COASTAL & MARINE BIODIVERSITY ASSESSMENT OF THE GAMBIA

September 2024 ©

Acknowledgements

While the majority of the research for this report was carried out through a desk study, the author did rely on the input of numerous partners and contributors with expertise in marine and coastal conservation in completing the report. The author is specifically grateful to the Government of the Gambia for the information and support provided in finalizing the report. Special thanks goes to Serign Omar Lowe, the Project Coordinator of the Digital Transformation for Africa/Western Africa Regional Digital Integration Program (DTfA/WARDIP), who encouraged and supported the study, along with Omar Manjang, Felicia Rosamond Mendy, Kawsu Barrow, Nfansu Saidykhan and Ndey Sireh Hydara (all staff of the WARDIP project) for their support and guidance during the exercise of the assignment and compilation of the report.

The author is also grateful to the Director of the Department of Parks and Wildlife Management Momodou L Kassama, and field staff of the various Marine Protected Areas (MPAs) along the Atlantic coast for their support and input during the assessment. We are extremely encouraged at their passion and dedication to marine conservation and believe that their advocacy efforts will ensure the Gambia's marine and coastal assets are protected for generations to come. Specifically, Mr. Omar Sanneh (head of Research and development Unit), Mr. Jerreh Njie (Tanji Bird Reserve), Sulayman Jabang (Bolong Fenyo Community Wildlife Reserve) as well as Mr. Modou Manneh (Kartong Allahein River MPA) who provided key details that were essential to the completion of a comprehensive report.

The author is highly indebted to Mr. Ahmed Fall the Environmental Specialist (TTL for this exercise), Western and Central Africa of the World Bank. who spent considerable time in editing and finalizing the report, and whose guidance and recommendations helped to improve the report. Mr. Omar Sanyang at the Smile for Life the Gambia (CBO) and Sulayman Jawo (the GIS expert who developed the maps) provided important information on their marine-related work in the protected areas and seagrass meadow of the country. The photographs in the report were all shot by Bakary Njie, who doubled as the driver supporting the consultant during his field visits. As we hope you find when reading the report, The Gambia is an incredible country for its marine and coastal diversity. Given the Gambia's current level of development, we believe the available asset should be seriously considered and not tempered for future development initiatives by the government and other partners. For that to happen, Government, Donors, Civil Society need to be aware and motivated to work together for sustainable use and conservation of the Gambia's marine and coastal assets. We hope this report serves as an initial foundation to understanding the state of play of the marine and coastal economy and a useful resource for policy makers, donors, civil society and the private sector to design responsible and sustainable marine and coastal actions that will ensure those resources can be enjoyed for generations to come.

Table of Contents

Table of Contents 3

Acronyms 5

TABLE OF FIGURES 6

Executive summary 7

1. Introduction 8

1.1. Context of the consultancy 8

2. COUNTRY BACKGROUND 13

2.1. Geography: 13

2.2. Environment and natural resources 13

2.3. Marine and Coastal Assets in the Gambia 14

3. Marine Ecosystem Habitats & Ecosystem Services 17

3.1 . Seagrass meadows 17

3.2. Mangroves 18

3.3. Oyster Reefs 20

3.4. Coastal Wetlands 21

4. Marine Habitats and Species 22

4.1. Sea Turtles 23

4.2. Marine Mammals 23

4.2.1 Sharks and Rays 24

4.2.3. Other Marine Biota 26

4.3. fish species and resource base: 26

5. Coastal and Marine Protected Areas (MPAs) 30

5.1 Niumi National Park 30

5.2. Tanbi Wetlands National Park 31
5.3. Jokadu Wetland National Park 33
5.4. Bijilo Monkey Park 34
5.5. Tanji & Bijol Islands Bird Reserve: 35
5.6. Bolong Fenyo Community wildlife Reserve 36
5.7. Allahein Kartong community wildlife sanctuary 37
6. Exclusion zones 39
6.3. Mangroves: 43
6.4. Estuaries and wetlands: 44
6.5. Beaches: 45
7. Preferential areas 46
8. Conclusion and recommendations: 50
References 52

This assessment has been commissioned by the World Bank, Western and Central Africa, ENVIRONMENT PM1 (SAWE1) and supervised by the WARDIP Gambia Project. The assignment focuses on mapping critical habitats and areas that are legally protected and internationally recognized for the high value of biodiversity in the coastal area of The Gambia.

