	277.5	71.4	8.6	0	0	236.5
2010	0	0	0	0	0	52.8	232.1	258.1	618.3	41.7	1	0	200.7
2011	0	0	0	0	0	43.4	112.4	373.1	276.2	75.9	0	0	176.2
2012	0	0	0	0	40.7	134.7	326.6	368.6	438	65.5	8.5	0	197.5
2013	0	0	0	0	0.2	17.7	118.1	651.4	179.2	55.8	0	0	170.4
2014	0	0	0	0	4.3	26.1	68.8	358.3	126.3	29.8	0	0	102.3

Source: DWR, 2015

The rainy season in the Gambia is from June to October, although small precipitations do occur outside these months (mostly in the month of May in the last decade) when as much as 45 mm and 40 mm were recorded in 2009 and 2012 respectively (Table 7).

Annual mean rainfall over the last decade has shown a decreasing trend, ranging from a high of 264.6 mm in 2008 to a low of 102 in 2014. July to October exhibits the highest humidity level which coincides with the rainy season, when humidity reached 91 per cent in September 2010. In this period the lowest humidity (see Table 8) was recorded in January 2014 (66 per cent was the lowest mean annual humidity level recorded in 2006 and 2014).

- **Humidity**

Table 8: Monthly Mean Relative Humidity (%) – Yundum WCR

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly Mean
2005	48	51	59	68	72	74	84	87	86	85	71	62	71
2006	46	49	58	71	70	75	84	88	87	82	71	49	69
2007	46	48	45	66	68	74	77	86	88	79	63	51	66
2008	40	55	65	72	69	77	87	88	87	83	69	54	71
2009	44	57	62	63	73	76	84	89	90	85	69	60	71
2010	53	61	60	68	72	75	84	88	91	84	70	71	73
2011	57	43	58	65	72	75	81	88	85	82	70	50	69
2012	48	51	55	64	71	76	82	87	87	83	70	56	69

2013	48	50	64	58	70	75	81	90	86	83	70	60	70
2014	50	39	57	57	73	74	78	85	86	81	62	47	66

Source: DWR, 2015

- **Temperature**

Temperature varies very little throughout the year, but December, January and February recorded the coolest periods over the last decade, with the highest levels recorded during the rainy season (June to October), (see Table 9).

Table 9: Monthly Mean Temperatures (ºC) Yundum WCR

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly Mean
2005	25.8	25.7	28.1	26.8	29	29.3	27.6	27.9	27.8	28	27	26.9	27.5
2006	24.6	25.8	27.2	26.3	26.6	28.6	28	27.4	27.2	28.1	27.4	25	26.9
2007	25.2	27.1	28	26.4	27.3	27.7	27.8	27.2	27	28	27.4	25.3	27.0
2008	25	26.8	26.8	26.4	27.7	28.3	27.1	27.1	27.6	27.7	27.3	25.6	27.0
2009	23.5	24.2	24.8	26.5	27.1	28.4	27.8	27.2	27.6	28.4	26.3	25.5	26.4
2010	25.5	26.9	28.3	27.2	28.5	29.1	27.6	27.6	27.3	28.2	27.7	26.5	27.5
2011	25.5	26.2	26.2	26.8	26.6	28.6	30.4	27.5	28.2	28.3	26.8	25.1	27.2
2012	25.4	25.7	27.6	26.7	27.5	28.2	26.8	27.2	27.1	28	27.8	24.7	26.9
2013	24.3	27.2	26.5	25.3	27.7	28.2	28	26.7	27.6	27.8	26.8	25	26.8
2014	25.3	25.6	26.1	26.2	26.3	29.1	29	27.6	27.8	28.5	26.2	25.9	27.0

Source: DWR, 2015

4.1.1.5 Potential Impact of Climate Change on the Proposed Project Interventions

It will be important to note that, according to the NIRAS Study report, the approach and design employed in these works are expected to be able to protect the facilities at both the Senegambia/Kololi and Tanji Bridge for at least 30 years. The design is expected to adapt the construction and function of the facilities to a general sea level rise of 25cm, expected to occur within this period.

Table 10 however seems to ask for vigilance on the part of those institutions mandated to manage the coastal area of the country because the above predicted scenario could be offset or jeopardized by the behaviors of a suite of meteorological parameters (particularly the parameters with asterisks within the context of these works) over the next 30 years.

It would be added quickly that climate prediction modeling is not essentially an exact science, and that any number of variables could behave contrary to the predicted scenario and thus the unexpected happens.

Be that as it may, it is important that the erosion control measures should be constantly monitored and adjusted appropriately, taking into account the behavior of these parameters due to climate change.

Table 10: Historical and Projected Climate Change Assessments for a Suite of Meteorological Parameters from a Variety of Sources (increasing trajectory ↑; decreasing trajectory ↓)

Climate Change Parameter	Projection	Assessments
Average annual and seasonal temperature	↑	Air temperatures in Africa increased by more than 0.5^{o}C during last 50 – 100 years over most parts of Africa… Over West Africa and the Sahel near surface temperatures have increased over the last 50 years. (IPCC-AR5) Increase of 0.5 – 0.8 ^{o}C between 1970 and 2010 in West Africa (IPCC-AR5) Increase of 0.40 – 0.67^{o}C per decade (Basse and Yundum respectively, NAPA, 2007) Temperatures in Africa are projected to rise faster than the global average increase during the 21st Century… However, in the tropics, especially tropical West Africa, these unprecedented climates are projected to occur one to two decades earlier than the global average because the relatively small natural climate variability in this region generates narrow climate bounds that can be easily surpassed by relatively small climate changes. (IPCC-AR5) Ensemble-mean changes in mean annual temperature exceed 2°C - 4°C above the late-20th-century baseline over most land areas of the continent in the mid- 21st-Century…..in West Africa an increase of 3-6°C is expected from late 20th Century baseline by end of 21st Century (IPCC-AR5).

Periods of high max/min temperatures	↑	Increase summer temperatures (~3 – 6^{o}C) (IPCC-AR4). Cold days and cold nights decreased in West Africa (IPCC-AR5)
Mean annual rainfall*	↓	Decline in mean annual rainfall. Additional 35% decline for next century (BA NAFAA, 2012)
Seasonal mean rainfall totals*	↓	Average summer rainfall of less than 800mm has increased 36% in 1965 to 93% of the country (NAPA, 2007). Greater inter-annual fluctuation (ICAM, 2007)
Days of heavy rainfall*	↑	Periods of rainfall have created increasingly numerous flood events (NAPA, 2007) (Potential impact at Galaxy and Nyanya's Beach Bar and Restaurant)
Storm events*	↑	Increase in tropical cyclones in Africa (IPCC-AR4) Regional model studies suggest an increase in the number of extreme rainfall days over West Africa and the Sahel during May and July with low to medium confidence (IPCC-AR5) – (phenomenon as above)
Dry periods more than 5 days	↑	Breaks in rainfall more than one week become frequent (ICAM, 2007) More frequent droughts (IPCC-AR4)
Annual average total soil moisture	↓	Increased evapotranspiration and reduced rainfall desiccate soil (BA NAFAA, 2012)
Annual runoff*	↑	Linked to storms and intense rain events (which can impact Galaxy area and Nyanya's)
Wave regime*	↑	Linked to storm events (above). Wind predictions for West Africa remain limited.
Sea surface temperature	↑	Medium confidence that the mean sea surface temperature mean of 2016-2035 will be 0.3-0.7°C above the mean of 1986-2005 (IPCC-AR5??)
Sea level rise*	↑	0.35m by 2050 (Brown et al. 2011) 18 – 59cm between 1990 to 2100 (IPCC-AR4)

		The AR5 report significantly increased projected sea level rise over the next century, due to new research that improves understanding of ice sheet movement and melting. The new projections show an increase of 0.26-0.55 meters by 2100 under a low emissions scenario and 0.52-0.98 meters under the high emissions scenario (IPCC-AR5). (This is relevant not only for the proposed works but indeed for the entire coastal area
CO_2 level in sea water	↑	Increase from present 350 ppm to 450 ppm or greatly higher by 2100 (IPCC-AR5).

Adapted from: Applied Coastal Vulnerability Assessment Study, 2015

4.1.1.6 Drainage in the Senegambia/Kololi Area

The general area along the Bertil Harding Highway of the Senegambia/Kololi area near Lamtoro Clinic, is prone to receiving heavy storm water and run-off during the rainy season, which leads to erosion of landward areas (starting near the highway), and channelization and eventually erosion on the beach. This does not only pose a hazard or danger to people, but also a serious threat to adjacent properties.

A gully has been created next to the wall of the Galaxy Entertainment Park (Figure 12) by the storm water that arises from around the highway and the village of Kololi. The gully is about 0.5m wide, and 1m deep at its beginning, and gets progressively wider and deeper as it slopes downwards towards the beach. Along its path it scours the edge of Galaxy's fence, and erodes the ground on which three rhun palms are standing putting them at risk of falling.

It is also observed that a number of properties (including the Galaxy) empty waste water as well as storm water into the gully through pipes from their properties. This practice tends to increase the rate of erosion of the gully, thereby worsening the damage caused. Other features (including a NAWEC power Pole Number LTS 1.5) are particularly threatened.

At its end, the path of the flood waters splits into three smaller gullies at the foot of Cabana Restaurant, one passing to the south of the restaurant towards the exit point of the storm water outfall of Senegambia Beach Hotel, to empty into the sea. Another gully is immediately to the north of Cabana Restaurant, but this cannot proceed to the beach because of the sand dune in its path. From this point, the gully runs still further north of Cabana towards two restaurants (one unfinished, and the newly finished "Sizla" Restaurant). These Restaurants have had to build foot bridges over the gully to access the properties.

Parallel to the flow of the gully is an underground waste piping believed to be waste water from the Oasis Plaza which empties into the main TDA sewage treatment Plant. Further

erosion by the gully may undermine and destroy this pipeline thereby causing an environmental problem in the area.

The damage currently caused by storm water arising from the higher grounds in Kololi may be further compounded by the headquarters of the GTB currently under construction right next to the path of the flood waters. This structure could obstruct the course of the run-off to divert its course, and in the process accelerate the speed of the water flow resulting in:

i) Impacting the building itself

ii) Damage to the general environment, and eventually the beach further down the slope

The building is understood to include an underground parking, which could be susceptible to flooding by storm water during the rains, putting the building itself at risk.

Even though this is outside the scope of the TORs for this assignment, but due to the potential environmental implications, it is hoped that the contractors are aware of this possibility, and would take the necessary precautions. An EIA study would be in order in this case.

4.1.1.7 Status of the Beach Front of the Targeted Hotels

In 2003/4 Government undertook an extensive coastal protection work along certain sections of the coast; these included, from Cape Point to Banjul Point; immediately east of the Bakau fish landing site; and at Kololi Point. At the Kololi Point an unprotected beach nourishment (approximately 1,000,000 m^3 of sand) was carried out, and as mentioned earlier, all the sand that was supplied onto this stretch disappeared in six years. The current planned works are designed for the same Kololi Point, aimed to protect the beach fronts of Senegambia Beach Hotel, the Kairaba and Kololi Beach Club, next to the Bijilo Forest Park and the Swiss Tavern Restaurant.

It is important to note that all these hotels have employed various ways and means to protect their respective beachfronts; the following is a brief description of the state of these beach fronts to day.

i). Senegambia Beach Hotel

To protect this hotel's beach front numerous sand bags (Figure 13) were used over the years, and they have been by and large ineffective; most of them have disappeared into the sea or buried into the ground, and the erosion is still continuing to within 10-15 meters from the hotel's fence. It is within this small beach space now left, where the beach shades are erected for the tourists to sit under.

Most of the sand bags have been torn open discharging their contents, and bits and pieces of the bags strewn all over the place dangerously; at high tide the bags are submerged, and hazardous for anyone trying to access the sea to swim, and during low water they are exposed, yet again hazardous to beach users as well as being unsightly.

ii). The Exit Point of Senegambia's Storm Water

Figure 14 shows the discharge point of the storm water drain from inside Senegambia Hotel. The water flows through the metal grill gate onto a concrete floor from where it scours the edged of the ditch to empty onto the beach area next to Cabana Restaurant. This discharge point poses a potential negative impact on the proposed revetment (expected to be constructed about 10-20 metres from the discharge point) towards the sea. However, according to the design drainage pipes will convey the storm water from all four hotels through the revetment, and out into the sea.

iii). The Kairaba Beach Hotel

To protect its investment from the eroding beach, Kairaba Beach Hotel built a sea wall stretching the entire length of its beach frontage, jutting out about 3 meters into the sea from the low water mark (Figure 15). The height of the wall is about 1.5-2m, built between the sea and what is left of its beach front. Behind the wall towards the hotel, there is hardly any beach

iv). Holiday Beach Club Hotel

The frontage of Holiday Beach Club is practically devoid of any beach space. The frontage of the building has collapsed totally (Figure 16); even the juice bars and fruit seller's stalls are sitting perilously on the edge of the eroded beach, the roots of the nearby trees clearly exposed and hanging over the edges of the sand cliff, only a few meters from the fence of the hotel (Figure 17).

This hotel ostensibly used concrete boulders and pillars to protect its frontage from the advancing sea. These were in ineffective as the front part of the buildings close to the beach has collapsed completely, and the debris is scattered under the cliff. Currently there is nothing between the sea and the collapsed structures.

v). Kololi Beach Club

Like the other establishments, this hotel too has had its beach totally eroded to the extent that even the coconut trees have fallen over onto the beach (Figure 18). It is reported that the two front rows of coconut trees have both been washed into the sea. What appears to be metal stumps are clearly visible above the ground on the beach arranged in three parallel rows extending towards the sea (Figure 19) posing a potential hazard to people walking on the beach. This are the remnants of the foot bridge that tourists used to get into the sea.

4.1.1.8 Health

Health care in the Gambia is delivered at government dispensaries and hospitals, approved non-governmental dispensaries, registered private clinics and hospitals, and by traditional healers. The number of inhabitants per health professional in the country is indicated in Table 11 below.

In relatively close proximity to the two proposed project sites are the following health facilities. These can be accessed in the event of accidents on sites during and project implementation.

Table 11: Health Human Resources Situation As at 2013

Health Professional	Per 1000	Per 10,000
Medical Doctor	0.1	1
Registered Nurse	0.11	1
Registered Nurse Midwife	0.12	1

Source: (Health Strategic Plan 2014-2020)

Table 12: List of Health Facilities

Hospital	Major Health Centers	Minor Health Center	Community Owned	Private Clinic	NGO Clinic	Services Clinics	Main Clinics
Jammeh Foundation for Peace**	Faji Kunda**	Serekunda Health Center**	Old Jeshwang**	West Field Clinic**	Gam. Fam. Planning Assoc. Kanifing**	Fire Service	Leman St. Clinic**
Sere Kunda General Hospital**		Bakau Health Center**	New Jeshwang**	ASB Clinic?	SOS Clinic*	Barracks Clinic	Polyclinic**
SZRECC**		Brufut Health*	Sinchu Baliya**	Ibn Seena*?	Bafrow**	State Guard Clinic**	
EFSTH**		Banjulnding Health Center**	New Yundum**	Mbowen**		Yundum Barrack**	
		Sukuta Health Center*	Mandinary**	Sharab*			
			Kubuneh**	Pakala Clinic**			
			Wellingera**	Kololi Clinic*			
				Ahmadiya**			
				Lamtoro Clinic*			
				Bijilo Clinic*			
				Africmed Clinic*			

Note: * = Health facilities closer to either of the two Project sites
** = Health Facilities more removed from either of the sites

4.1.2 The Biological Environment

4.1.2.1 Coastal Wetland Ecosystem

In the Gambia today, the tourist industry essentially depends on the coastal wetland area, where the main holiday resort areas are on a 10.5km band of beach whose locations are along the coast facing the Atlantic Ocean. This is the area where tourist hotels are located, including the ones that fall within the scope of this project. This area is also extremely important, and as a wetland, among the most productive ecosystems in the country; more than half of the commercially harvested fish in the country depend on the estuaries and nearby coastal waters at some stage in their life cycle. These coastal habitats provide spawning grounds, nurseries, shelter, and food for finfish, shellfish, birds, and other wildlife.

The nation's coastal resources also provide resting, feeding, and breeding habitat for both resident and migratory birds, as evidenced within two of the country's protected areas situated along this coastal area (Bijilo Forest Park and the TBR). These wetlands can also buffer the coastal area against storm and wave damage and help stabilize shorelines, increasingly important functions in the face of climate change.

In view of the above therefore, the implementation of these proposed works along such sensitive areas requires a careful assessment of the existing biophysical environment in order to maintain the integrity of this important ecosystem.

4.1.2.2 Fish Resources

The fishes resources found in the Senegambia and Kololi area are the same that occur in Tanji. The main difference is that fishing activities are more intense and diverse in Tanji than in the Senegambia area. Consequently, the existing fish and fisheries within the two sites are described in more detail under Tanji in Chapter 4.2.2.2.