Disclaimer: The contents of this report do not necessarily reflect the views or policies of the World Bank or contributory organizations. The designations employed and the presentation of material in this report do not imply the expression of any opinion whatsoever on the part of WB.

Acronyms

BWR	Bao Bolong Wetlands Reserve
BMH	Beach Man Hole
CBO	Community Based Organisation
DoF	Department of Forestry
DoFish	Department of Fisheries
DPWM	Department of Parks and Wildlife Management
DTfA	Digital Transformation for Africa
EEZ	Exclusive Economic Zone
GIS	Geographical Information System
GoTG	Government of The Gambia
ICCA	Indigenous Community Conserved Area
JNP	Jokadu National Park
MPA	Marine Protected Area
NEA	National Environment Agency
NNP	Niumi National Park
IUCN	International Union FOR Nature Conservation
ICT	Information and communication technologies
RGNP	River Gambia National Park
SDM	Single Digital Market
TBR	Tanji Bird Reserve
TTL	Task Team Leader
TWNP	Tanbi Wetlands National Park
WABSA	West African Bird Study Association
DTfA/WARDIP	Digital Transformation for Africa/ WARDIP Western Africa Regional Digital Integration Program
WB	World Bank
WWF	World Wide Funds

TABLE OF FIGURES

Fig 1 : Tanji fish landing site……..……...16

Fig 2: Kartong women building an oyster farm with rags……..…...20

Fig 3: Wetland in Niumi National Park…….……..21

Fig 4: Ecological map of the coastal zones……22

Fig 5: Sea Turtle hatchlings struggling to reach the sea……...…….23

Fig 6: some Sharks exploited by Ghanaian fishermen……..….24

Fig 7: Fisher stalls, vendors and mongers……...….29

Fig 8: Sea Turtle nest…….…...……40

Fig 9 : Turtle hatchery at Sanyang Beach……..…….40

Fig 10: map of sea turtle nesting sites……....……....40

Fig 11: seagrass meadows map……..…...42

Fig 12: Mangrove of Tanbi Wetlands……..…....…...43

Fig 13: Wetlands around Banjul……..……44

Fig 14: Sandy beach around cape point, Bakau……...……..45

Fig 15: Ecological map of the coastal and marine zones……..…….....47

Fig 16: Beach Manhole of the ACE Cable……....……...49

Fig 17: Cable laying with the boat offshore…….…...…...….49

Fig 18: Pictures of field visits…….……..…..53

Fig 19 : List of experts consulted …….……..54

Executive summary

The Gambia is a small country that lies on the west coast of Africa. It is the smallest country on mainland Africa, covering an area of approximately 11,300 km2. The country is divided into the North and South Banks by the River Gambia, which has its source in the Fouta Djallon Highlands in Guinea, 680 km away. The climate of The Gambia is Sudano Sahelian, with a short rainy season from mid-June to early October and a long dry season from October to early June.

The land surface of the country was once very rich in biodiversity, with about 47% of the total area covered by dense forest. This provided habitats to different species of organisms. A total of 3335 species of organisms have been recorded in The Gambia to date. However, many of the large mammal species and some plant species have become extinct. Despite the biodiversity loss, many habitats of high ecological significance have been identified along the coastline from Buniadu Point to the Allahein River mouth. These habitats are: Toll Point to Cape Creek (Camaloo Corner), Oyster Creek Mangrove Swamp to Mandinari Point, Tanji Bird Reserve, Brufut Wood, Solifor Point, Tujereng Lagoons, River Kakima Delta- Kachuma Forest, Dua Dula to Kartong, and Kartong Point to Allahein River mouth. Only five of these ecologically sensitive areas are under any form of protection. Protection of ecologically sensitive areas is critical to the long-term survival of biological diversity. There are twenty eight (28) protected areas in The Gambia. These protected areas today cover 103,089 ha which represents more than 10% of the territory. Most of the areas earned recognition as Site of Regional and International Importance especially BWR, NNP & TWNP. The Department of Parks and Wildlife Management (DPWM) currently manages eight protected areas namely Abuko Nature Reserve, River Gambia National Park, Niumi National Park, Kiang West National Park, Tanji and Bijol Islands Bird Reserve, Bao bolon Wetland Reserve, Jokadu Wetlands National Park and Tanbi wetlands National Park. The remaining are Indigenous Community Conserved Areas (ICCAs) with local community ownership regime. The DPWM aims to have 15% of the marine and 10% of the terrestrial cover of the country under protection by 2030.

This report presents the results of The Gambia's Coastal and Marine Biodiversity Assessment, an exercise funded by the World Bank in partnership with the government of the Gambia through the WARDIP Project under the Ministry of communications and Digital Economy. This exercise is meant to map out critical Biodiversity hotspots along the coastal and marine zones of the Gambia to avoid biodiversity degradation along the route of a new sub-marine cable to be laid and connected to Amilcar Cabral cable of the West African Sub-region. A range of stakeholders, scientists and biodiversity management experts provided inputs and comments on the report. The consultant assesses the state of the Gambia's Coastal and Marine biodiversity, across terrestrial, freshwater, estuarine and marine environments, emphasizing spatial (mapped) information for both ecosystems and species. The Assessment is central to fulfilling the Environmental and Social Commitment Plan of the project (ESCP), "Adopt and implement any measures to avoid adverse impacts on local biodiversity and living natural resources through the application of a mitigation hierarchy consistent with ESS6.

1. Introduction

1.1. Context of the consultancy

The Gambia is located on the West African coast and extends about 400 km inland, with 97 persons per square kilometer. The country's width varies from 24 to 28 kilometers and has a land area of 10,689 square kilometers. It is bordered on the North, South, and East by the Republic of Senegal and on the West by the Atlantic Ocean. The country has a tropical climate characterized by two seasons, the rainy season (June- October) and the dry season (November-May). Though the Gambia's GDP per capita fluctuated substantially in recent years, in 2020, GDP per capita for the Gambia was 791 US dollars. In the Gambia, like many African countries, containment measures introduced to limit the COVID– 19 pandemic helped cause the country's GDP to contract by an estimated 2.4% in 2020 after growing 6.2% in 2019.

Under the Digital Transformation for Africa / Western Africa Regional Digital Integration Program (DTfA/WARDIP), the Government of The Gambia (GoTG) received a grant facility worth $50 million from the World Bank (WB). The project aims to increase access to broadband and digital services by developing and integrating digital markets in the Western Africa region. The project will support The Gambia, ensuring an enabling environment for digital skills, innovation, and competitiveness in the regional Single Digital Market (SDM). It will also ensure the achievement of national digital development objectives more effectively and rapidly while cognizant of regional digital transformation objectives.

The Gambia needs a comprehensive strategy that involves government, the private sector and civil society. This includes improving ICT infrastructure, developing clear policies and regulations, promoting digital skills, promoting cybersecurity, and creating an enabling environment for investment in the digital economy. To address the challenges of the information and communication technology (ICT) sector, the Government of The Gambia (GoTG), with the support of the World Bank, confirmed its participation in the Regional Project for Digital Integration in West Africa ("WARDIP") to promote the implementation of the national development plan which focuses on the promotion and development of information and communication technologies (ICT).

1.2. Biodiversity Conservation Policy Objectives:

The Gambia ratified the Convention on Biological Diversity (CBD) 1994 as the 163rd party to the Convention and is therefore committed to implementing the Decisions of the CBD Conference of Parties (COP). The Department of Parks and Wildlife Management (DPWM), under the Ministry of Environment, Climate Change and Natural Resources (MECCNAR) is the custodian of NBSAP, which in partnership with allied institutions and bodies are transforming the objectives into practical activities and gains. The Department is further aiming to integrate, as far as appropriate, the conservation and sustainable use of biological diversity into the national frameworks including YIRIWAA National Development Plan, and other relevant sectoral or cross-sectoral plans, programs and policies.

A. Environment: The ultimate goal of the GEAP is to ensure sustainable development. Consistent with the Government's commitment to this goal and the set environmental priorities, the policy objectives are to provide the operational guidelines for the environmental protection and natural resource management intervention:

- To conserve and promote the rational use of natural resources for the benefit of the present and future generations;
- To protect and improve the health and quality of life of all Gambians through sound environmental management;
- To preserve and restore the equilibrium of ecological processes;
- To strengthen the institutional framework for the environmental coordination and management at the national, regional and global levels;
- To increase the environmental awareness and understanding of the public and bring about effective public participation and community involvement in environmental management
- To ensure the integration of environmental considerations in all development strategies and related activities; and
- to accelerate the adoption of alternate source of renewable energy.