4.1.2.3 Forest Resources

Generally in the Gambia in three decades alone, the forests have undergone considerable degradation from about 60 per cent closed forest type in 1968 to less than 10 per cent closed forests in 1993. Going from Cape Point towards the proposed project location of Senegambia/Kololi in the south, the lack of forest vegetation up to Bald Cape is striking. The main area that provides a reasonable stand of vegetation is the Bijilo Forest Park, located right opposite the main gate of Kololi Beach Club and is within walking distance to the Senegambia Beach and Kairaba Hotels.

Gazetted in 1952, this fenced woodland covers an area of 51.3 hectares and a total length of 1,500m parallel to the coast and width of 350m. The Park comprises primarily of a closed canopy forest with a significant number of rhun palms, and a relatively thin strip of herbaceous dune vegetation. The *African Padauk* and *Palmyra Palm* stand is found on the plateau. Other species present in the stand include Terminalia, oil palm and a variety of other species like *Cordyla, Piliostigma, Prosopis*, and *Entanda.*

The sand dunes on the sea side are stocked with brush and shrub, as well as lilies, salt-tolerant vines, wild orchids, climbers, towering silk cotton trees, and the occasional baobab tree.

4.1.2.4 Fauna

The Bijilo Forest Park is home to various invertebrates, reptiles and mammalian species. Among the primates is the Green Vervet monkey, Western Red Colobus monkey, Senegal Bushbabies (Gulagos), Callithrix monkey, Campbell's Mona monkey and Patas. The forest is a really valuable habitat for the Colobus monkey especially as it is now listed as Endangered on the IUCN Red List with a decreasing population.

The Green vervet and Patas monkeys are now a common sight in all the nearby hotels and private residences in the neighborhood, where they look for food and other nourishments. Tourists like to feed them as a good way to see them, but that in fact may be contributing to their demise. Feeding peanuts changes their behaviour and increases the likelihood of them developing many problems that are associated with artificially feeding wild animals. In addition, this will reduce their fear of humans, putting them in danger of being harmed or stolen.

Other mammal species include the Sun Squirrel, African Civet, Genets, Mongoose, Brush Tailed Porcupine and some rodents. Among the reptiles are the Royal Python, Agama, Red Skink, Rainbow and Monitor lizards. These are often seen on the sand bank especially at night feeding on dead fish. They also lay eggs on the sand bank. Also present in the Park are insects such as the fire ants, dragonflies, termites, butterflies, and the Golden Silk Orb-weaver among the numerous of insects and spiders.

The civet, porcupine and mongoose use the beach for feeding and nesting; these animals are shy and are rare in Gambia nowadays, especially within the Greater Banjul Area. In addition to these a number of rare and shy birds, such as Black caps, Bee eaters etc., often forage on sea weeds flowers and foliage by the beach.

The scrub side of the park, along the beach is home to a large number of crabs (mainly the Tufted Ghost Crab and African Ghost Crab) inhabiting the area, manifested by the large number of crab burrows on the site, often found with crabs in and around the burrows. They feed on dead fish on the beach, and lay their eggs on the sand bank.

4.1.2.5 Avifauna

The avifauna within this strip of the beach essentially resides within the Bijilo Forest Park. There are over 133 bird species recorded in the Park including various hornbills, pheasants, cuckoos, sunbirds, starlings, weavers, waxbills, eagles and hawks, etc.

Some other recorded species include the Black-necked Weaver, Red-billed Hornbill (Tockus erythrorhynchus), Greater Honeyguide, Green-backed Eremomela, Grey-backed Camaroptera, Bearded Barbet, Oriole Warbler, Lizard Buzzard, Variable Sunbird, Western Grey Plantain Eater, Blue Breasted and Woodland Kingfisher, Yellow Crowned Gonolek, Paradise Flycatcher, Senegal Coucal, African Grey Hornbill (Tockus nasutus), Tawny-flanked Prinia, Red-necked Falcon, Black-billed Wood-dove, Reinward's Babbler, Hooded Vulture, White-throated Bee-eater, Stone Partridge, Palm-nut Vulture and many other avians.

4.1.3 The Social and Economic Environment

4.1.3.1 Land Ownership and Settlement Pattern

The TDA is an 800-metre strip of land facing the Atlantic Ocean, extending from the Kotu Stream to Kololi Point. It was declared in the 1970's as a reserve mainly for tourism related activities. Therefore, the area is mainly of a typically tourism-related land use.

Land outside the TDA, especially settlements in the vicinity (mainly Kololi and Kerr Serign), were originally customary land and now formalised by direct leasing in accordance with the State Lands Act. The neighborhoods of Kololi and Kerr Serign are mainly residential with mixed uses and commercial land uses in existence. Other social uses such as the Lamtoro Clinic are also close to the site.

4.1.3.2 Socio-economic Activities

Many individuals, private entities and public bodies have a vested interest in this coastal area, and together they represent a broad spectrum of socio-economic activities, which make use of the natural resources produced by nature, and the socio-economic resources provided by man. The various activities can be clustered into the following user categories:

i. Social activities, the activities of individuals, such as land tenure, domestic activities and subsistence

ii. Economic activities, all commercial activities such as agriculture, fishery, tourism, services and industry

iii. Public activities, all government activities to guide, control and facilitate the above social and economic activities

iv. Nature conservation

Against this backdrop therefore the following economic activities are found:

Tourism

The sector provides employment for people directly involved in the tourist business (travel agencies, hotels, restaurants, bars, etc.) and benefits indirectly through related activities (beach bars, juice pressing, fruit selling, petty trading, etc.).

Craft, petty and market trade

There is a major craft market at the Senegambia junction, and smaller craft shops in the hotels around the project site. Petty trading of various items such as fruits, fruit juice, clothing, groundnuts, cashew nuts, cigarettes and cultural items are also common in the area.

Fisheries

There are limited fishing activities around the Senegambia beach except for recreation, and beach seine fishing employed by only a fishing crew of not more than 15 people.

Agriculture (horticulture and livestock)

Women are the main farmers of vegetables around the project area, for both consumption and the local market at a small scale.

The International Trypanotolorence Center (ITC), not far from the project site, houses cattle and small ruminants mainly for livestock research purposes. It is completely fenced and the animals are contained within the site. There is no likely impact of the project on the livestock.

Natural Resource Use

Water in the area is sourced from seasonal rains, surface water from the sea and below ground in deep and shallow aquifers. Domestic water supply, and that used for agriculture around the site is from groundwater.

Minerals and Aggregates

Beach sand used in construction have been mined around the area, particularly at the nearby Bijilo Beach, which was later forbidden due to ecological issues.

4.2 The Tanji Bridge Area

4.2.1 The Physical Environment

4.2.1.1 Topography

Typical ground levels in the Tanji area range between 3m GD along the beach to 6m GD along the main coastal highway, and 15m GD in the village of Tanji. In very low-lying areas around the mouth of the Tanji River, the combination of river flow and high tide can cause flooding especially along the Tanji fish landing site and Nyanya's Beach Bar and Restaurant. In addition to this the site remains highly vulnerable to coastal erosion.

4.2.1.2 The Sand Spit System at the Mouth of the Tanji River

The general area of the Tanji Bridge, which extends north from the fish landing site to the mouth of the River Tanji is characterized by the dynamic spit system associated with the River Tanji, which separates the River from the sea. The spit runs for about 2 km up to Bald Cape.

The river's entrance channel through the spit is known to have moved to different positions in the past. However currently, the River Tanji follows a sinuous path as it runs north from the road bridge to empty into the sea located at about 600 meters.

During floods over the past rainy season, the river cut back towards the coastal highway causing considerable erosion damage, which has been temporarily repaired. As the river channel may again erode towards the main road during future rainy seasons, it is likely that further works will be needed.

4.2.1.3 Nyanya's Beach Bar and Restaurant

Nyanya's Beach Bar and Restaurant is located right next to the Tanji Bridge. Built in 1989 by the proprietor Mrs. Nyanya Gaye, she explained that the property had a wide expanse

of beachfront on which were erected chalets and other tourism related infrastructure such as a beach bar, sunshades, sheds, etc. The facility was thriving well until a few years after the coastal protection works of 2003/4 were carried out.

According to Mrs. Gaye, two phenomena happened at the seafront of the facility: whilst sand accretion was taking place north of the property, massive erosion was taking place both to the south, as well as along the beachfront of the property. The accreted area (or spit) is in fact currently directly opposite the bridge looking towards the sea, now covered with vegetative shrubs and creeping plants. The spit stretches out further north following the meandering river (now pushing it back towards the elevated sand dune close to the road which is currently being eroded) as it empties into the sea.

Whilst accretion was taking place to the south, erosion had accelerated from the west and directly opposite the facility, and flooding the frontage facility. Three chalets were taken away by the erosion, and the entire frontage is flooded at high tide, with water flowing through the facility and emptying out into the Tanji River through an opening of the fence to ease the pressure on the other parts of the surrounding wall fence. The flood waters are currently threatening an unfinished storey building along the path towards the River mouth.

In addition, during the rains storm water from the main road and beyond enters the property through a metal wrought gate located towards the main road, (it will be noted that the facility is sitting in a slight depression below the road). This flood water also finds its way through the property, following the same path as the flood waters from the sea, to empty into the Tanji River. This scours the ground it passes on and creates small gullies along its way.

Against the perimeter wall of the facility towards the river there is a buildup of sand, but only during maximum high tide (Spring tide) does the river lap against the wall. It is not of much concern to her however, at least not as much as with the rushing floods through the property from the sea at high tide, the storm water during the rains. There is however, the need for protection against possible erosion by the River.

4.2.1.4 Other Threatened Infrastructure and Service Facilities

The road corridor also includes an electricity power line (Figure 7), as well as a GAMTEL telephone service wire both located close to the bridge, and are under threat. As a matter of fact the river bank was so heavily eroded (the electricity pole was only a meter away from the erosion) before action was taken to protect it. Another NAWEC infrastructure (the main water pipe that supplies the region) Figure 8, will also be threatened should the erosion be allowed to progress.

4.2.1.5 Use of the Sheltered Bay by Fishermen

Fishermen do use the calm and sheltered waters at the mouth of the River to repair, or to breakup old canoes to recycle the planks. At the time of this study four old canoes were moored in the bay, and the owner of one of them (Mr. Arfang Faye) indicated that should the construction works commence, he would simply move away to another part of Tanji beach to continue his work.

Another fisherman has actually set up camp on the edge of the spit, opposite the bridge mending his nets. He said he was taking shelter from the bigger waves on the beach to this

calm section to do his nets and prepare for his next fishing trip or “Mare” (fishing trips that last for at least a week)

4.2.1.6 Neighborhood of the Camel Safari

The Tanji wetlands adjacent to a private property and the Camel Safari Camp, east of the bridge are prone to flooding due to the fresh water flow during severe rain storms. This may be further aggravated by the road bridge particularly the old one (immediately to the east of the new bridge).

4.2.1.7 Land Ownership and Settlement Pattern

It will be noted that as in the Senegambia area, ownership of land within the TDA is usually based on sub-leases from GTB whilst areas outside the TDA are customary tenure, which may be converted to formal leases. Unlike the Senegambia/Kololi area, the western side of Tanji Bridge Project is within the TDA whilst the eastern portion falls outside it. However, as custodian of fish landing sites, the Department of Fisheries has mandate for the management of the Tanji Fisheries Center, plus a hundred meters on either side of it, even though these facilities are within the TDA.

On the eastern side of the highway lies the settlement of Tanji with a population of more than 8,200 (Table 13**).** In addition to Tanji other neighboring communities that could be affected in some way as a result of the works are Brufut, Madyana, and Ghana Town with a total population of more than 23,000 (Table 13).

Table 13: Population Distribution of Peripheral Villages to Proposed Project Site

Village	Population		Total Village Population
	Men	Women	
Brufut	6,056	6,008	12,064
Madyana	1,084	1,120	2,204
Ghana Town	348	419	767
Tanji	4,132	4,078	8,210
Total	**11,620**	**11,625**	**23,245**

Source: GBOS (2013)

4.2.1.8 Air Quality

In the proposed project site, and neighboring areas over which the project’s influence is felt, the density of vehicles on the roads is low; hence quality of air is good.

4.2.2 The Biological Environment

4.2.2.1 Coastal Wetland Ecosystem

The proposed site for the construction of the structures is essentially within the Tanji Bird Reserve (TBR), a typical coastal wetland ecosystem. The TBR and Bijol Islands are a national gazetted Reserve under the purview of the Department of Parks and Wildlife Management (DPWM). Established in 1993, the Reserve (area locally known as Karinti), encompasses the Tanji River and its estuary, incorporating a wide variety of habitat types including marine, estuarine, freshwater, coastal scrub woodland and dry woodland, and has a total area of 612 ha.

The Bijol Islands are a part of the Reserve, located 1.5 km off the coast. It is an important offshore roosting and feeding habitat for substantial numbers of shorebirds, seabirds, ospreys and other avians, breeding turtles, as well as mammals. There are two islands, one large and one small, joined at low tide by a sand spit. Both islands are low lying with maximum elevation of about 2m, although this varies with the season. The surrounding waters are relatively shallow and lie on the continental shelf.

4.2.2.2 Fishes and Other Aquatic Populations

The fish resources that are found in this area are within the Gambia's continental shelf, an area of about 4,000km^2 in addition to approximately 10,500km^2 Exclusive Economic Zone (EEZ). This area is believed to have abundant and diverse fisheries resources. Over 500 marine fish species have been recorded in these waters, usually classed as demersals (bottom dwelling) and pelagics (surface dwelling).

The demersals include the high value shrimps, groupers, sea breams, grunts, croakers, snappers, etc., and pelagics include the two small sardinellas (*Saridnella aurita* and *Sardinella maderensis*), the bonga/shad (*Ethmalosa fimbriata*), horse mackerels (*Trachurus trecae, Trachurus trachurus* and *Caranx rhoncus*) and the mackerel (*Scomber japonicus).*

The operators at the Tanji Fisheries Center target the species named above. It is important to note that the Gambia River and its ecology also serve as a transitional phase for many of the marine fish species named above; they spend part of their life cycle to reproduce, feed or as nursery grounds in the Gambia River. Such species include the shrimps, the croaker, the thread fins (locally known as the "kujali") and other high value pelagic species such as the barracuda whose juveniles occur among mangroves and the estuaries.

The status of some fish species has been a concern to Gambian fisheries managers, and have expressed over excessive exploitation of the marine fish species. The results of limited surveys and assessments over recent years indicate that the major marine fish stocks are over-fished or fully-exploited (Table 14). In particular, the most commercially important demersal species appear to be under threat from high levels of exploitation (Mendy, 2009; Tobey et al, 2010).

Table 14: Status of the Main Fish Stocks

Species	Status	Year of Assessment	Reference
Small Pelagic Species			
Sardinella aurita/NW Africa	O	2008	FAO SPWG NWA (2008)
Sardinella maderensis	NA	2008	FAO SPWG NWA (2008)
Ethmalosa fimbriata	NA	2008	FAO SPWG NWA (2008)
Scomber japonicas	O	2008	FAO SPWG NWA (2008)
Trachurus trecae	F	2008	FAO SPWG NWA (2008)
Caranx ronchus	O	2008	FAO SPWG NWA (2008)
Demersal species			
Pagellus belottii	O	2007	FAO/CECAF DWG (2008)
Arius spp.	O	2007	FAO/CECAF DWG (2008)
Pseudotolithus spp.	F	2007	FAO/CECAF DWG (2008)
Epinephelus aeneus	O	2007	FAO/CECAF DWG (2008)
Penaeus notialis	F	2007	FAO/CECAF DWG (2008)
Octopus vulgaris	O	2007	FAO/CECAF DWG (2008)

Source: Mendy, 2009, based on reports of the FAO Working Group on the Assessment of Small pelagic fish off Northwest Africa (FAO SPWG NWA) and of the FAO/CECAF Working Group on the Assessment of Demersal Resources (FAO/CECAF DWG). Note: O–over-exploited; F–fully exploited; NA inconclusive assessment

4.2.2.3 Forest Resources

The forest resources of this area consists essentially of the vegetation within the TBR and Bijol Islands. The mainland reserve is degraded savanna and stabilized sand-dunes, the latter with wooded grassland dominated by *Parinari macrophylla*. There are tiny patches of forest.

The small island of Bijol, which bears the remains of an old lighthouse, is devoid of any vegetation. The larger island is mainly covered with low growing saline-tolerant plants, such as seaside purslane (*Sesuvium portulacastrum)*, Beach Morning Glory (*Ipomoea caprae*), *Cenchrus biflorus* and *Cyperus maritimus*. There are a few casuarinas (*Casuarina equisetifolia*) and Baobab *(Adansonia digitata*) trees present, but none of these reach higher than 3m. *Seavola plumeri* also occasionally occurs as small shrubs in the interior of the island.

4.2.2.4 The Fauna

Most of the fauna, like the forest resources around the project site, is essentially composed of those residing within the TBR. The fauna comprises an impressive range of terrestrial mammals of global conservation concern; these include the *Procolobus badius temminckii*, while within the surrounding waters are *Monachus monachus*, the dolphins, *Sousa teuzsii* and *Tursiops truncatus*.