B. Parks and Wildlife Management: Due to the rapid rate of loss of wildlife habitats, the Gambian Government initiated a strategy to set up a system of protected areas. The Department of Parks and Wildlife Management (DPWM) currently manages eight protected areas namely Abuko Nature Reserve, River Gambia National Park, Niumi National Park, Kiang West National Park, Tanji and Bijol Islands Bird Reserve, Bao bolon Wetland Reserve, Jokadu Wetlands National Park and Tanbi wetlands National Park. The remaining are Indigenous Community Conserved Areas (ICCAs) with local community

ownership regime. The DPWM aims to have 15% of the marine and 10% of the terrestrial cover of the country under protection by 2030. Other biodiversity-related sectoral laws include the main goals of The Gambia's Biodiversity/Wildlife Act, 2003, include:

1. **Biodiversity Conservation**: Protecting and preserving the diverse range of flora and fauna in The Gambia, including endangered and threatened species.
2. **Habitat Protection**: Ensuring the protection of natural habitats to maintain ecosystems and support wildlife populations.
3. **Sustainable Resource Management**: Promoting sustainable use of wildlife resources to balance conservation with the needs of local communities.
4. **Ecotourism Development**: Enhancing ecotourism opportunities to generate revenue for conservation while educating visitors about the importance of wildlife protection.
5. **Community Engagement**: Involving local communities in conservation efforts to foster an understanding of the value of biodiversity and promote sustainable practices.
6. **Research and Monitoring**: Conducting research to monitor wildlife populations and assess the effectiveness of conservation strategies.
7. **Legislation and Policy Enforcement**: Strengthening laws and regulations related to wildlife protection and ensuring compliance.
8. **Education and Awareness**: Raising awareness about the importance of wildlife conservation and biodiversity among the public and stakeholders.

These goals are integral to ensuring the long-term sustainability of the natural resources and wildlife.

C. Forestry: The main objectives of The Gambia's forest policy include:

1. **Sustainable Forest Management**: Ensure that forest resources are managed sustainably to meet the needs of the current population without compromising the ability of future generations to meet their own needs.
2. **Community Involvement**: Promote community participation in forest management, recognizing the rights and responsibilities of local communities in preserving and utilizing forest resources.
3. **Biodiversity Conservation**: Protect and conserve the country's forest biodiversity, including its flora and fauna, to maintain ecological balance and protect vulnerable species.
4. **Reforestation and Afforestation**: Encourage reforestation and afforestation initiatives to restore degraded forest areas and enhance tree cover.

5. **Economic Development**: Enhance the contribution of forests to the national economy by promoting sustainable forestry practices, eco-tourism, and other forest-based enterprises.
6. **Climate Change Mitigation**: Use forest management as a strategy for climate change mitigation by sequestering carbon and reducing greenhouse gas emissions.
7. **Fire Management**: Implement fire management strategies to prevent forest fires and protect forest health.
8. **Policy Coordination**: Ensure alignment with national and international environmental policies and agreements to address broader environmental issues.

These objectives are central to addressing the challenges of deforestation and degradation while promoting sustainable livelihoods for communities dependent on forest resources.

D. Fisheries: The current policy objectives are as follows:

• To effect a rational and long-term utilization of the marine and inland fisheries resources;

• To use fish as a means of improving nutritional standards of the population;

• To increase employment opportunities in the sector;

• To increase the net foreign exchange earnings;

• To increase and expand the participation of Gambians in the fisheries sector ;

• To develop aquaculture; and,

• To improve the institutional capacity and legal framework for the management of the fisheries sector.

The Government recognizes that responsible fisheries management is essential for the sustained development of the fisheries sector and its economic benefits as well as the welfare of its stakeholders. To achieve these goals the following should be addressed: (i)National Fisheries Planning for economic development to be based on principles of responsible fisheries and sustainable livelihoods; (ii) Maintenance and enhancement of fisheries ecosystem, to conserve the variety and richness of the marine and freshwater resources.; (iii) Conservation and enhancement of the quality of natural heritage of the country including wildlife, wetlands, biotic diversity, river, estuary, and beaches; (iv) Cooperating with international organizations for global protection of the marine and fresh water ecosystems; (v) Training facilities and research in fisheries matters including studies pertaining to socio-economic, cultural and legal aspects and to provide adequately trained professionals and technical capacity, and ; (vi) Improvement of access to financial resources by promoting the review of financial and micro-finance policies/regulations to take into account the special characteristics of fisheries.