The surrounding waters are also important feeding grounds for the Green Turtle, which breed on both the mainland and on the Bijol Islands. The internationally rare Mediterranean Monk Seal has also been seen there occasionally. The turtle *Chelonia mydas* is regular offshore and breeds on the Bijol Islands.

The Western Red Colobus, green vervet and Patas Monkey, Genet, Civet, Hyena and Porcupine are also inhabitants within the Reserve. Among the other species that are known to occur are the Aadvark, the Ratel, Serval, and the African Clawless Otter. The Nile crocodile is also present, and antelope species identified include Bushbuck, Maxwell's and Bush Duikers. Reptiles are plentiful, snakes and lizards being fairly frequently encountered.

Fauna in the agricultural ecosystem consists mainly of reared animals and poultry such as sheep, goats, pig, chicken etc., which are raised on a small scale at the household level. Cattle are also reared within the peripheral communities.

4.2.2.5 The Avifauna

Basically, the avifauna within the project site consists of what exists within the Reserve. As a matter of fact, the Reserve was established primarily for its ornithological importance. The diversity of birds within the area results from the range of habitat present, which include marine, estuarine, freshwater, coastal scrub woodland and dry woodland.

Tanji's coastal location on the West African flyway makes it of considerable importance for passage of migrant birds. Wintering birds migrating from Europe and Asia use the area as a staging post and feeding grounds. For European migrants, the Reserve is one of the first stops offshore and offers both a safe haven as well as good feeding opportunities. These are Palaearctic migrants of 82 species (27 per cent), Intra-African migrants of 32 species (11 per cent), and Resident species of 181 species (61 per cent). This constitutes 295 species from 61 families, out of 515 species and 75 families in the whole of the country.

The lagoons have Little Egret, Black Headed Heron, White Fronted Plover, Caspian Tern, Pied and the Kingfisher. Others include the Spur Winged Plover, Cattle Egret, Grey Headed Gull, Greenshank, Royal Tern, Grey Heron, Lesser Black Backed Gull and Redshank, among others.

In addition the Bijol Islands provide the only known breeding site in the country for the Grey headed Gull, the Caspian Tern, and Royal Tern; between 2000 and 2004 breeding Royal Terns were present in numbers up to 15,000 pairs, (about 20 per cent of the breeding population of the West African sub-species *Sterna maxima albidorsalis*), (Figure 20). The Bijol Islands and the mouth of the Tanji River are the most important sites in the country for flocks of most species of gulls and terns, and occasionally hold more than 20,000 water birds.

On the banks of the Tanji River gulls are often present, feeding on fish in the shallow waters during low tide. It is expected that when actual construction of the revetment and dike begins the birds will disperse as a result of the presence of heavy construction equipment, machinery and humans in the vicinity. However, since the disturbance will be for a relatively short time, the impact is expected to be low, and the birds will be back as soon as work is completed and the place becomes tranquil again.

Thirty four species of Raptor (birds of prey) have been recorded from the Reserve, which reflects the abundance and diversity of prey.

4.2.3 The Social and Economic Environment

Agriculture

The communities around the project site are basically subsistence agriculturalists, (who for the most part depend on rain-fed agriculture, growing crops such as groundnut, sorghum, millet, rice and vegetables), and the harvesting of minor forest products such as wild fruits, and mangrove wood for firewood or construction materials. There is also a brisk informal trade in locally produced fruits and vegetables.

Fisheries

With the Tanji Fisheries Center close to the Tanji River, a large portion of the communities are dependent on the fisheries activities for their daily fish and protein intake. The Center re is an important economic hub, thronged with people engaged either in fishing or in one form of fishing related activity including boat building, fish processing, (smoking, drying, and salting), fish trading, fish retailing and wholesale buying. Unloading fish from fishing canoes is another rewarding form of economic activity on Tanji beach. Women from the surrounding villages also engage in oyster harvesting from the mangrove forest along the Tanji River.

Craft, Petty and Market Trade

There is a food and clothing market near the Project intervention site extending to the beach where fisheries activities dominate, including an ice plant.

Resource Use

Water in the area is sourced from seasonal rains, surface water from the sea and below ground in deep and shallow aquifers.

Minerals and Aggregates

Beach sand used in construction used to be mined around the area but has since ceased.

Fuel wood

Artisanal fish processors use considerable amounts of fuel wood, mainly mangroves, for construction and smoking.

Tourism

There are tourism facilities around the project site including Nyanya's Beach Bar and Restaurant, Camel Safari Camp, TBR and the ecotourism camp within the Reserve. Specifically, the Eco-tourism facility was built for the peripheral communities to TBR to manage, and the proceeds to be reinvested in other forms of revenue generating activities to reduce the pressure on the coastal resources. However, because they could not run it efficiently it was put under the management of an experienced person, and the revenue generated shared among the various stakeholders.

Currently it employs eight community members; shares the revenue it generates with the communities who receive 50 per cent of the allocated share. In addition the Camp supports community efforts and projects such as the Health Centers in Brufut and Tanji, the Tanji and Brufut Primary Schools, and the football club in Brufut. All of the above are vital for the economy of the communities, and therefore any negative impact of the planned works on the Reserve could affect these livelihood sources.

CHAPTER 5: CONSULTATIONS AND PUBLIC PARTICIPATION

Consistent with best practice in developing ESIAs, consultations were held with relevant stakeholders. Annex 2 indicates the list of institutions and persons met. The stakeholders and beneficiaries of the project were identified after undertaking literature review and preliminary consultations.

Consultative meetings were held during field visits with key stakeholders and institutions including: DPWM, DOF, NEA, NRA, Department of Technical Services, GTB, Hotels, etc. Others included the informal and self-employed operators within the tourism sector in the project sites. They include the juice pressers, hair dressers, tourist guides, fruit sellers, tourist taxi drivers, and a few European tourists. Table 15 summarizes key stakeholder concerns and views.

5.1 Objectives of the Stakeholder Consultations

The consultations with these stakeholders were carried out to specifically achieve the following objectives:

i. To provide information about the project and to tap stakeholder information on key environmental and social baseline information in the project area

ii. To provide opportunities to stakeholders to discuss their opinions and concerns

iii. To identify specific interests and to highlight potential roles and responsibilities of stakeholders and ensure the participation

iv. To inform the process of developing appropriate management measures as well as institutional arrangements for effective implementation of the project

5.2 Key Stakeholder Concerns and Views

The Table below is a summary of key stakeholder concerns and views.

Table 15: Summary of Stakeholder Concerns and Views

Issue Raised	Remarks
Department of Parks and Wildlife Management	
Mr. Lamin Gassama: Director, DPWM: The Tanji Bridge and River are essentially part of the TBR, a sensitive ecological area. In as much as the road needs to be protected project implementers should be mindful not to disturb the ecological balance within the Reserve.	The DPWM will be a key player (under the institutional arrangement) in the implementation of the ESMP from this study.
Mr. Ousainou Touray: Asst. Director, DPWM: We need a long term solution to beach erosion; other management measures, such as enforcing set-back zone regulations, need to be considered; dredging and nourishments may impact beach wave and beach dynamics which can in turn affect the biodiversity at the TBR.	Indeed set-back zoning is a possible scenario being considered by the Government as another measure in the management of the coastal zone. However, there are other collateral costs to consider as well. Currently studies are under way to determine the implications of various approaches of coastal zone management in the Gambia as there is no one measure that fits all circumstances.
Mr. Kausu Jammeh: Wildlife Officer Great care should be taken in deciding where to dredge sand for beach nourishment activities.	This is an important issue, and clearly the studies will indicate the best possible options and sites.
Department of Forestry	
Mr. Sambou Nget: Director, DOF: No interference with Forest Park; workers could invade the forest for any number of	Workers at the site will be instructed to refrain from entering the Park, or loiter around during working hours. Strict rules in this regard will be applied.

reasons, and this could potentially disturb the biodiversity.	Besides, the security personnel at the Park will be around to prevent unauthorized entries.
Mr. Cherno Gaye: Forestry Officer There are certain animals that inhabit the Park but have their feeding areas outside the Park perimeter, (e.g. the civet, porcupine and mongoose) on the beach front. The implementation of the works should not disrupt their movement.	The expected results of the proposed works include creation of more beach, and consequently the availability of more of the types of feeds for these animals that migrate from and into the Park.
Mr. Abdoulie Jobe: Warden, Bijilo Forest Park: The DOF will be happy to have the beach protected. However, during construction there is the possibility of destruction and trampling of eggs, and crabs on the site by workers; use of heavy machinery and equipment will have potential negative impact on the crab biodiversity.	Workers will be guided by the rules and regulations as enshrined in the Contract, so that they will be mindful of these, and prevent them from happening.
Tanji Bridge and The Community of Tanji	
Mr. Sainey Manneh: Member of Beach Management Committee I think the bolong's mouth needs to be dug up to allow the water free movement. In the old days our people would remove the accretion.	The engineers do not seem to agree with this view. They advised that the mouth should be left alone.
Ms. Ida Ndure: Ward Councilor: Constructing revetments will be good for the road and for all road users. I hope however, that the quality if the works will be as high as the one at the Gambia Ports Authority	It is expected that these revetments will be equally good.
Mr. Assan Jallow: Beach Management Committee I feel the mouth of the bolong should be left alone. Instead revetments should be constructed rather than the option of removing the sand from the mouth.	This is in line with the engineers views.
Mr. Assan Jallow: We are ready to bear with the contractors; the short period of discomfort during construction of the revetment is nothing compared to the long-term destruction of the road and bridge.	This view was supported by all participants
Mr. Lamin Bojang: We hope the crest of the revetment will be strong enough to withstand storm water emanating from the village.	The design will ensure that flood waters from the village will not affect the revetments.
Mr. Lamin Bojang: Alkalo of Tanji Village NAWEC electricity pole on the highway by the bridge, which serves the entire region from Kotu to Kartong, will equally be protected should the revetment be in place.	To be noted: Important as positive impact of the works.

Mr. Lamin Kanteh: APRC Chairman: Indeed for a very longtime after the old bridge was completed there was nothing in the river, all the mangroves at the mouth died. Women cockle harvesters stopped because there were no more cockles by the mouth of the river	This could have been due to many factors such as increase or decrease in salinity levels and disease that could have led to the death of the mangroves. Regarding the absence of cockles any, or a combination of many factors, could have been responsible including non-availability of breeding cockle populations within the area
Mr. Cherno Bojang: **Council of Elders:** I think the blocking of the mouth of the river is caused by the run off from the land. Therefore the run off from the land must be controlled.	This could be a contributing factor. These issues need to be studied some more to determine what measures to take to control the flood waters. The measures could be expensive as well.
Mr. Laibo Manneh: There used to be vegetation along the river mouth; now they are all gone. We need to replant with coconut. The government should provide the seedlings, and the community will be responsible for their management.	This is good suggestion and it indicates community willingness and commitment. It will be included in the report as a recommendation for the project implementers to consider.
Mr. Laibo Manneh: VDC Chairman We hope members of the community will be given priority in the employment of the labor force to construct the revetment. The income will be good for the village economy.	This is important as it is a positive economic impact
Mr. Saikou Sonko: **Youth Leader:** We appreciate this participatory consultative approach. Consultation with the local community is good, and is highly welcome. The works could have started, and we would not have been consulted as has happened in many projects implemented locally before. We do not care about the short- term discomforts the works will be bring.	This is normal practice in our work for it builds confidence, ownership and constituency, and it often results in successful implementation of projects.
Mrs. Nyanya Gaye: Proprietor of Nyanya's Restaurant: I hope the construction of the offshore breakwaters and the nourishment around the Senegambia area will not affect my restaurant, as it seemed to have done when the Senegambia area was nourished in 2003/4	This is important.
Mrs. Nyanya Gaye: Proprietor of Nyanya's Restaurant: A few years after the works the erosion seemed to have accelerated, and it took away three of my chalets into the sea. Even now, at high tide the water from the sea flows through the facility to empty into the River, putting at risk the last building at the back towards the sea.	It is assumed these times could be spring tides -times of high high tides, when the gravitational effects of the sun and the moon combine

Mrs. Nyanya Gaye: I also hope that the construction of the revetment at the Tanji bridge area will not affect my facility? Is it possible to have my facility protected as well by some form of revetment?	Even if it will affect your facility, there are plans to construct a dike towards your facility to protect it, as part of the project.
National Environment Agency	
Ms. Ndey Bakurin: Executive Director, NEA: The role of NEA in this project is to coordinate implementation of the ESMP. It is important that the ESMP is implemented to the letter during project implementation	It is expected that the details of the ESMP will be included in the Contractor's terms and conditions; NEA and its relevant partner institutions will be expected to conduct monitoring exercises as the works get underway
Ms. Ndey Bakurin: Executive Director, NEA: We need to strengthen the capacity of the Integrated Coastal Zone Management Unit (ICZMU) and membership of the Coastal Zone Working Group to be able to monitor implementation of the works, as well as conduct auditing and functions.	The capacity building requirements for effective participation of NEA and other partners are expected to be addressed during project implementation.
Mr. Foday Fatty: Programme Officer, CME: The Coastal and Marine Environment (CME) Unit was created to manage and coordinate all coastal zone management issues within NEA. The Unit is very small; only 4 staff. Unit needs to be enlarged and capacity of staff enhanced. Weak capacity of Unit to develop biophysical monitoring system due to lack of sufficient monitoring capacity (training) and appropriate equipment.	But there is no legal framework to back the Unit to enhance enforcement. Unit does not have the required technical capacity (e.g. engineer, lawyer, etc.) to be able to monitor coastal engineering works, and lawyer to develop the necessary legal framework. NEA will have to rely on MoWTI and AG's Chambers to support the CMEU. Unit needs skills development as well as provision of equipment and materials to be able to function properly.
Ms. Haddy Jaw: Proprietor, Eco-Tourism Camp: TBR: I believe that protecting the road from being eroded is good for the economic prosperity of the region in particular, and for the whole country in general. However, I hope the TBR will not be affected negatively in the construction of the revetments at the Tanji Bridge.	No. This is not expected.
Ms. Haddy Jaw: Proprietor, Eco-Tourism Camp: TBR: The Camp provides employment for eight people from the peripheral communities, supports community projects such as the Health Centers and Primary schools of Tanji and Brufut	This is another economic and social benefit of the eco- camp.

Ms. Haddy Jaw: Proprietor, Eco-Tourism Camp: TBR: The community gets a percentage of the earnings of the Camp each year which is good for the local economy	This is another economic and social benefit of the eco- camp.
Gambia Tourism Board	
Mr. Abdoulie Hydera: DG, GTB: GTB welcomes any intervention that is aimed at creating the beach in front of the hotels in the Senegambia/Kololi area. This will enhance employment and increase national revenue from the tourism industry	As the implementer of the Tourism Master Plan the GTB should play a major role in the implementation of this project. With increased arrivals (target 500,000 by 2020) the sector will create more employment and perhaps continue to be the largest foreign exchange earner in the country
Mr. Lamin Fatty: Manager, Product Development, Investment and Culture: GTB There is urgent need to prevent the beach front from eroding. GTB has been on the Task force charged with finding solutions to address the erosion problem at the Senegambia area. I did not know realize that the GTB office is located on the path of flood waters.	GTB is the implementer of the tourism policy (the Tourism Master Plan), and thus has an important role to play in this project. GTB headquarters currently being constructed is on the path of storm water from across the road in Kololi.
The Informal/Self-employed Sector	
Mr. Musa Manneh/Brikama: Juice Presser: Sen: I welcome this project because it is good for all of us working in the industry. Without the beach the tourists will not come to Gambia. Now I have nothing; for a week I have sold only a glass of juice (D75/glass), unlike before when I could sell up to 10 glasses a day.	For this year the tourists have not come in large numbers because of the Ebola scare, and not necessarily for the lack of beach.
Mrs. Haddy Jatta/Kololi: Fruit Seller: K. Beach: I have been selling fruits here since 1988. Increasing the beach area is good because the tourists love the beach. Then they will come out of the hotel on to the beach. When they are many on the beach we used to earn much more money, but now only a few tourists come out to the beach	This is a good point, and cannot be disputed.
Mrs. Haddy Jatta/Kololi: Fruit Seller: K. Beach: When the beach is increased, I hope the Hotel authorities will help us with toilet facilities. This is a major challenge for us on the beach. We don't have anywhere to ease ourselves. I am	Your message will be relayed.

an elderly woman, I simply cannot just go anywhere on the open beach to ease myself.	
Ms. Mary Gomez/Ibo Town: Hair Dresser: K. Beach: Six of us operate on this beach; in a good season, we can each earn up to D1, 000 daily. Now however, most of the tourists do their hair in saloons in town. They don't come to the beach as much as before. We support the planned works. With increase in the beach area, there will also be improved income as we all have families to take care of at home.	
Mrs. Ndey Kebbeh: President of Fruit Sellers Association: When will work start? Timing of the Project is very important to our livelihood. If construction is undertaken during the tourist season, many stakeholders will lose their source of earning. I recommend that construction be carried out after the Tourist Season.	The timing is important for your people, but the overall picture is very important too. The potential impact will be of short duration, after the works are done, you will get back to a wider beach with more tourists to buy your fruits.
Alieu Badu Bobb: ASSET Works are meant to improve the Coastal Area for the benefit of all stakeholders. We must sacrifice for tomorrow, protecting the beach is in our interest. We appeal to GTB to temporarily relocate affected stakeholders during construction.	The GTB will be informed of this request
Mr. Mustapha Jobe: Happy Safari Will the works extend to the BB Hotel Area?	Works cover only the Senegambia/Kairaba Hotel Area
Mr. Sheriff Fofana: Juice Pressers Association This is a very important project, we welcome it. We have not operated the whole season, we hope Government will help us.	With an extended beach area more guests will be out on the beach, and this will increase your chances of making more sales.
Mr. Bakary Darbo: Tourist Taxi Drivers Association. What is the current status of the Project? Are the works permanent or temporal?	We are the stage of conducting an ESIA of the project, to determine what aspects of the project will affect you and how to address them.
Department of Technical Services	
Mr. Malang Jammeh: Director of Technical Services: Supervision of civil works is the mandate of the Technical Services, and would be available to deploy a focal person to join the monitoring team in this project.	It will be recommended that this Department be coopted into the CMEU as and when required.