1.3. Objectives of the Assessment

The objective of this study is to carry out an assessment of the biodiversity of the coastal area that will constitute the marine and coastal reference situation for the deployment of the second submarine cable and landing site. This assessment will also contribute to strengthening the analysis of knowledge on the biodiversity of the marine and coastal area, through the collection and synthesis of all existing documentation. It will also contribute to the formulation of future interventions and, specifically, to the definition of alternatives (technological and infrastructure location) that favor the application of the mitigation hierarchy and, specifically, the prevention of significant potential impacts on biodiversity. More specifically, the intended assessment should make it possible to map critical[1] habitats and areas that are legally protected and internationally recognized for the high value of biodiversity[2] in the coastal area of The Gambia that should be taken into account in the following phases of the development of the Project and to inform future telecommunications projects that aim to extend the broadband network

1.4. Methodology:

The assessment process was conducted based on sound judgement and analysis. A participatory process was adopted with the involvement of relevant DPWM experts, key stakeholders and beneficiaries. The consultant had some consultations with park staff and community members in kartong, tanji, tanbi, with the turtle rescue team, port extension in Tanbi, the Director of the department of Parks, a team of 8 staff at the maritime agency and the two senior staff responsible at Gamtel. This has helped in ensuring the insightfulness of the findings and recommendations. Overall, this exercise was intended to assess the extent to which the objectives of the project are attained. The initial discussion was done with the PIU staff of the WARDIP Project and the World Bank support team to set the stage. The Admin Assistant of the Project, Mr. Manjang took the consultant to the Maritime Agency and Gamtel office at Brusubi. The Environmental Specialist, Ms. Ndey Sireh Hydara assisted in the field visits and provided relevant and insightful inputs to support the consultant and reviewing the report.

An intensive desktop review of relevant national and international policy documents was done and data collected through the exercise. Mr. Sulayman Jawo , the GIS expert made some field visits and data collection in order to prepare the maps of the report. A final validation workshop was organized on the 26th September 2024 at the Bakadaji Hotel and comments provided by the participants were addressed adequately and the most relevant integrated in the final version of the Assessment report.

---

paragraph 23 of the World Bank's Environmental and Social Standard (ESS) 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources of the World Bank's Environmental and Social Environment:https://thedocs.worldbank.org/en/doc/894681554138033403029002202O/original/ESFGN6portuguese.pdf

[2] See paragraph 26 of the World Bank's Environmental and Social Framework (ESF): ESS6 Biodiversity Conservation and Sustainable Management of Living Natural Resources of the World Bank; Link given above-

2. COUNTRY BACKGROUND

2.1. Geography:

The republic of The Gambia, a small country on the west coast of Africa lies between longitude 13.79 and 16.82 West and within latitude 13 North (NEA 2010). It covers an area of 11,300 km2 (NEA 2010, Republic of The Gambia 2010) which makes it the smallest country on mainland Africa. The country is bounded by Senegal to the North, East and South and by the Atlantic Ocean to the West (NEA 2010). The Gambia, widest at its westerly end towards the ocean, is 48 km across, narrowing to about half this width at its eastern tip, 480 km inland (Republic of The Gambia 2010). The country is bisected into the North and South Banks by the River Gambia which has its source some 680 km upstream in the Fouta Djallon Highlands in Guinea (Republic of the Gambia 2010, 2011a). The natural drainage of the country is centered mainly on the River Gambia and its tributaries, namely the Bao, Bintang, Nianija, Sandougou and Sofaniama Bolons (Republic of The Gambia 1999).

The climate of The Gambia is sudano-sahelian characterized by a short rainy season from mid-June to early October and a long dry season from October to early June (NEA 2010, Republic of The Gambia 2011). The country is regularly affected by the northerly Harmattan wind during the dry season (Republic of The Gambia 2010). Average temperatures vary, ranging from 23o C to 33o C during the rainy season and from 18o C to 30o C during the dry season (Republic of The Gambia 2010). During the rainy season, the relative humidity is generally about 77% throughout the country while during the dry season it is about 68% along the coast and 41% inland (Republic of The Gambia 2010). Average annual rainfall is in the region of 1000 mm, although it ranges from 850 mm to 1597 mm, depending on the agro-ecological zone (Republic of The Gambia 2010). Before the 1968 drought in the Sahel, average annual rainfall for the 1951-1967 period was well over 1000 mm (Republic of The Gambia 2010). However, over the past forty years, there has been a decline in mean total annual rainfall (Republic of The Gambia 2010).

2.2. Environment and natural resources

The land surface of The Gambia was once covered by dense forest, constituting about 47% of the total land area of the country (Republic of The Gambia 1999). The forest was very rich in biodiversity and provided habitats to different species of large mammals (NEA 2010). A total of 3335 species of organisms have been recorded in the country to date (NEA 2010). Many of these

are now rare or locally extinct. More than 13 mammal species and a number of plant species have become extinct (NEA 2010).

Despite the loss of biodiversity, the coastline of The Gambia stretching from Buniadu Point in the North to the mouth of the Allahein river in the South, has many areas of high ecological significance. Nine areas of high ecological significance along the coastline have been identified (UNEP 1996). The tenth area, Bijilo Forest Park, though not included in the map, is also an area of high ecological significance.

2.3. Marine and Coastal Assets in the Gambia

The Gambia has a continental shelf area of 4000 sq. km and an Exclusive Economic Zone (EEZ) of 10,500 sq. km. The marine waters are part of the Sahelian Upwelling Marine Ecoregion (SUME). Seasonal upwellings and fluvial outflows make SUME a highly productive area with rich pelagic and demersal fisheries resources. It also contains important habitats for a number of mammals and threatened species including five species of marine turtles and the critically endangered monk seal. Sharks, rays and marine mammals such as the bottlenose dolphin, the Atlantic humpback dolphin, manatees and hippopotamuses are also found here.

The marine waters of The Gambia are believed to be rich in terms of species abundance and diversity. The productivity of these waters is enhanced by the flow of nutrients from the River Gambia (an estuary attracting fish for feeding and spawning). The effect of the up-welling system observed in the Northwest Africa region has significant influence on the abundance and spatio-temporal distribution and recruitment of notably, the small pelagic fishes and aquatic resources in general. The upwelling phenomenon starts at the northern plateau of Senegal in November thus moving south and attaining maximum effect on the Senegambia plateau in March/April. The two opportune natural effects accord The Gambia the status as one of the world richest fishing nations with fish species of economic importance. Worthy of mention here is concern about the health of the demersal fish stocks expressed by many and from many quarters.

The estuarine zone of the River Gambia is also believed to be rich in shrimps, sole fish, threadfins and other marine fish species of economic importance. The prolific mangrove vegetation offers good potential for an oyster fishery. The fisheries resources in the freshwater zone are not well known because no studies have as yet been undertaken but there are species of commercial exploitation potential such as the Clarias spp. (kono-kono). The vast area of the floodplains of the

freshwater zone is also very ideal for the development of commercial aquaculture especially within the rice growing areas.

The Gambia has an 80 km long coastline and an Exclusive Economic Zone (EEZ) extending 200 nautical miles from the low water mark. Fisheries resources are provided from two sources, the river covering an area of 2,000 km2 and the ocean covering the continental shelf to an area of 5,000 km2. The estimated total biomass of demersals and pelagic fish resources in Gambian waters is as follows: Demersals 22,000 tons (Fridtjof Nansen, 1995) and pelagics 284,000 tons (Fridtjof Nansen, 2005), giving a total figure of 302,000 tons (Fridtjof Nansen, 1995, 2005). The total fish potential from the maritime fisheries is estimated at about 88,000 tons with pelagic and demersals fish resources constituting 78% and 22% respectively. Total annual fish production is 49,911.30 tons in 2010,(D0F 2011) clearly indicating a surplus potential. Information on the size of the river fish resources and annual fish landings from the river fisheries are not available.

Certain fish species, such as the lobster (Palinurus spp), shark, catfish (Arius heudeloti) and the white grouper (Epinephelus aetheus) are threatened as a result of unsound human exploitation strategies. Based on the current production levels, there is considerable scope for exploiting the marine pelagic fisheries and developing aquaculture. In contrast, there is great need for tighter and more effective control of the threatened demersals resources.

Conservation of biodiversity in Coastal and marine areas in The Gambia requires the protection and regulation of very large areas, and effective management to control pollution and shared resources. Management constraints are rather different to those for terrestrial systems. Resource users include a much broader community than those who live geographically close, and outsiders often have little or no incentives to protect the resource. Involving local communities in management of estuaries and other marine resources to control all users can be very effective since better protection brings an immediate incentive in increased fish harvests.