Mr. Malang Jammeh: Director of Technical Services: Capacity of the Department needs to be built in order that it can carry out its function.	Its Focal person can be trained in conjunction with the members of the CEMU at NEA
National Roads Authority (NRA)	
Mr. Dodou Senghore: DG, NRA: The current stop gap measure at the bridge is a collaborative effort between NEA, NRA and National Disaster Management Authority (NDMA). NEA provided the funds, NDMA provided equipment and machinery and NRA supervised the backfilling with laterite, as a temporary measure to stop the erosion reaching the coastal highway. A longer term control measure is the planned revetment funded under the GEF project	Clearly, it can be concluded that this is a well-coordinated collaborative inter departmental effort that should continue even beyond project completion. It is recommended for NEA to continue to collaborate with these and similar institutions within the context of the Integrated Coastal Zone Management Working Group (ICZM WG) In the longer term the CEMU at NEA should be the core organ to carry out the day to day (or periodic) monitoring of the coastal works, and to enforce any enacted regulations for the sustainable use of, not only this stretch of beach, but in fact the entire coastal area of the country.
Gambia Hotel Association Representation	
Mr. Nicola Blell: Deputy Gen. Manager/Sen. The Hotel Association welcomes this move by government to support our private efforts to protect our beach fronts. We have tried several measures individually, (sea walls, sand bags, concrete blocks, etc.), but none seems to be good enough to stop the erosion.	It will be expected that
Mr. Nicola Blell: Deputy Gen. Manager/Sen. Senegambia Beach Hotel does monitor its beach front regularly and sends reports/photos to NEA and UNDP to apprise them of the situation from time to time. We will continue to do this even after the planned works have been completed.	There is need for the Association (or at least those hotels most affected by the erosion) to form an organ to monitor the entire beach front, and report to NEA on the results. NEA should then continue to seek funding for repair works that have been identified, or as they are needed. This partnership could even mean the Hotels chipping in as and when necessary. Government should enact regulations to punish violators of the rules designed to protect the beach front from degradation, to be enforced by NEA and other relevant parties. The existing legal and institutional arrangements should be further evaluated and if necessary appropriate changes proposed. This refers in

	particular to the need for a framework law for ICZM, to protect the planned measures and future development and management of the coastal area.
Mr. Nicola Blell: Deputy Gen. Manager/Sen. NEA's capacity needs to be built	This is necessary if the planned works are to be implemented successfully.
Mr. Buba Bah: Exec. Asst. Manager:/Kairaba The beach clearly needs to be protected. Kairaba has tried several types of protection. The latest is the sea wall. We support the effort by government	With the planned works completed the hotels should work closely with Government to protect the beach.
Visiting Tourists	
George Anamolga/Holland: Sen: Surfing will be restricted because of the offshore breakwaters	Yes, but there will be increase in beach space. Besides the offshore breakwaters could become a refuge and natural environment for the fishes and other aquatic organisms**.**
Daniel Waknine/Holland: Sen: The beach, as it looks now is uncomfortable and scary. It will be good to have it improved. Dutch companies can do these types of work.	This is why the project is trying to improve the beach.
Vincent Laban/Holland: Sen: The beach is certainly not the idea of a tropical beach.	This is fair comment.
Mr. Dick Vlot/Holland: Sen: Even though the beach does not look nice, it is not necessarily my idea of a perfect holiday in Gambia; it can be rebuilt however, but I'd rather prefer talking and mixing with the friendly people.	An increased beach space will potentially provide another source of a satisfactory holiday besides the smile of the people.

CHAPTER 6: ASSESSMENT OF ANTICIPATED IMPACTS AND MITIGATION MEASURES

6.1 Principles and Method Used in Screening Potential Significant Impacts

The project activities can present potential risks based on the surrounding environment (physical, biological and social) they take place in. The interaction of the hazard of an activity with the sensitivity of the surrounding environment leads to an impact. The occurrence and significance of the impact depends on level of compatibility of both the activity and the type of the environment.

Considering the combination of various factors, significance of an impact can be characterised as (+2) high positive significance, (+1) low positive significance, (iii) neutral - no discernible impact, (-1) low negative significance or (-2) high negative significance. These include:

i. Project activities leading to hazards and risks:- their nature, magnitude, indirect or indirect

ii. The sensitivity of the receptor: - for the beneficiaries, for instance, is the receptor a woman, child or elderly considered as more sensitive. Sensitivity of the physical or biological environments such as wetlands? Flora or fauna of ecological significance?

iii. Temporary scale:- Will the impact have effect in the short, medium or long term (permanently)?

iv. Geographical scale:- Does the impact affect one family, one village, one region, etc.?

v. Are there cumulative minor or localised negative impacts leading to major problems?

The screening to evaluate the significance of the potential impacts of this project was based largely on expert opinion, information from the consultations and observation of existing situations. The evaluation matrices for Senegambia/Kololi and Tanji on potential impacts are presented in Tables 16 and 17 below.

6.1.1 Analysis of Potential Impacts at Senegambia/Kololi Beach

Table 16: Significance Evaluation Matrix of the Potential Impacts at Senegambia/Kololi Beach

	ENVIRONMENTAL PARAMETER	POTENTIAL IMPACTS	Significance of Potential Impacts During Specific Phases/Activities					
			During construction			During operation:		
			Revetment	Breakwaters	Beach nourishment	Revetment	Breakwaters	Backfilled Beach
PHYSICAL	Surface Water	Pollution from spilled engine oil, debris and construction waste, dust, and suspension of beach sand	-2	-2	-2	0	0	-1
	Ground Water	Pollution from spilled engine oil and over mining	-2	-2	-1	0	0	0
	Air Quality / Climate	Dust and emissions from vehicles, sea vessels and heavy machinery	-2	-2	-2	0	0	0
	Geology & Soils	Erosion; destruction from mining; sedimentation	-2	-1	-2	-2/+2	-2/+2	-2 / +2
	Noise & Vibration	Nuisance from heavy vehicles, sea vessels and machinery	-2	-2	-2	0	0	0
	Landscape and Aesthetics	Waste and excess materials left on site; Unsightly structures	-1	-1	-1	-2	-2	+2
BI	Fisheries & Aquatic Ecosystem	Loss of aquatic live from engine oil spills; disruption of habitats	-2	-2	-2	0	0	0

ECOLOGICAL	Terrestrial Ecosystem (Birds, Wildlife etc.)	Noise; invasion of Park by large influx of workers	-2	-2	-2	0	0	0
	Agriculture & Livestock	Agricultural land contaminated from engine oil spill; encroachment when locating camp; indirectly at and around quarries	-1	-1	-1	0	0	0
	Forest & Vegetation	Encroachment when locating camp; trampling during works	-1	-1	-1	0	0	0
SOCIOECONOMIC	Public Health and Safety	Accidents; poor waste management; dust and noise nuisance	-2	-2	-2	-2	-2	-2 /+2
	Occupational Health and Safety	Poor health from dust and noise; drowning; other accidents due to slippery surface of revetment	-2	-2	-2	-1	-1	-1
	Land Ownership / land use	Temporary relocation; land lost to future erosion / accretion	-2	0	-2	+2	+2	-2 /+2
	Employment & Income Generation	Employment on Project works; in tourism; maintenance	+2	+2	+2	+2	+2	+2
	Communication / Transportation	Traffic disruption	-1	-1	-1	0	0	0
	Public services & infrastructure / drains	Improved drainage system	+1	0	0	0	0	0
	Economy	Improved economy directly and secondarily	+2	+2	+2	+2	+2	+2
	Community Stability / vulnerable groups	Conflict resulting from choice of Project sites	-2	-2	-2	0	0	+2
	Culture/Tourism /Traditions / Archaeology	More tourism and beach activities;	-2	-2	-2	+2	+2	+2

6.1.1 Analyses of Potential Impacts: Senegambia/Kololi

6.1.1.1 Potential Impacts and Mitigation of the Revetment, Breakwaters and Beach Nourishment

Potential Positive Impacts

- The soil will be stable after the Project, encouraging activities that were not previously possible due to severe erosion.

- The nourished beach will be beneficial to public health and safety as the current situation with poor access, uneven slopes and disused structures at the beach are extremely hazardous. Confidence in using the beach will be enhanced.

- After the Project, land value along the nourished beach will be increased significantly and land use investments shall be more likely due to better security, consequently increasing income for improved livelihood.

- The Project, during construction, will employ a large number of various experts and unskilled workers. Income generation is also expected for women who target food sales at workers as common in most major construction sites.

- During operation there shall be more tourists in the area with indirect employment and income generation for tourist guides, tourist taxis, craft producers, fruit and juice sellers, etc. Hotel staff will have more job security when risk of scaling down or closure is eliminated. Monitoring and maintenance after the works shall also provide employment.

- The revetment shall include properly designed drainage channels to allow free flow of storm water from upland areas and prevention of erosion at the outlets.

- The Project, during all phases, will enhance the economy from work related use of local construction firms where possible and boost of the tourism industry during operation.

Potential Negative Impacts and Mitigation

Surface water

During construction, there is potential for high significant impact on water quality of the sea, at and around the Project site. The extent shall be high as there are no water boundaries, allowing polluted water to quickly and continuously spread with the water movement.

During stockpiling of the basalt rocks; laterite boulders; sand; transportation of materials along the beach; excavation activities to remove sand bags; concrete blocks; debris; etc. earth materials are likely to be suspended in the water until after construction, when eventual settlement of particles takes place. There is also a potential for water pollution by illegal waste dumping and hydrocarbon spillage from equipment into the water.

During operation, surface water dynamics will change but shall not affect water quality. The backfilled sand shall, at an unnoticeable pace suspend in the water for deposition along the coast within years. During operation, maintenance activities may also cause similar impact on a lower scale.

Mitigation
As large quantities and different types of wastes are expected to be generated, a waste management guide for the Project shall be developed to include management of spare parts, used oils, existing structures such as sand bags, fallen trees and concrete structures.

Constant supervision of the works will ensure workers are careful in preventing spills.

Ground water
Pollution of ground water is likely at the base camp from mismanaged hydrocarbons, and at secondary sites of rock or gravel extraction, if the water table is exposed. The extent of pollution will be limited to the quarries, although of long term duration if there is no intervention. With hydrocarbons spillage, high quantities may leach to the aquifer if clean-up is not immediate, or particularly during rainy season.

During operation of the Project, there is no likely impact of significance on ground water.

Mitigation
At the base camp, fuel, new and used oils shall be handled and safely stored, and disposed of to avoid spills and leaks. Cesspools for sanitation purposes will be used and collected as necessary.

There are plans to import rocks for the Project, however, as the option to source these locally is still open, extraction sites and companies will need to be assessed before commencement and approval, including reclamation plans, be sought from the NEA and Geology Department.

Air Quality
Once earth materials are moved around dust will be produced, and with high winds at the beach, the dispersion rate is high. Surrounding structures, human and animal livelihood will be affected by dust and sand particles in the air.

Emissions from use of onshore and offshore machinery and equipment will also be produced, however, these will be temporal during use of the equipment and with less impact due to high dispersion by strong winds.

Air pollution is not expected during operation of the structures.

Mitigation
Equipment must be serviced regularly and run below the optimal as overloading strains the mechanisms that produce incomplete combustion. High quality oils must also be used to reduce dangerous air emissions.

Adequate and appropriate signs must be placed at strategic locations to prevent public activities that shall be affected by sandy winds. Information and consultations have already started and shall continue to inform beach users of the impacts for their protection and avoidance of the Project site during construction.

Geology and soils
During all works, localised, temporary erosion may occur due to soil disruption from clearing and construction activities. Removal of old sea defence structures buried long ago will tend to develop pits that may cause water to accumulate and wash away surrounding sand.

There is also likely compaction from the movement of heavy machinery along the beach. This shall open the route to erosion risks and potential formation of natural drainage routes during rainy seasons, particularly causing erosion at the emptying point to the sea.

Despite the benefits of the Project, studies and experience from previous beach nourishment of the same area in 2003/4 have shown that there is high likelihood that erosion and deposition in other areas along the coastline will take place subsequently.

Mitigation
Phase II of the Project to construct the breakwaters must be implemented to complete the intervention and assist in reducing the rate of erosion of the nourished beach. A monitoring and maintenance program after construction shall also be put into practice to increase durability.

Removal of the existing beach protection structures must be systematic allowing the revetment to start once clearing is done to prevent adequate time for the formation of deeper pits.

Only established transportation routes must be used to limit destruction and ensure reclamation is done at the end of each construction phase.

Continuous inspection and monitoring shall be carried out by the CMEU to evaluate the effectiveness of the structures in order to take timely actions in case of unwanted developments. Monitoring will determine effect of the structures on the environment (bathymetry, topography, etc.).

The CMEU will in the process carry out visual observations of the shoreline by means of walk over surveys, topographic survey of the dry beach, and bathymetric survey of the wet beach and foreshore.

Noise and vibration
Nuisance from noise and vibration is expected at the Project site during construction activities from operation of machines, piling of rocks, and the large influx or workers. At the base camp, maintenance activities including hitting, grinding and welding will create noise.

These impacts will affect wildlife, particularly at Bijilo Forest Park, sea life and birds, tourists lodging in nearby hotels and other daily users of the beach. Vibration may also cause the semi-permanent structures along the beach to settle or subside based on stability of the area.

Mitigation
Working hours must be limited between 8 a.m. and 6 p.m. Hotels will take measures to reduce impact by first allocating rooms further away from the beach where nuisance will be created and issuing notices to guests informing and apologising for the potential nuisance from beach upgrade.

The camp must not be situated next to Bijilo Forest Park where there exists open space to be potentially used.

Landscape and aesthetics
For the duration of the construction period of each erosion control intervention, the landscape and aesthetics of the area will be affected as the beach scenery is usually natural and calm when compared to the industrial-like nature of the site during the works.

The impacts will cover only the Project sites and shall be short term during the works. There is also potential for unsightly areas where construction, human and other waste are discriminately dumped.

Mitigation
Equipment not in use shall not be left on site although it is also discouraged to be moving heavy machinery around due to its associated impacts earlier mentioned. Therefore, it is important to plan and time activities such that movement is limited yet storage on site avoided.

The proposed waste management guide must also be implemented to avoid haphazard dumping. Furthermore, sanitation facilities must be provided for the workers to prevent them from using the beach and nearby land as toilets.

Aquatic ecosystems
Aquatic ecosystems will significantly be affected as a result of movement in the sea, particularly on the sea bed during construction of the breakwaters and offshore dredging of sand for backfilling the area for beach nourishment.

The site is not normally used for fishing although the sea bed is habitat for various other organisms. Hydrocarbon spills from marine equipment may also destroy spawning grounds or slow growth of sea life.

Operation of the Project structures and beach will not have any significant impact on fisheries and aquatic ecosystems. In fact the revetment and breakwaters will provide new and additional habitats, enabling the establishment of a more varied aquatic flora and fauna (enhancing bio-diversity), in an otherwise uniform beach coast environment.

Subsequent sedimentation will be too gradual to create major impacts at any point. Lack of disturbance during operation shall also allow natural adaption to the changes.

Mitigation
Activities offshore must be carried out with limited breaks to encourage quick adaptation and natural repair of the seabed.

Terrestrial Ecosystems
During development of the Project, noise from the works and workers may affect birds and wildlife in the area. Wildlife (particularly the monkeys) may run in fear from the safer sanctuary to more dangerous areas such as crossing the busy, adjacent coastal road to developed areas with risks of diseases and accidents.

The large influx of workers may access the nearby Bijilo Forest Park for food, water, chatting and sanitation purposes disturbing the natural setting of the Park. Too much disturbance and excessive movement of workers could lead to increased movement of the monkeys away from the forest to nearby hotels and residences in the neighbourhood.

Birds may also shift their routes causing tourists to miss out on bird watching experiences.

Mitigation
Mitigation for noise as earlier discussed shall address this issue by siting the camp away from the Park. The camp must also provide adequate sanitation facilities for workers to prevent them from invading the Park and hotel.

Bijilo Forest Park must be fenced to control and keep movement of wildlife, especially monkeys, within the Park.