More than one hundred and nineteen species of migratory water birds occur in the country. The first quarter of the year is an important moment for birding and monitoring of the abundance, distribution and occurrence in important wetlands around the country. The Sahelian Upwelling Marine eco-region is an important area for birds, including resident and migrant species, such as the lesser Black back Gull, Great Cormorant, Sanderlings, small plovers (e.g. Kittlizts, Ringed plover, Little Ringed plover, Kentish plover, and white fronted sand plover). Royal Tern, Caspian

Tern, Audoin's gull, Grey headed Gull, Slender billed Gull, Kelp Gull, Osprey, Grey Plover, Ruddy Turnstone, Bar tailed Godwit, Black tailed Godwit, Bridled Tern, Reef Heron, Grey Heron, Great White Pelican. Wintering birds migrating from Europe and Asia use the coastal areas as staging post, nesting and feeding grounds. The Bijol islands known as the lone breeding ground of terns and gulls, is reducing in size due to sea level rise.

Fig 1 : Tanji fish landing site

3. Marine Ecosystem Habitats & Ecosystem Services

Important marine ecosystem habitats can be found along the coastline of the Gambia. Each habitat not only provides important ecosystem services, such as producing food, regulating flood waters, mitigating storm surges and waves and sinking carbon, each habit is home to many critical marine species. Each habitat also forms a piece of the blue economy in the Gambia, enabling citizens to earn livelihoods and the country to grow economically. There are also associated threats with each of the ecosystem habitats, which we outline generally in Section II. The marine assets found in The Gambia's main regions include corals, mangroves, seagrass beds and coastal wetlands and lagoons.

Marine and coastal ecosystems form the basis for the Gambia's fishing industry, support key mining activities and provide an array of opportunities for recreation, tourism and settlements, with the coast in particular being a focus for human activity and development. Pressures on marine and coastal ecosystems are multiple and tend to be more intense along the coast and inshore, which are more accessible to people than the open ocean. Coastal development is the biggest pressure on coastal ecosystems, and fishing is the biggest pressure in most inshore and offshore ecosystems. Fishing not only impacts on the targeted species and those caught as by-catch—and thus on food webs and ecosystem dynamics—but also causes direct damage to marine habitats in some cases. For example, trawling of the seabed can be likened to ploughing in the terrestrial environment, with severe impacts that may be irreversible in some habitats.

3.1 . Seagrass meadows

Similar to grasses on land, seagrasses grow on the bottom of the sea floor, capturing the sun's energy, generating food and oxygen, and providing a critical home for fish and other marine creatures. Seagrass beds are often found in shallower waters and can be damaged by fishermen scraping the ocean floor for shrimp and flatfish, or boat propellers and anchors. The author have enjoyed the field visit in the seagrasses of Kartong, Sanyang, Gunjur, and in Tanji (Bijol Islands) Bird Reserve. These vibrant and healthy seagrass beds are home to large communities of seahorses, frog fish, squid, octopuses and other marine life. Seagrass is an important part of the marine ecosystem and can be found in many of the seascapes throughout Gambian coastal zones. Three species of seagrasses have been recorded in the Gambian waters.

Seagrass beds are known to be highly productive, serve as critical habitats to economically important as well as rare and endangered marine species, and are a critical food source (80%) for the threatened marine turtles. They are important as nursery grounds, foraging areas and predation refuges for numerous fish and invertebrate populations and provide crucial benefits for commercial, and subsistence fisheries. Seagrasses are important because they provide Carbon sequestration - Seagrasses are nicknamed "the lungs of the sea" because they can generate enormous amounts of oxygen. A single square meter of seagrass can release as much as ten liters of oxygen a day through photosynthesis.

Because they are so photo-synthetically productive, seagrass can absorb huge amounts of carbon from the atmosphere. Each square meter of seagrass is capable of absorbing 83 grams of carbon per year, and seagrass meadows hold around 15% of the carbon stored in the ocean. The average hectare of seagrass stores 139.7 metric tons of carbon in its soil, and studies are also finding deep layers of centuries-old, carbon-rich soil beneath these habitats.