Workers shall be restricted from the Park and informed of their expectations as part of the induction program before the works commence.

Agriculture and Livestock
There is minimal land used for subsistence agriculture near the Project site and no livestock rearing in the open. Therefore, the potential impacts are very low, unless indirectly if quarries are opened around fields.

The camp shall not encroach on farmland, and where rock materials are not imported, only approved sites shall be used.

Forests
Plantation in the nearby Bijilo Forest Park should not be affected for any reason during all phases of the Project. Limited vegetation may only be cleared for the base camp, or destroyed by heavy machinery or rocks.

Mitigation
The Camp site shall be chosen considering minimal clearance and re-vegetation done after decommissioning. Material and equipment shall be stored at the camp and not in various locations as shortcut.

Public health and safety
During the works, generation of dust may affect users, whilst noise nuisance will negatively affect relaxation and concentration of hotel guests on leisure or business, or as the case may be. Movement of vehicles and heavy machinery may slow traffic and cause accidents if not controlled.

Public users of the site and its surrounding are at risk of accidents after the works from potentially hidden structures at high tide, limited open access along the stretch of the revetment and slippery surfaces from algal growth on the rocks.

Poor waste management will encourage spread of waste materials along the beach with associated safety impacts and encouragement of pests in the area.

As the Project is located in the urban area where expertise for the proposed interventions is in abundance (unlike where workers are imported into the area, and confined), predicted risks associated with diseases such as sexually transmitted infections as a result of high influx of workers are insignificant. There is no need to import workers that reside away from home during the works, thus, workers can stay with their families.

Mitigation
Warning and safety signs must be used before commencement and during the works to inform and warn the public of risks, and means of avoidance. Waste shall be properly managed and movement controlled through flagmen and security guards restricting access.

Occupational health and safety
Offloading of very heavy boulders from trucks could cause the trucks to tilt dangerously and thus become potential hazards to workers on the site. Thus, accidents from equipment use, construction traffic, noise and dust may affect workers on the Project.

Likely ill health with low significance may also be evident if staff are overworked, or not qualified for delegated responsibilities. These will cause stress and increase in human error during work. The monitoring and maintenance teams may be at similar risk during operation.

Mitigation
Provision of first aid kits and training on their use is important. There is also a need for reporting incidents to address causes for preventing recurrence. Staff must be educated on health and safety including use of personal protective gear as in many instances they are not used even if provided.

To prevent accidents, constant supervision is essential to ensure safe work environment.

Land ownership and land use
The planned development will not require permanent displacement and relocation. Movable structures including stalls for fruit sellers, juice pressers, and hair dressers can be transferred outside the Project area during construction. As most of the area is currently not in use due to the erosion, the limited stalls will have to relocate thereby increasing competition in those areas and potentially reduced income.

Beach umbrella posts owned by the hotels may have to be removed to clear the site and once again there will be secondary impacts on land use in other areas that will be affected by future deposition or erosion due to this Project. Although there are uncertainties as to the rate and specific locations, further studies are suggested.

Mitigation
The Gambia Tourism Board must ensure that both temporary and permanent structures are within 150m of the shoreline where possible.

Consultations and awareness creation of affected hotels should continue to prepare them for potential land use changes that may be necessitated for sustainability.

Traffic
During construction, traffic will be disturbed as a result of frequent movement of Project vehicles. Access roads to the site may be degraded from heavy use and dirt creating potholes.

Mitigation
Flagmen shall control traffic and road repairs carried by the Contractor at the end of construction phases.

Public Services and Infrastructure
Domestic water and electricity services are not likely to be affected by the Project along the shore as activities will mainly be mechanical and carried out during daylight. The little electricity demand for the base camp and office use will not affect supply of the area. The need for water shall be at the camp only with no impact on surrounding supply.

Rainwater drains that are not constructed by the Project should be avoided to prevent erosion and accumulation of foul effluent at the emptying points to the sea.

Community Stability
Conflict may arise as a result of the choice of Project sites and boundary of interventions that may be complained by adjacent facilities with similar erosion problems.

Mitigation
Technical justifications must be readily provided to the public and land owners to gain support, and cooperation particularly in the long term.

Tourism / Culture / Archaeology
There are no sensitive sites of cultural or archaeological significance within the Project area. Tourism and cultural activities will instead be enhanced. As earlier mentioned, tranquillity and access to the beach for swimming and other activities will be controlled during the works.

Mitigation
Tourism facilities shall market alternative inland activities and trips to other beaches to compensate.

6.2 Evaluation of Impacts at Tanji Bridge Area

Table 17: Significance Evaluation Matrix of the Potential Impacts at Tanji Bridge Area

	ENVIRONMENTAL PARAMETER	POTENTIAL IMPACTS	Significance of Potential Impacts During Specific Phases/Activities			
			During construction of:		During Operation of:	
			Revetment	Dike	Revetment	Dike
PHYSICAL	Surface Water	Pollution of Tanji River from oil spills, waste, dust, and suspension of beach sand.	-2	-2	0	0
	Ground Water	Pollution from oil spills and over mining	-2	-2	0	0
	Air Quality / Climate	Dust and emissions from vehicles, and heavy machinery.	-2	-2	0	0
	Geology & Soils	Erosion; destruction from mining; sedimentation	-2	-2	-2 /+2	-2/+2
	Noise & Vibration	Noise and vibration nuisance from heavy vehicles, and machinery.	-2	-2	0	-1
	Landscape and Aesthetics	Waste and excess materials left on site.	-1	-1	0	-1
BIOLOGIC	Fisheries & Aquatic Ecosystem	Loss of aquatic live from water contamination; disruption of habitats	-2	-2	0	-1
	Terrestrial Ecosystem (Birds, Wildlife etc.)	Noise; invasion of large influx of workers	-2	-2	0	0
	Agriculture & Livestock	Agricultural land contaminated from oil spill; or encroached upon when locating camp; indirectly at, and around quarries.	-1	-1	0	0

AL	Forest & Vegetation	Mangrove clearance for the structures. Encroachment when locating camp; trampling on vegetation during works.	-1	-2	0	0
SOCIOECONOMIC	Public Health and Safety	Accidents; poor waste management; dust and noise nuisance	-2	-2	0	-2
	Occupational Health and Safety	Poor health from dust and noise; drowning; other accidents at work.	-2	-2	0	-1
	Land Ownership / land use	Land lost to future erosion / accretion.	-2	-2	+2	-2/+2
	Employment & Income Generation	Employment on Project works; in tourism; maintenance	+2	+2	+2	+2
	Communication / Transportation	Traffic disruption of main highway;	-2	-2	+2	+2
	Public services & infrastructure, drains	Protection of electricity pole, Improved drainage system	+2	0	+2	+2
	Economy	Improved economy directly and secondarily	+2	+2	+2	+2
	Community Stability / Vulnerable groups	Conflict resulting from choice of Project sites	0	+2	0	0
	Culture / Tourism /Archaeology	More security in tourism development activities;	-1	-1	+2	+2

6.2.1 Analyses of Potential Impact at Tanji

6.2.2.2 Potential Impacts and Mitigation of the Revetment and Dike

Potential Positive Impacts

- The river bank will be stable after the Project, and the main highway will be protected and saved from erosion.

- The protected road will be beneficial to the public, and economic activities that are conducted using the road will continue.

- After the Project, Nyanya's Beach Bar and Restaurant will be protected and will continue to contribute to the Gambian tourist industry, consequently increasing income for improved livelihood.

- The Project, during construction, will employ a large number of various experts and unskilled workers. Income generation is also expected for women who target food sales at workers as common in most major construction sites.

- The revetment and dike shall include properly designed drainage channels to allow free flow of rainwater and storm water from upland areas, and thus prevent erosion of the river bank and Nyanya's Beach Bar and Restaurant.

- The Project, during all phases, will enhance the economy from work related use of local construction firms, where possible and boost of the tourism industry as well as maintain free flow of goods and services between Kombo South and the major centers of Serekunda and Banjul, etc. during operation.

Potential Negative Impacts and mitigation

Surface water

During construction, there is potential for high significant impact on the quality of the sea water and around the Project site. The extent shall be high as there are no water boundaries, allowing polluted water to quickly and continuously spread with the water movement.

During stockpiling of the rocks and sand, transportation of materials along the road, digging activities to remove existing materials, and construction are likely to cause sand materials to be suspended in the water until after construction when eventual settlement of particles would take place.

There is also potential for water pollution by illegal waste dumping and hydrocarbon spillage from equipment in the water.

During operation, surface water dynamics will change but shall not affect water quality. The disturbed river bottom and sand shall, at an unnoticeable pace suspend in the water for deposition along the river system within years. During operation, maintenance activities may also cause similar impact on a lower scale.

Mitigation
As large quantities and different types of wastes are expected, a waste management plan for the Project shall be developed to include management of spare parts, used oils, felled mangroves and other trees, existing structures such as fence walls, and concrete structures.

Constant supervision of the works will ensure workers are careful in preventing spills, and minimising vegetation clearing.

The pollution of ground water is likely at the base camp from mismanaged hydrocarbons, and at secondary sites of rock and gravel extraction if the water table is exposed. The extent of pollution will be limited to the quarries although will be of long term duration if there is no intervention. With hydrocarbons spillage, high quantities may leach to the aquifer if clean-up is not immediate or particularly during rainy reasons.

During operation of the Project, there is no likely impact of significance on ground water.

Mitigation
At the base camp fuel, new and used oils shall be handled safely, stored and disposed of to avoid spills and leaks. Cesspools for sanitation purposes will be used and collected as necessary.

There are plans to import rocks for the Project; however, as the option to source these locally is still open, extraction sites and companies will need to be assessed before commencement and approval; companies will need to include reclamation plans which will be assessed. Permission shall be sought from NEA and Geology Department.

Air Quality
Once earth materials are moved around dust will be produced, and with high winds at the beach, the dispersion rate is high. Surrounding structures, human and animal livelihood will be affected by dust and sand particles in the air.

Emissions from onshore machinery and equipment will also be produced; however, these will be temporal during use of the equipment, and with less impact due to high dispersion by strong winds.

Air pollution is not expected during operation of the structures.

Mitigation
Equipment must be serviced regularly and run below the optimal as overloading strains the mechanisms that produce incomplete combustion. High quality oils must also be used to reduce dangerous air emissions.

Adequate and appropriate signs must be placed at strategic locations to prevent public activities that shall be affected by sandy winds. Information and consultations have already started and shall continue to inform road users of the impacts for their protection and avoidance of the Project site during construction.

Geology and soils
During all works localised, temporary erosion may occur due to soil disruption from the clearing and construction activities. Removal of nearby mangrove vegetation, and some of the Restaurant's defence structures will tend to develop pits that may cause water to accumulate and wash away surrounding sand.

There is also likelihood of compaction from the movement of heavy machinery. This shall create possibility for erosion once again and thus cause the road to be threatened.

Mitigation
A monitoring and maintenance program after construction shall be implemented to increase durability of the structures to protect the road and the Restaurant.

Only established transportation routes must be used to limit destruction and ensure reclamation is carried out at the end of each construction phase.

Noise and vibration
Nuisance from noise and vibration is expected at the Project site during construction activities from operation of machines, piling of rocks, and the large influx or workers. At the base camp maintenance activities including hitting, grinding and welding will create noise.

These impacts will affect wildlife, particularly at TBR, sea life and birds that feed on fish by the bridge during low tide.

Mitigation
Working hours must be limited between 8 a.m. and 6 p.m. The proprietor of Nyanya's Restaurant will take measures to reduce and/or avoid the impact by opening for business only outside the proposed time of 8 a.m. to 6 p.m., and issuing notices to customers informing and apologising for the potential nuisance caused by the works.

The base camp must not be sited next to the Restaurant.

Landscape and aesthetics
For the duration of the construction for both the revetment and dike, the landscape and aesthetics of the area will be affected as the scenery is usually natural and calm when compared to the industrial-like nature of the site during the works.

There is also potential for unsightly areas where construction, human and other waste are indiscriminately dumped. The impacts will cover only the project site and shall be short term, during the works.

Mitigation
Equipment not in use shall not be left on site although it is also discouraged to be moving heavy machinery around due to its associated impacts earlier mentioned. Therefore, it is important to plan and time activities such that movement is limited yet storage on site avoided.

The proposed waste management plan must also be implemented to avoid haphazard dumping. Furthermore, sanitation facilities must be provided for the workers to prevent them from using the beach and nearby land as toilet.

Aquatic ecosystems
The aquatic ecosystem will be affected as a result of the use and movement of heavy machinery and equipment particularly in the river during construction of the revetment and the dike.

The site is not usually a common fishing area although the bottom is habitat for various organisms. Hydrocarbon spills from the equipment may also destroy or disrupt feeding grounds of the birds that congregate on the site at low tide to feed.

Operation of the revetment and dike will not have any significant impact on fisheries and aquatic ecosystems. Subsequent sedimentation will be too gradual to create major impacts at any point. Lack of disturbance during operation shall also allow natural adaption to the changes.

Mitigation
Construction activities must be carried out with limited breaks to encourage quick adaptation and natural repair of the river bed.

Terrestrial Ecosystems
During implementation of the project, noise from the works and workers may affect birds and wildlife in the area. Wildlife may tend to run in fear from the safer sanctuary to more dangerous areas such as crossing the adjacent coastal highway to other areas with risks of and accidents and diseases.

The large influx of workers may access the nearby TBR for wild fruits, loitering, and sanitation purposes disturbing the natural setting of the Reserve.

Birds may also shift their routes causing tourists to miss out on bird watching experiences.

Mitigation
Mitigation for noise as earlier discussed shall address this issue by siting the base camp away from the Restaurant vicinity. The base camp must also provide adequate sanitation facilities for workers to prevent them from invading the Reserve.

Workers shall be restricted from the Park and informed of their expectations as part of the induction program before the works.

Agriculture and Livestock
There is minimal land used for subsistence agriculture close to the project site, and no livestock rearing in the vicinity of the project site. Therefore, the potential impacts are very low, unless indirectly if quarries are opened around fields.

The base camp shall not encroach on farmlands, and where rocks and boulders are not imported, only approved sites shall be used.

Forests
Plantation in the nearby TBR should not be affected for any reason during all phases of the project. Limited vegetation may only be cleared for the base camp or destroyed by heavy machinery or boulders and rocks.

Mitigation
The site for the base camp shall be chosen considering minimal clearance, and re-vegetation carried out after decommissioning. Material and equipment shall be stored at the camp and not in various locations as shortcut.

Public health and safety
During the works, dust production may affect users, whilst noise nuisance will negatively affect clients and customers in nearby facilities such as the Nyanya's Beach Bar.

Movement of vehicles and heavy machinery may slow traffic and cause accidents if not controlled.

Public users of the site and its surrounding are at risk of accidents after the works from potentially hidden structures at high tide, limited open access along the stretch of the revetment and slippery surfaces from algal growth on the rocks.

Poor waste management will encourage spread of waste materials along the road side with associated safety impacts and encouragement of pests in the area.

Mitigation
Warning and safety signs must be used before commencement and during the works to inform and warn the public of risks and means of avoidance.

Waste shall be properly managed, and movement controlled through flagmen and security guards restricting access as necessary.

Occupational health and safety
Accidents from equipment use, construction traffic, noise and dust may affect workers on the project. Likely ill health with low significance may also be evident if staff are overworked or not qualified for delegated responsibilities. These will cause stress and increase in human error during work. The monitoring and maintenance teams may be at similar risk during operation.

Mitigation
Provision of first aid kits and training on their use is important. There is also need for reporting incidents to address causes for preventing recurrence.

Staff must be educated on health and safety including use of personal protective gear as in many instances they are not used even if provided.

To prevent accidents, constant supervision is essential to ensure safe work environment.

Land ownership and land use
The planned development will not require permanent displacement and relocation. The remoteness and unsuitability of the site of the revetment does not allow for any form of land use besides occasional anglers potentially operating from it.

As the dike is to be located close to Nyanya's Restaurant the use of the facility will have to abide by the proposed timing of construction activities. By and large the disruption will be only temporary.

Mitigation
Consultations and awareness creation of affected community members and proprietor of the restaurant should continue to prepare them for potential disruptions that may be necessitated for sustainability of the works.

Traffic
During construction, traffic will be disturbed as a result of frequent movement of project vehicles.

Mitigation
Flagmen shall control traffic, and road repairs carried by the Contractor at the end of construction works.

Public services and infrastructure
Domestic water services are not likely to be affected by the project along the road as activities will mainly be mechanical. However, due to the close proximity of the NAWEC pole to the construction activities electricity services will likely be affected should the pole be disturbed.

The need for water shall be at the base camp only, with no impact on surrounding supply, as the Restaurant is serviced by a borehole within the premises. The electricity demand for the base camp and office use (relative little) will not affect supply of the area.

Mitigation
The main water supply pipe that supplies the Region should be avoided to prevent its damage. In addition the NAWEC pole should be avoided.

Tourism / Culture / Archaeology
There are no sensitive sites of cultural or archaeological significance within the Project area. Tourism and cultural activities will instead be enhanced. Tranquillity and access to the construction site for swimming, angling, canoe repairing, and other activities will be controlled during the works.

Mitigation
Consultations and awareness creation should continue to get the support and cooperation of the users of the site; besides the impact is only for a short term.

7: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

7.1 MATRIX ON MITIGATION OF IMPACTS RELATED TO SENEGAMBIA/KOLOLI BEACH

Table 18: Potential Impacts and Corresponding Mitigation Measures for Senegambia/Kololi Beach Activities

Activity	Potential Negative Impacts	Mitigation Measures	Responsibility for Mitigation	Responsibility for Monitoring	Timeframe	Budget (US$)
DURING WORKS ON THE REVETMENT, BREAKWATERS AND BEACH NOURISHMENT						
Camp setup and operation	Disturbance of wildlife in Bijilo Forest Park	Locate camp away from the Park to prevent noise and risk of invasion by workers	Contractor	NEA	Before works commence	
		Workers sensitized on the Park importance and restrictions	Contractor	NEA	Before works commence	ESMP awareness budget - **10,000**
	Encroachment on land used for agriculture affecting women	Avoid agricultural land or compensate if inevitable	Contractor	NEA with support from DPPH / *DLS*/DOA	Before works commence	Contractor's budget

	subsistence farmers					
	Vegetation clearance for the camp	Re-vegetate the site.	Contractor	NEA	After camp decommissioning	Contractor's budget
Deposition of sand and rocks for stockpiling and during works on the beach protection structures.	Soil compaction along routes of heavy vehicles and machinery.	• Use only specified routes. • Repair access roads with evidence that destruction is due to the Project activities.	Contractor	NEA / MoWCTI	During works	Contractor's budget
Sourcing of raw materials.	Seabed disturbance from dredging.	All dredging activities to be carried out at once to allow regeneration of the seabed.	Contractor	NEA / MoWCTI	During works	Not applicable
	Quarrying impacts on geology, landscape, ground water and agriculture.	All local sites and companies for extraction of earth materials must be approved.	Suppliers.	Contractor, NEA and Geology Dept	Before quarrying	Not applicable
All activities	Noise nuisance and emissions of air pollutants.	• Regular maintenance and routine servicing of equipment and machinery. • Use high quality fuel and oils. • Equipment must not be overloaded, overused.	Contractor	Daily by Contractor supervisors and periodically by NEA.	During works.	Contractor's budget.
		• Fencing of Bijilo Forest Park to prevent movement and indirect loss of wildlife due to noise.	DPWM	NEA	At commencement of works.	**30,000.00**

	Effects on land, water, fauna, and public health from improper management of waste and excess material.	• Waste management guide specified for the Project.	Contractor	NEA	Before works commence.	Contractor's budget.
		• Liquid and solid waste must be collected and stored for disposal or treatment at approved sites as per guide.	Contractor through all its workers.	Daily by Contractor supervisors and periodically by NEA.	During the works.	Contractor's budget.
	Risks on public safety from accidents, and access to equipment and stockpiled rocks.	• Restrict and monitor public access to the site. • Provide adequate information to the public.	Contractor, hotels, Project Coordinator, GTB	Contractor supervisors, hotel managers, and NEA.	Before and during the works.	**20,000.00**
		• Install warning and safety signs at strategic locations.	Contractor, hotels	NEA and GTB.	At commencement of works.	**10,000.00**
	Poor health and safety of workers.	• Provide adequate safety information and personal protection equipment such as safety boots, hats, ear protectors and goggles. • Constant supervision to ensure the works are as planned. • Allow frequent staff breaks to improve	Contractor	NEA	During works.	Contractor's budget

		concentration and prevent human errors.				
		• Provide induction and training on safety plus other relevant ESMP requirements.	Project Coordinator	NEA	Before commencement of works.	ESMP awareness budget
	Lack of employment and related effects on development.	Employ Gambian engineers where the expertise is available and local unskilled workers.	Contractor	NEA	Before commencement of works.	Not applicable
THE BREAKWATERS						
Lack of resources to build the breakwaters	Mobilise funds to construct breakwaters	NEA/UNDP (Green Climate Fund)	MEWRCFW NEA/UNDP	Immediately	Funding to be sought	Not Applicable
DURING OPERATION (POST WORKS) OF REVETMENT, BREAKWATERS ANDE NOURISHED BEACH						
Daily use of the revetment, breakwaters and nourished beach	Potential accretion or erosion on other areas along the costs	• Ensure the breakwaters are constructed on time.	Project Coordinator	NEA	During second phase of the Project	Funding to be sought
		• Suggest further studies on the potential impact and magnitude plus appropriate measures	Project Coordinator	NEA	After construction	Funding to be sought
Monitoring	Risks to health of the monitoring team	• Provide training and safety information. • Provide personal protective equipment.	Monitoring coordinator	NEA	During operation in the long term	**15,000.00**
Maintenance	Risks to health of the maintenance teams	• Provide training and safety information.	Monitoring coordinator	NEA	During operation in the long term	Maintenance budget

		• Provide personal protective equipment.				
	Impacts on biophysical and socioeconomic environment based on the activity	• Mitigation as per suggestions in the construction phase based on activity	Monitoring coordinator	NEA		Maintenance budget
New /expansion of existing developments	Land destruction from locating structures along the beach	• Licences must not be issued for structures within 150m of shoreline and where it exists	GTB	NEA	During operation in the long term	Not applicable
		Develop policies and enforce coastal/marine environment management regulations. Enforce adopted rules and commitments as agreed by Hotels' Committee	CMEU/NEA Hotel Association	NEA Hotel Association /NEA	During operation in the long term	**5,000.00** Not Applicable
					TOTAL	**90,000.00**

7.2 MATRIX ON MITIGATION OF IMPACTS RELATED TO TANJI BRIDGE AREA ACTIVITIES

Table 19: Potential Impacts and Corresponding Mitigation Measures for Tanji Bridge Area Activities

Activity	Potential Negative Impacts	Mitigation Measures	Responsibility for Mitigation	Responsibility for Monitoring	Timeframe	Budget (US$)
Camp set up and operation	Traffic disruption due to the highway's nearness.	• Employ flagmen to control the Project related traffic.	Contractor	Daily by the contractor's supervisor and NEA periodically.	During the works.	Contractor's budget
	Vegetation clearance for the camp.	Re-vegetate the site.	Contractor	NEA	After camp decommissioning	Contractor's budget
	Disturbance of nearby Tanji Bird Reserve.	• Locate camp away from the Reserve to prevent noise and risk of invasion by workers. • Workers sensitized on the Reserve importance and restrictions.	Contractor	NEA	Before works commence.	ESMP awareness budget - 5,000
Deposition of rocks during stockpiling	Soil compaction along routes of heavy vehicles and machinery.	• Use only specified routes. • Repair access roads destroyed by the works.	Contractor	NEA / MoWCTI	During works	Contractor's budget
Sourcing of raw materials	Quarrying impacts on geology, landscape, ground water and agriculture.	All local sites and companies for extraction of earth materials must be approved.	Suppliers.	Contractor, NEA and Geology Department.	Before quarrying	Not applicable
All activities	Noise nuisance and emissions of air pollutants.	• Regular maintenance and routine servicing of equipment and machinery. • Use high quality fuel and oils.	Contractor	Daily by Contractor supervisors and periodically by NEA.	During works	Contractor's budget

		• Equipment must not be overloaded, overused.				
	Effects on land, water, fauna, and public health from improper management of waste and excess material.	• Waste management guide specified for the Project.	Contractor	NEA	Before works commence.	Contractor's budget
		• Liquid and solid waste must be collected and stored for disposal or treatment at approved sites as per guide.	Contractor through all its workers.	Daily by Contractor supervisors and periodically by NEA.	During the works.	Contractor's budget
	Risks on public safety from accidents, and access to equipment and stockpiled rocks.	• Restrict and monitor public access to the site. • Provide adequate information to the public.	Contractor, tourism facilities nearby, Project Coordinator, GTB	Contractor supervisors, hotel managers, and NEA.	Before and during the works.	10,000.00
		• Install warning and safety signs at strategic locations.	Contractor, hotels	NEA, NRA and GTB.	At commencement of works.	5,000.00
	Poor health and safety of workers.	• Provide adequate safety information and personal protection equipment such as safety boots, hats, ear protectors and goggles. • Constant supervision to ensure the works are as planned. • Allow frequent staff breaks to improve concentration and prevent human errors.	Contractor	NEA	During works.	Contractor's budget.

		• Provide induction and training on safety plus other relevant ESMP requirements.	Project Coordinator	NEA	Before commencement of works.	ESMP awareness Budget
	Lack of employment and related effects on development.	Employ Gambian engineers where the expertise is available and local unskilled workers.	Contractor	NEA	Before commencement of works.	Not applicable.
	Destruction of mangroves and carrying habitats.	• Only mangroves on the exact construction sites will be removed.	Contractor	NEA	During construction.	Not applicable.
		• Compensate by re-vegetating nearby areas.	Community	Department of Forestry / NEA	During construction.	20,000.00
DURING OPERATION (POST WORKS) OF REVETMENT AND DIKE						
Daily use of revetment and dike	Potential flooding behind the dike the rainwater outlet from Nyanya's Beach facility	• Construction of gates to naturally allow flow in either direction as required	Contractor, Project Coordinator	NEA and the MoWCTI	During design and construction	Contractor's budget
		• Provide and operate a pump for use at high tides during heavy rain	Contractor, Project Coordinator	NEA and the MoWCTI	After construction	40,000.00 and contribution
	Potential accretion or erosion on the opposite side of the Tanji River	• Suggest further studies on the potential impact and magnitude plus appropriate measures	Project Coordinator	NEA	After construction	Funding to be sought
Monitoring	Risk to health of the monitoring team	• Provide training and safety information. • Provide personal protective equipment.	Monitoring coordinator	NEA	During operation in the long term.	Project monitoring team (same one for Kololi Beach).
Maintenance	Risk to health of the maintenance teams	• Provide training and safety information. • Provide personal protective equipment.	Monitoring coordinator	NEA	During operation in the long term.	Maintenance budget
	Impacts on biophysical and socioeconomic	• Mitigation as per suggestions in the construction	Monitoring coordinator	NEA		Maintenance budget

	environment based on the activity.	phase based on activity.				
New/ expansion of existing developments	Land destruction from locating structures along the beach.	• Licenses must not be issued for structures within 150m of shoreline where it exists.	GTB	NEA	During operation in the long term	Not applicable
					TOTAL	**80,000**

CHAPTER 8: ENVIRONMENTAL COMPLIANCE MONITORING

8.1 Effective Monitoring of the ESMP

Table 20 indicates the monitoring program of ESMP implementation. This exercise is essential in ensuring that the project is environmentally sound, by checking that the recommended mitigation measures have been carried out effectively in a timely manner. Monitoring also helps in evaluating whether the measures recommended are adequate in preventing, reducing or compensating the identified negative impacts. Efficiency of those responsible for the ESMP implementation and the proposed structures should also be reviewed and the necessary changes made accordingly.

The main issues to be monitored include activities that have been earlier identified to have potential significant negative impacts on environmental and socio-economic parameters, and corresponding mitigation. Monitoring and evaluation of the ESMP will be mainstreamed in the general monitoring system of the Project at various levels.

The Project Coordinator, Contractor, GTB, MoWTI and the NEA all have monitoring responsibilities. NEA has the overall monitoring role of the ESMP implementation. Notwithstanding, the hotels and general public also have monitoring roles by reporting issues to the NEA for addressing. Sensitisation on the ESMP before the Project commencement shall ensure consistency in understanding roles and responsibilities of each stakeholder.

It is the responsibility of the Project Coordinator to ensure that all involved stakeholders are facilitated to monitor the ESMP implementation based on the Plan.

Table 20: Monitoring Programme for the ESMP Implementation

Mitigation Measure	Responsibility for monitoring	Monitoring Frequency	Monitoring Timeframe	Monitoring Indicators	Budget (US$)
Senegambia/Kololi Beach					
DURING WORKS ON THE REVETMENT, BREAKWATERS AND BEACH NOURISHMENT					
Locate camp away from Bijilo Forest Park	NEA, MoWTI	Once, or as required if there are breaches	Preparation stage for construction	Camp located away from the Park	**200**
Avoid farmlands	NEA/**DPPH/**	As above	As above	No. of farmlands avoided	**100**
Re-vegetation	NEA, DOF	Twice, for a month	After the camp decommissioning	Area/Size of land that has been re-planted	**20**
Heavy vehicles to only use approved routes to reduce compaction	NEA, MoWTI	Weekly (visit to sites)	During all phases of works	Number of vehicles using approved routes	30
Flagmen to control traffic	NEA, MoWTI, NRA	Weekly	During all phases of works	No. of flagmen No. of traffic accidents related to the Project	**0**
Repair damaged road	NEA, MoWCTI, NRA	Weekly	At the end of construction phase	No. of roads repaired No. of repairs made on the road	**0**
Carryout dredging activities in as short a time as possible to allow regeneration of seabed	NEA / MoWCTI	Weekly	During collection of materials for nourishment	Number of dredging activities carried out	**0**
Quarries assessed and approved before use	NEA/GD/Contractor/MoWTI	Weekly	Prior to commencement of the works	No. of applications and approvals from NEA, GD No. of quarries approved	**0**
Regular maintenance of vehicles and equipment	Contractor/Supervisors NEA/MoWTI	Daily by contractor, Weekly by NEA, MoWTI	During all phases of the works	No. of maintenance records	**30**
Use high quality oils and lubricants	Contractor supervisors, MoWTI, NEA,	Daily by contractor, Weekly by NEA, MoWTI	During the works	Quantity of high quality oils and lubricants used or procured	**0**
Vehicles must not be overloaded	Contractor supervisors / NEA, MoWTI	Daily by contractor,	During the works	No. of vehicles not overloaded	**0**

		Weekly by NEA, MoWTI		No. of vehicles overloaded	
Fencing Bijilo Forest Park	NEA, MoWTI, DOF	Weekly	At start of Project	No. of metres of Forest Park fenced	**200**
Prepare a waste management guide	NEA	Weekly	At start of Project	Waste management guide available	**0**
All waste collected, stored and disposed of properly	NEA	Daily by contractor, Weekly by NEA	During all phases of works	Collection and disposal records No. of reports on the process No. of illegal dump sites	**0**
Restrict public access to the sites	Contractor supervisors/hotel managers, NEA, MoWTI	Daily by contractor and hoteliers Weekly by NEA, MoWTI	During all phases works	No. of safety signs put up No. of non-Project related people sighted in the Project area No. of accidents to the public recorded	**0**
Raise public awareness on the project activities	Contractor/supervisors/NEA/ hotel managers/MoWTI	Monthly	During the works	No. of sensitization activities programmes, carried out	**100**
Provide safety information, training and protection for workers	NEA, MoWTI,	Quarterly	During the works.	No. of training sessions conducted No. staff accidents recorded No. of reports on the process	**0**
Constant supervision	NEA / MoWCTI,	Weekly	During the works	No. of recorded accidents and oils spills	**0**
Flexible staff timetable	NEA	Weekly	During the works	No. of sick days	**0**
ESMP sensitization	NEA	Once	At the start of Project	No. of workshops No. of community meetings	**1,000**
Employ local community members	NEA, MoWTI	Weekly	During all works	No. of local staff employed	**0**

RESOURCE MOBILIZATION FOR BREAKWATERS					
Fund mobilization for phase II (build breakwaters)	NEA, MoWTI, UNDP	Monthly progress on fund raising	Within 5 years of Phase I	Amount of funds acquired	**0**
OPERATION AND MAINTENANCE OF REVETMENT AND NOURISHED BEACH					
Carry out further studies on potential sand erosion/accretion on these and other areas	NEA	Monthly progress	Post Construction	No. of studies carried No. of sites studied	**0**
Hotels must ensure all drainage passes through the system built by the Project	GTB, NEA, MoWTI	Weekly	After construction of the revetment	No. of illegal drains No. of re directed drainage outlets	**30**
Suggest further studies to build a well-designed drainage system to control storm water from higher ground.	NEA	Monthly	Immediately	Progress Reports Studies conducted	0
Provide safety information, training and protection for the monitoring team	NEA	Biannually	During operation	No. of trainings conducted No. of accidents reported	**200**
Provide personal protection for the monitoring team	NEA	Monthly.	During operation of the Project, before long term monitoring	No. of accidents recorded No. of protective gears	**0**
Provide safety information, training and protection for the maintenance teams	NEA	Biannually.	During operation	No. of trainings conducted No. of accidents reported	**200**
Provide personal protection for maintenance teams	NEA	Monthly	During operation	No. of trainings conducted No. of protective gears	**0**
Licenses in the TDA must not be issued for structures within 150m of shoreline	NEA	Monthly	During operation	No. of applications No. of licenses issued/ rejected	**0**
Develop and enforce policies/regulations	NEA	Monthly	During operation	Coastal management policies available	**0**

on sustainable coastal management				Regulations available No. of convictions	
Develop and enforce rules and commitments as agreed by Hotels' Committee	Hotel Assoc. CMEU/NEA	Monthly	During operation	Rules and regulations available	**0**
TANJI: (Based on the above, with specific impacts highlighted here)					
Locate camp away from Tanji Bird Reserve	NEA, MoWTI	Once, or as required if there are breaches.	Preparation stage for construction.	Camp located outside TBR	**200**
Only mangroves on the exact construction site will be removed	NEA, DPWM, DOF	Weekly	During the works.	Area/size of mangrove vegetation	**200**
Construction of gates at the dike to allow flow of water in either direction	NEA / MoWCTI	Weekly	During final designing and construction of dike	No. of gates appropriately constructed to allow c flow of water in either direction	**0**
Provide and operate a water pump for use during high tides	NEA / MoWCTI	Immediately and quarterly	At end of construction stage	A pump is provided and used	**0**
Total					**60,240**

NB: The monitoring budget was calculated on a weekly basis for an expected Project period of six months.

8.2 Reporting

Effective communication within NEA, and between and amongst NEA and other stakeholders is essential. Monthly reporting of monitoring is recommended from NEA. The evaluated reports shall be used to facilitate immediate improvement, where necessary, considering the short duration of the Project.

The Project monitoring team shall continuously ensure that reports from the EMSP monitoring are taken into account.

8.3 Environmental Auditing

Environmental auditing is a systemic review of the activities against the ESMP. Part VI of the EIA Regulation, 2014, makes provisions for self-audit and audit by the NEA to ensure

the ESMP is implemented as planned, and identify potential impacts that have arisen due to any change in activity.

8.4 Cost Estimation for Implementation of the ESMP

To ensure that the mitigation measures in the ESMP are fully implemented, training and capacity building of personnel, and sensitisation on the issues are essential in addition to constant monitoring. Total cost of the ESMP implementation is indicated in **Table 21** below.

Table 21: Estimated Cost of ESMP Implementation

Item	Budget ($US)
ESMP mitigation measures	170,000
Monitoring ESMP implementation	60,240
Environmental auditing	10,000
Capacity building	154,200
Total ESMP implementation Budget	**394,440**

CHAPTER 9: IMPLEMENTATION ARRANGEMENTS

Implementation arrangements in both sub projects will be the same; consequently the proposed arrangement is for both the Senegambia/Kololi and the Tanji Bridge area.

9.1 Stakeholder Analysis - Roles and Responsibilities of Agencies

9.1.1 National Environment Agency (NEA)

As the holder of the national environment policy, the NEMA and its supporting legislation NEA will be responsible for overall coordination of the implementation of the ESMP and other safeguard instruments.

It will be responsible for ensuring compliance with NEMA and the various attendant legislation, as well as monitoring implementation of the ESMP through the Coastal and Marine Environment Unit (CMEU) located within NEA. Specifically NEA will appoint a focal person (the CME Program Officer, presumably) to be responsible for the day to day supervision and monitoring of implementation of the ESMP through the CMEU (currently understaffed).

However, the technical capacity of NEA is generally inadequate, especially with regard to technical skills, equipment and materials. It is therefore recommended to build the capacity of the institution to enhance its effectiveness. A manual produced by the EU-

funded GCCA Support Project in November 2014 could be used in the process of capacity enhancement of the CMEU.

Materials and equipment necessary for effective monitoring of ESMP implementation, as well as carry out routine coastal inspections include profiling rods, measuring devises, compasses, etc. A detail list is provided in Annex 3. In addition data useful for erosion control projects that could be collected by the CMEU is indicated in Annex 4.

The Agency is represented in all the regions of the country including the Governor's Office in Brikama, WCR. Ideally the ANR/EIA sub Committee of the TAC in WCR should oversee the implementation of this ESMP at the two sites since they are both within the WCR. However, due to the obvious low capacity of NEA's regional offices across the country, the CME Program Officer at NEA Kanifing will continue to support the coordination efforts of the ANR sub-committee of the TAC in Brikama, WCR (headed by the REPO).

Further support, in the form of application of ESIA principles, will be provided to the CEMU by the EIA Program (also located at NEA), as well as other related NEA-based Programs to monitor ESMP implementation.

9.1.2 The Integrated Coastal Zone Management (ICZM) Working Group

Located at NEA this multi sector Working Group will be the oversight body to review reports prepared by the CMEU (supported by the PO, EIA) on progress of project implementation.

Coordinating with the EIA Working Group, the ICZM Working Group will address issues arising from the reports to facilitate implementation. The ICZM Working Group comprises the following member institutions:

National Environment Agency (Secretariat)	Department of Physical Planning and Housing
Department of Water Resources	Geology Dept.
Department of Fisheries	Department of Forestry
National Roads Authority	Department of Livestock Services
National Disaster Management Agency	Gambia Ports Authority
Gambia Transport Association	Ministry of Energy
The Association of non-Governmental Org.	Gambia Maritime Administration
Gambia Fire and Rescue Services	Ministry of Works, Transport and Infrastructure
Kanifing Municipal council	Banjul City Council
Brikama Area Council	Department of Parks and Wildlife
Gambia Tourism Board	Gambia Navy

Ministry of Environment, Water Resources, Climate Change, Forestry, and Wildlife

9.1.3 Ministry of Works, Transport and Infrastructure (MoWTI)

The Ministry of Works, Transport and Infrastructure is responsible for implementing all civil works of the government. Where implementation of civil works are undertaken by another entity, the Department of Technical Services coordinates with the implementers on behalf of Government.

Effectively, MoWTI will therefore be responsible for overseeing the implementation of the civil works of the two sub projects, as it did in the Coastal Protection Project in 2003/4. It is a member of the ICZM WG, and will be coopted into the CMEU to offer advice on technical issues related to the implementation of the civil works component of the ESMP.

A focal person (an Engineer, preferably) will be appointed to work in close collaboration with the CMEU at NEA to support the Unit. Specifically, the MoWTI will ensure the following:

i. that the engineering designs incorporate engineering solutions to address the potential socio-economic and environmental impacts and risks identified in this ESMP, where possible

ii. that all mitigation measures proposed in all phases of project implementation are integrated into the construction bidding documents and contracts

iii. that the Contractors will implement the environmental mitigation terms and conditions contained in their construction contracts, properly and effectively. These include:

- Preparation of specific safeguard policy implementation plan to submit to NEA for consideration and approval before construction commences
- Displaying information, sufficiently and timely about the construction activities
- Complying with the environmental safeguard policies during all phases of project implementation
- Together with NEA to address any complaints and/or grievance

The Ministry's focal person to the project will monitor and make daily notes about the Contractor's compliance with the safeguards, and to report to the Ministry and NEA.

9.1.4 The Gambia Hotel Association

This is the apex body representing the hotels in the country generally, and in particular the individual hotels directly affected by the project. The role of this body will include maintaining close observation of project implementation, (beginning from construction phase), noting and reporting to NEA/CEMU observations on perceived dynamics, etc. of the beach and other infrastructure built by the project (post project implementation).

In this regard it will be beneficial if the Hotel Association (in particular, the relevant hotels in this project) would form a "Monitoring Unit or Organ" comprising 1 or 2 representatives from each of the four hotels; their role and responsibility will be to monitor not only their individual beach fronts, but indeed the entire stretch of the rehabilitated beach.

All the four hotels should endeavor to develop and operate within set rules and guidelines that they all agree upon. They should take collective decision and unified action to effect any protective work (in collaboration with the relevant government institutions) on the structures, rather than taking individual measures to address issues of common concern.

As the saying goes, *"You put your mouth where your money is*", funding for the operations of this Organ will be provided through contributions from the respective hotels based on some agreed formula. In addition they would be urged to seek and exchange knowledge and experience with the contractors implementing the works on the beach.

9.2 Institutional Capacity Enhancement Plan

The assessment of the potential impacts of the project highlighted the interventions required to remedy those impacts in order to prevent them from manifesting themselves. It is important to note the composition of the ICZM WG and the EIA WG (see section 9.1.2 above). All these government institutions and offices are under-resourced.

During the studies it became evident that the focal institutions are in most cases presently overwhelmed by their current responsibility, and are trying to cope with limited human and technical resources. Their current capacities are inadequate to efficiently monitor and ensure implementation of the ESMP. There is therefore need to progressively develop their respective capacities through various ways and means, as indicated in Table 22 below. The plan covers the need for both the Senegambia and Tanji Bridge subprojects.

Table 22: Capacity Enhancement Plan for Effective ESMP Implementation

No.	Identified Activity	Expected Output	Beneficiary	Estimated Cost (US $)
Institutional Capacity – Equipment and Materials				
1	Conduct analysis of samples	Laboratory equipment and; reagents; field testing equipment available	NEA, the EIA/ ICZM Working Groups	10,000
2	Monitoring of project sites to ensure compliance with ESMP	Field kits provided (details in Annex 2)	CMEU/NEA MoWTI	80,600
3	Procure appropriate transportation for enhanced mobility (6 motor cycles x 2600)	Ability to carry out field inspection built	CMEU/NEA and MoWTI	15,600
Institutional Capacity – Technical Skills Development and Awareness Creation				
4	Develop capacity of CMEU to monitor illegal discharges; collect and analyze discharges; conducting in-situ tests on discharges	Capacity built in monitoring and analysis	CMEU	5,000
5	Strengthen the capacity of the ICZM and EIA Working Groups and other actors in managing the EIA process	Capacity built in EIA Impact assessors and auditors trained in EIA A platform for sharing information/experiences and maintaining high EIA standards is formed	NEA, EIA/ ICZM WGs	10,000
6	Sensitization to raise awareness on coastal management issues	Increased awareness of sustainable coastal zone management	ICZM/EIA WGs	3,000
Development of Policy and Legal Framework				
7	Develop relevant coastal zone management policies	Relevant policies on sustainable coastal zone management developed	All operators within the coastal zone	10,000
8	Develop a national master plan for integrated coastal zone management	A National Master Plan developed	All operators within the coastal zone	10,000
9	Develop supporting legal instruments for effective enforcement of legal framework	Relevant regulations and legal framework developed	All operators within the coastal zone	10,000
			Total Cost	**154,200**

CHAPTER 10: CONCLUSIONS AND RECOMMENDATIONS

This study has determined that the Atlantic coast of the Gambia is one of the most economically active in the areas of tourism, fisheries, sand mining for construction, and trade. The unregulated development and uncontrolled exploitation of the resources, compounded by the effect of climate change over the years, have had a negative environmental and social impact on this important area.

However, the proposed beach protection works at both the Senegambia/Kololi Beach area, and at the Tanji Bridge area will create ecological protection of the beach front of the targeted hotels, and the main coastal highway against erosion and significant associated socioeconomic benefits.

The implementation of the works at all stages will have varying levels of negative impacts that will be mitigated through this ESMP to strike a balance between development and environmental protection. However, it is important to note that to a large extent, this is dependent on the level of preparedness and competence (in terms of technical skills, and availability of the required equipment and materials) of the implementing institutions. Among other issues, the study identified the following constraints that need to be addressed:

1. Capacity Enhancement

Specifically, the study revealed serious capacity weaknesses at all the important institutions whose roles are critical to the successful implementation of the planned interventions; for example, the entire membership of the ICZM WG, and by extension the NEA are under resourced. The responsible institutions are presently overwhelmed by their current responsibility. The key handicaps are:

iv. Inadequate expertise in environmental management, and low capacity in EIA at all levels of government

v. There is limited pollution discharge monitoring and analysis due to lack of equipment

vi. Inadequate capacity to conduct monitoring exercises due to lack of equipment

Recommendation: In view of the above, it is strongly recommended that the issues listed above be addressed as soon as possible to enable the institutions to function effectively.

2. Strengthening the Legal Infrastructure

The NEMA established TACs and TWGs to support NEA in GEAP implementation. NEMA places exclusive responsibility for the management, control and regulation of the coastal area within the regulatory regime of NEA (certain sections empower NEA to make regulations and guidelines for management of these areas), but there is no law yet to that effect.

The only action undertaken by NEA in this regard is the establishment of the TWGs, including the ICZM WG. This body, and the CMEU are essentially weak and need to be strengthened to enforce coastal zone management strategies and regulations. With the required regulations the CMEU within the NEA could be more effective, to ensure compliance with particularly, regulations that deal with coastal protection and use of coastal resources.

Recommendation: The existing legal and institutional infrastructure should be critically reviewed, and recommendations for improvement made to include, among other things:

- New framework law, normative acts and regulations
- Purchase of equipment
- Capacity building and human resources development

3. Waste Management

Issues of waste management have been highlighted as potentially creating negative impacts, especially liquid effluent and discharges into the environment from inside the hotels into the drains. In addition, solid waste will obviously be generated as a result of the works, which should be handled in a manner consistent with good environmental practice. However, the national Waste Management Bill, drafted since 2007 is yet to be enacted to address such issues. Its enactment is long overdue.

Recommendation: In view of the importance of this piece of legislation, it is strongly recommended that the Bill be passed as soon as possible in order to protect and safeguard the integrity of the environment.

4. Need for Creation of Monitoring Body by Hotels

It was learned that Senegambia Beach Hotel does monitor its beach front regularly and sends reports/photos to NEA and UNDP to apprise them of the situation from time to time. This is a good idea, and the management has indicated that it will continue to do this even after the planned works have been completed.

To protect their beach fronts, the individual hotels each employed one form of protection or another as described above, and the effect has been dismal; the remnant of the beach is cluttered with debris, torn sand bags, half-buried boulders and concrete, etc. making the beach unsightly and a hazard to walk on.

Recommendation: Rather than take individual measures to address issues of common concern, it is strongly recommended that all the four hotels, (and indeed all users of the beach) operate on the beach within set rules and guidelines that they all agree upon. They will take collective decision and unified action to effect any protective work (in collaboration with the relevant government institutions) on the structures.

There is need for the Association (or at least those hotels whose beachfronts are being reclaimed) to form a “Committee” or “Body” to monitor their entire beach fronts, and report regularly to NEA on the results.

In close collaboration with NEA and other relevant institutions in Government (such as the MoWTI) the national coastal management laws will be applied in support of the rules and guidelines developed by the Hotel Association.

5. Sequencing of the Various Works

Three different interventions have been proposed for implementation at the Senegambia/Kololi area prioritized as follows:

i. Revetments
ii. Beach nourishment
iii. Four detached breakwaters

However, due to financial constraints construction of the breakwaters may be delayed pending the availability of funds, in which case the revetment and nourishment will be undertaken before construction of the breakwaters. This will have potential negative implications especially as the predictions have indicated that the breakwaters must be constructed within 5 years, if the two systems are to function effectively, and to last for the predicted period of 30 years.

Recommendation: In this regard, it is strongly recommended that the NEA begins to vigorously seek the required funds to enable the construction of the breakwaters. One possible source is the “Green Climate Fund” which essentially is focused on mitigation and adaptation. In addition NEA should continue to seek funding for repair works that would have been identified, or as they are needed.

6. Environmental Auditing

Environmental auditing is a systemic review of the activities against the ESMP as required by NEMA, and Part VI of the EIA Regulations makes provisions for self-audit and audit by the NEA to ensure the ESMP is implemented as planned. This system is susceptible to flaws.

Recommendation: It is recommended that an independent environmental auditor be contracted to undertake a midterm performance review to prevent bias in reporting, and recommend any necessary corrective measures on time. The audit shall include review of the ESMP implementation, recommended monitoring and reporting at all levels.

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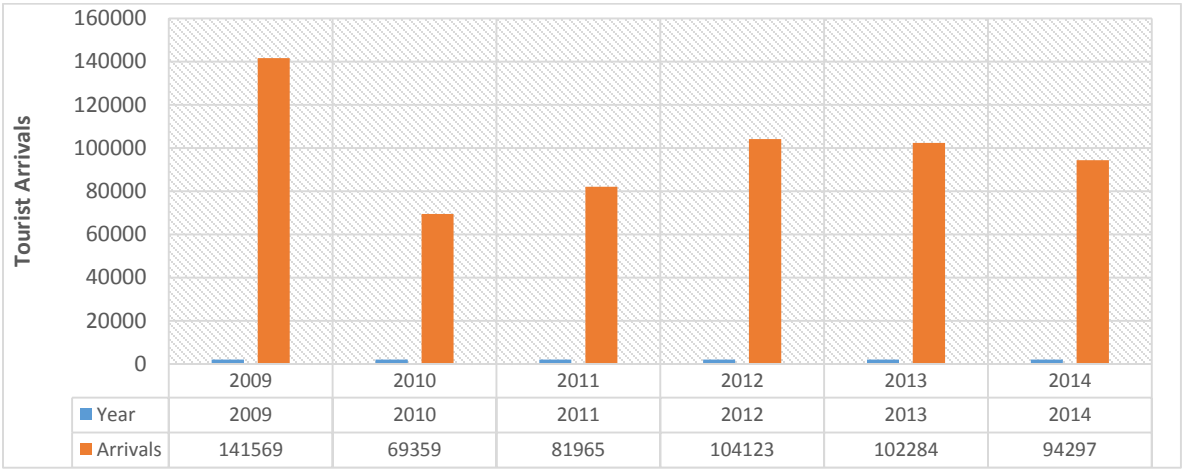
ANNEXES

ANNEX 1 – FIGURES

Figure 1: Location of Senegambia/Kololi Project Site

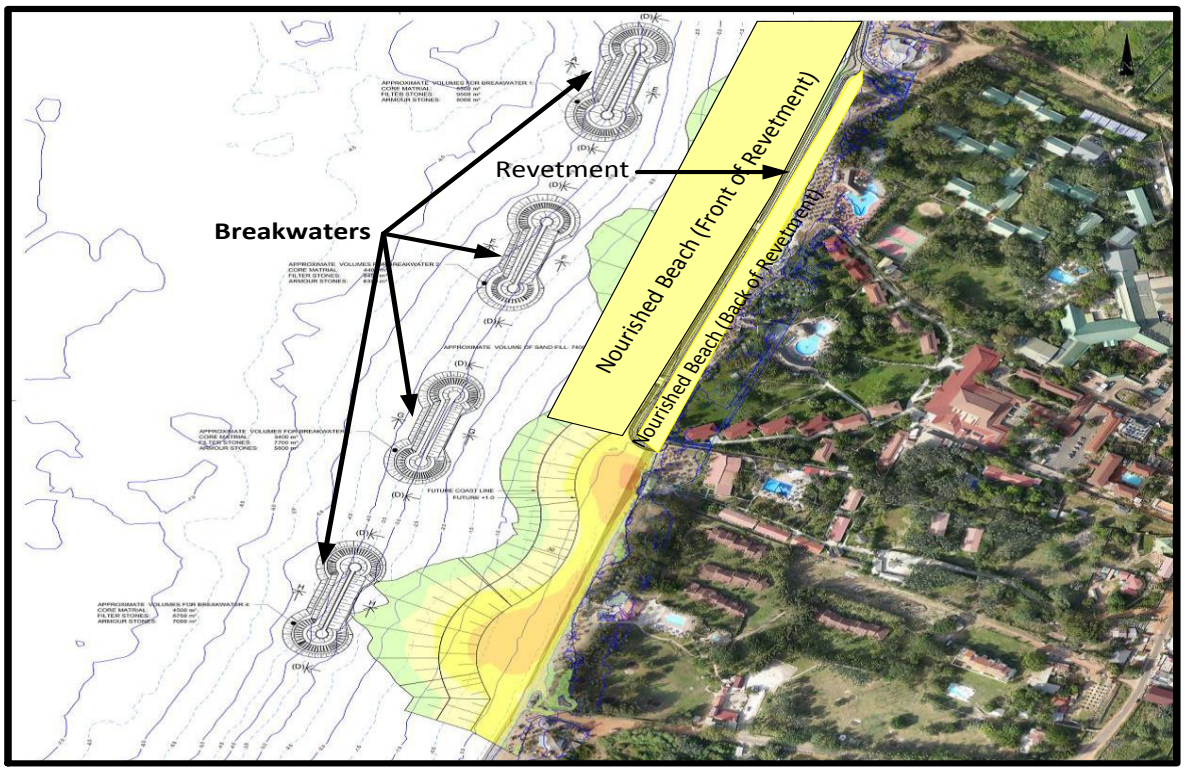
Adapted from Google Maps

Figure 2: Tourist Arrivals – 2009 to 2014



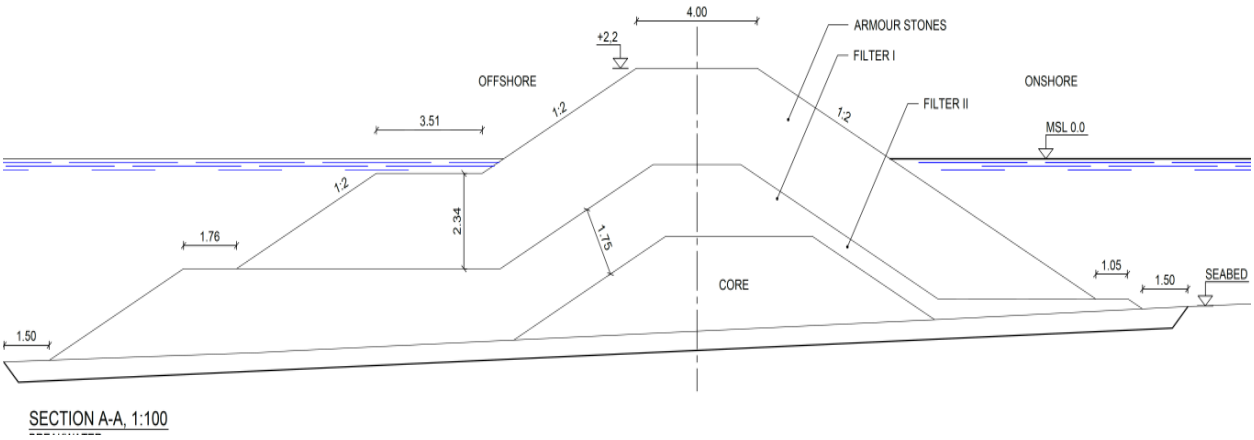
Source: Gambia Tourism Board (GTB), 2014

Figure 3: Location of Breakwaters, Revetment and Beach Nourishment in the Senegambia/Kololi Project Site



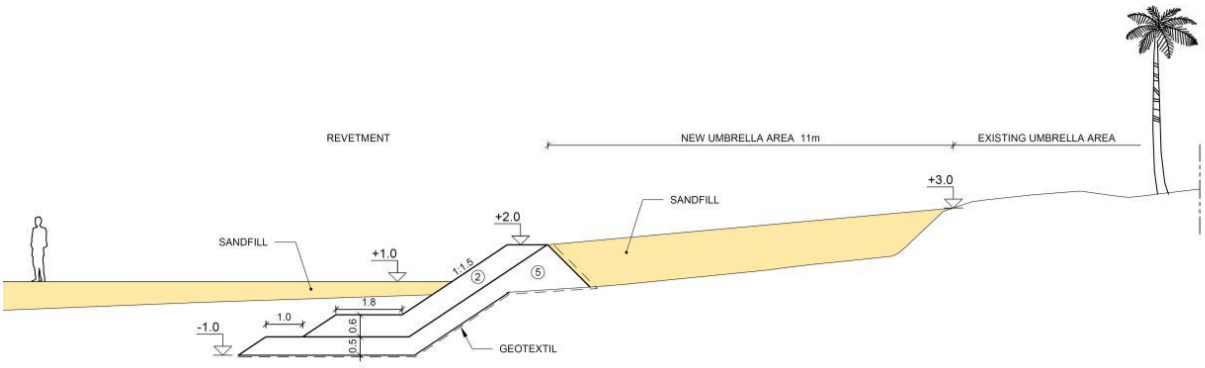
Adapted from Google Maps

Figure 4: A cross section of the Breakwater at Senegambia/Kololi Beach



Source: NIRAS study, 2015

Figure 5: Cross Section of the Revetment



Source: NIRAS Study, 2015

Figure 6: Project Location in the Tanji Bridge Area

Source: Adapted from Google Maps

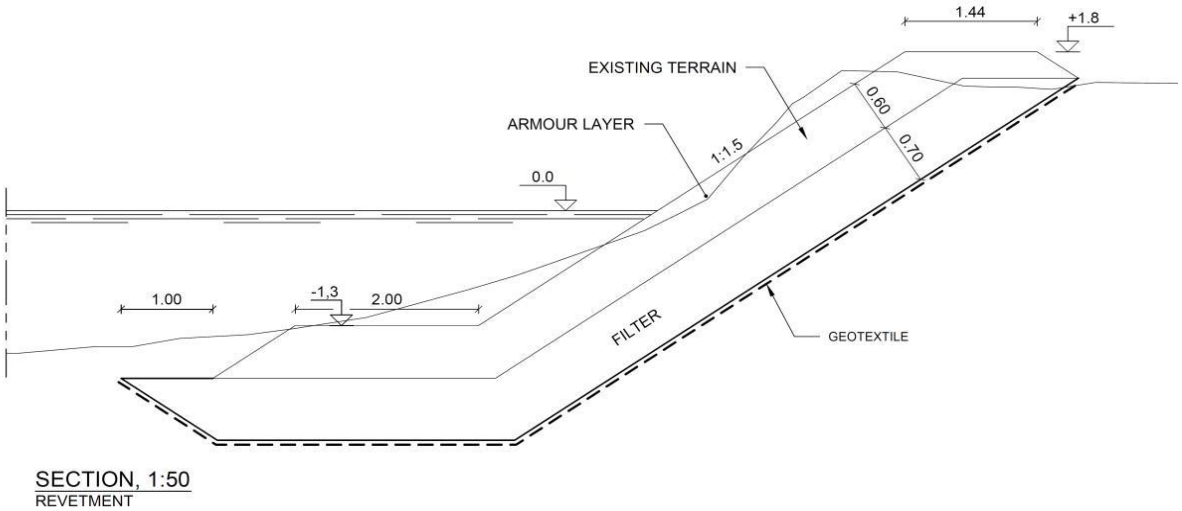
Figure 7: Eroded section of the river bank after backfilling with gravel; the NAWEC pole was less than a meter away from the erosion

Figure 8: Water pipe located along the road corridor close by the Bridge

Figure 9: Location of the Revetment and Dike

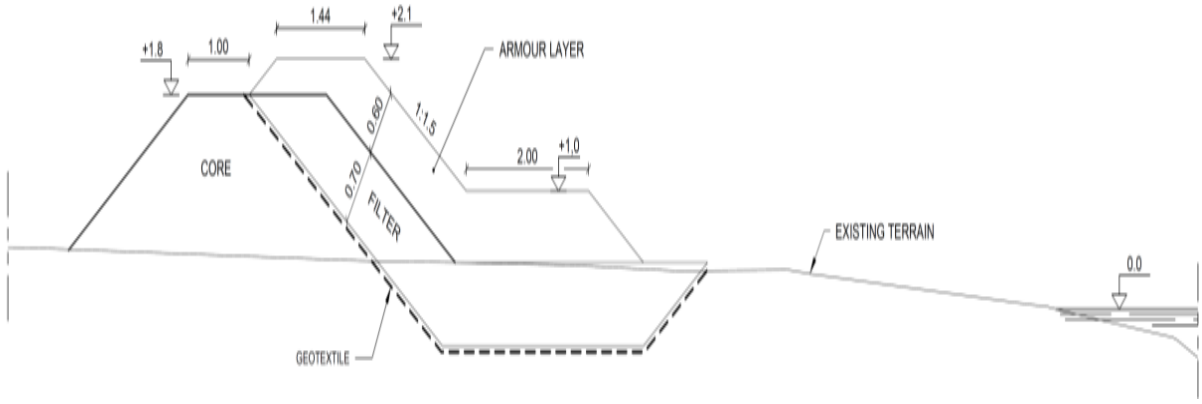
Source: Adapted from NIRAS Study

Figure 10: The Cross Section of the Revetment



Source: NIRAS Study, 2015

Figure 11: The Cross Section of the Dike



Source: NIRAS Study, 2015

Figure 12: Photo of gully by the fence of Galaxy Entertainment Park created by storm water arising from the highway and Kololi

Figure 13: Sand bags on the beach at Senegambia Beach Hotel

Figure 14: The Discharge Point of the Senegambia Storm Drain

Figure 15: The Seawall at Kairaba Beach Hotel

Figure 16: The Collapsed Frontage of the Holiday Beach Club Hotel

Figure 17: Stalls and bars of fruit sellers and juice pressers on the sand cliff at Holiday Beach Club Hotel

Figure 18: Frontage of the Kololi Beach Club; note the fallen coconut trees

Figure 19: Remnants of the foot bridge that tourists used to get into the sea

Figure 20: Nesting Ground for Grey headed Gull, Caspian Tern and Royal Tern on the large island of Bijol

Source: DPWM, 2015

ANNEX 2: LIST OF INSTITUTIONS AND PERSONS MET

No.	Name	Institution/Sector	Designation
1	Mr. Lamin Gassama	DPWM	Director
2	Mr. Ousainou Touray	DPWM	Asst. Director
3	Mr. Kausu Jammeh	DPWM	Wildlife Officer
4	Mr. Sambou Nget	DOF	Director
5	Mr. Cherno Gaye	DOF	Forestry Officer
6	Mr. Sainey Manneh	Tanji Village Comm.	Member-Beach Management Comm.
7	Ms. Ida Ndure	Tujereng	Ward Councilor
8	Mr. Assan Jallow	Tanji Village	Beach Management Committee
9	Mr. Lamin Bojang	Tanji Village	Alkalo of Tanji Village
10	Mr. Lamin Kanteh	Tanji Village	APRC Chairman
11	Mr. Cherno Bojang	Tanji Village	Council of Elders
12	Mr. Laibo Manneh	Tanji Village	VDC Chairman
13	Mr. Saikou Sonko	Tanji Village	Youth Leader
14	Mrs. Nyanya Gaye	Nyanya's Beach Bar and Restaurant	Proprietor of Nyanya's Restaurant
15	Ms. Ndey Bakurin	NEA	Executive Director,
16	Mr. Foday Fatty	NEA	Programme Officer, CME
17	Ms. Haddy Jaw	Eco-Tourism Camp, TBR	Proprietor
18	Mr. Abdoulie Hydara	GTB	DG
19	Mr. Lamin Fatty	GTB	Manager, Product Development, Investment and Culture
20	Mr. Musa Manneh	Brikama	Juice Presser, Senegambia
21	Mrs. Haddy Jatta	Kololi	Fruit Seller, Kololi Beach
22	Ms. Mary Gomez	Ibo Town	Hair Dresser, Kololi Beach
23	Ms. Ndey Kebbeh	President Fruit Sellers	Fruit Seller
24	Mr. Alieu Badu Bobb	ASSET	
25	Mr. Mustapha Jobe	Happy Safari	Tourist Taxi Driver
26	Mr. Sheriff Fofana	Juice Sellers Association	President
27	Mr. Bakary Darbo	Tourist Taxi Drivers Assoc.	Tourist Taxi Driver
28	Mr. Ebrima T. Jaiteh	Tourist Taxi Drivers Assoc.	
29	Mr. Malang Jammeh	Department of Technical Services	Director of Technical Services
30	Mr. Dodou Senghore	NRA	Director General
31	Mr. Nicola Blell	Senegambia Beach Hotel	Deputy General Manager

32	Mr. Buba Bah	Kairaba Beach Hotel	Exec. Asst. Manager
33	Mr. George Anamolga	From Holland- Sen:	Tourist
34	Mr. Daniel Waknine	From Holland- Sen:	Tourist
35	Mr. Laban	From Holland –Sen:	Tourist
36	Mr. Dick Vlot	From Holland-Sen:	Tourist
37	Mrs. Sabina Vlot	From Holland- Sen:	Tourist

ANNEX 3: LIST OF COASTAL MONITORING EQUIPMENT

No.	Name	Quantity	Unit Price ($)	Total Cost
1.	GPS (Montana 650)	1	1000	1000
2.	Fiber glass boat	1	3,750	3750
2.	Outboard engine (40 HP)		4,375	4375
3.	Refractor Meter	1	50	50
4.	First Aid Box	1	200	200
5.	Life Jackets	6	50	350
6.	Measuring Tape	1	75	75
7.	Wellington Boot	5 pairs	10	50
8.	Compasses	6	125	750
9.	Desktop Computer	1	500	1000
10.	Motor Cycles	3	2000	6000
11.	Rain Coat	6	25	150
12.	Bundle of Rope 100m	2	25	50
13.	Measuring Wheel	1	150	150
14.	Laptop (Notebook)	5	350	1250
15.	Video Camera	1	5000	5000
16.	Color Printer	2	1000	2000
17.	Gloves	6 pairs	20	120
18.	Pickup Vehicle	1	30,000	30,000
19.	Hp Design Jet Z6600 Printer-A0 SIZE	1	10,995	10,995
20.	Tent	2	500	1000
21.	Digital Camera	1	150	150
22.	Hand held clinometer	1	150	150
23.	HP Design Jet A0 scanner	1	2,425	2425
24.	Accessories (Color toners)	1	125	125
25.	Leveling equipment and accessories	1	3000	3000
26.	Server	1	5000	5000
27.	A3 Printer	1	1250	1250
28.	External Hard Disk 3Tb	1	585	585
			Total Cost	**80,600**

ANNEX 4: DATA USEFUL FOR EROSION CONTROL PROJECTS

The following is a list of information that may be useful to have when undertaking coastal erosion projects. It may not be possible to access all the items on the list, but most of the items in the list would be considered important for planning and implementing a coastal erosion project. Therefore for the CEMU this would form a good basis for data collection when it starts work.

- Tidal data – daily, monthly and annually
- Wave climate data – wave heights, direction and periods – also 10 or 20 year storm data
- Type of beach – high energy active beach or low energy beach
- Signs of existing erosion or accretion on the beach
- Sediment transport data – prevailing direction, volumes and seasonal changes
- Identify potential sediment sources and sinks
- Sediment grain size distribution on a target shoreline
- Water quality – primarily turbidity and suspended solids
- Site history, developments and historical impacts such as storms
- Bathometry, as detailed as possible, particularly at target sites
- Benthic data composition of the profile, coarse or fine sediment and associated biological communities e.g. indicator species such as crab burrows or worm burrows
- Budget