Nurseries and reproduction - Seagrass provides food and shelter for many marine organisms such as the green sea turtle. Many marine species also utilize seagrass habitats as feeding grounds and nursery areas. Fishes such as jacks and snappers forage in the seagrass while others like snappers spend their juvenile stage in seagrass habitat, eventually moving on to mangroves as they mature. Commercially important species including lobsters, shrimp and crabs also use seagrasses as nurseries.

Sediment Stabilization - Seagrass stabilizes sediments with their dense roots, which prevents erosion along the coastline. This ecosystem service is especially important during storms and big waves that often threaten the Gambian's coastline.

Water Clarity - Seagrasses can help dissolve nutrients and trap water sediment which helps to improve water clarity. Seagrasses also trap fine sediments and particles from both land and water.

3.2. Mangroves

The coastal area of the Gambia is a suitable estuarine zone sheltering several mangrove hot spots. These habitats include DuaDula to Kartong Point, Allahein river mouth, Tanbi Wetland National Park, River Kakima Delta-Kachuma Forest, Solifor Point, Tanji Bird Reserve, Toll Point to Cape Creek and Tujereng Lagoons.

Five protected areas: Kartong Allahein community wetlands sanctuary, Bolong Fenyo Community Reserve, Niumi National Park, Tanbi Wetlands National Park and Tanji bird Reserve (including Bijol Islands) are situated in the coastal and marine area. All of the six species of mangroves found in West Africa occur in The Gambia and have been recorded. These include Avicenia africana, Conocarpus erectus, Laguncularia racemosa, Rhizophora harrisonii, Rhizophora mangle and Rhizophora racemosa. Despite their ecological significance, the coastal and marine areas of The Gambia are threatened by both natural and anthropogenic factors. Natural threats include sea level rise and wave action. Anthropogenic threats are mainly the results of a large proportion of the population being concentrated in the coastal and marine areas. This has resulted in increased pressure on natural resources. Anthropogenic threats include uncontrolled sand/gravel mining, destructive mangrove cutting, random inappropriate methods of shrimp fishing and oyster harvesting, contamination of marine ecosystems by domestic and industrial waste and solid waste disposal.

Coastal protection: The dense root systems of mangrove forests trap sediment flowing down rivers and off the land. This helps stabilize the coastline and prevents erosion from waves and storms. In areas where mangroves have been cleared, coastal damage from hurricanes and typhoons is much more severe. By filtering out sediment, the forests also protect seagrass meadows from being smothered after large storms.

Nurseries and reproduction: Mangrove forests are nurseries for many fish species, including crabs, clams, and shrimp as well as commercially important fish species. Mangroves also support a number of threatened and endangered species that are active in the Gambia, such as turtles which depend at some point in their life on mangroves.

Renewable timber and medicinal resource: Mangrove wood is resistant to rot and insects, making it extremely durable for construction, and thus extremely valuable. Many coastal communities throughout the Gambia rely on this wood for construction material as well as for fuel. These communities also collect medicinal plants from mangrove ecosystems and use mangrove leaves as food for animals. Government institutions such as the Department of Parks and Wildlife Management (DPWM), the Department of Forestry (DoF) and NGOs, such as WABSA, Sahel Wetlands Concern are working with local communities to plant mangroves for sustainable harvesting.

3.3. Oyster Reefs

Oyster reefs create important habitat for hundreds of other marine species as they provide nursery and nesting sites for fish. Juvenile fish find shelter among the beds, allowing them to grow bigger and providing better food sources for their predators. Oyster reefs filter and clean the surrounding water. Species like mussels, barnacles, and sea anemones settle on them, creating abundant food sources for commercially valuable fish species. Oyster reefs also protect coastlines from storms. Densely packed beds and reefs of oysters form a natural breakwater, dramatically cutting wave heights. They can also occur naturally in intertidal areas where they provide a form of shoreline armoring, preventing erosion and protecting marshes.

Oyster reefs and other bivalves eat algae for food, and in so doing filter and clean vast amounts of water. A single oyster can filter 180 liters of water every day. Cleaner waters support the growth and health of seagrasses and other plants that depend on sunlight for survival. These plants, in turn, yield additional benefits, like fish production and carbon storage. Scientists call oysters a "keystone species" in recognition of their important role in estuaries. Oyster reefs have become an endangered marine ecosystem. Oyster Reefs can be seen around Kartong and the mouth of Tanji river, where the bivalve beds provide a natural barrier to the coast. Oysters can be found in Tanbi wetlands National Park, Tanji Bird Reserve and Niumi National Park.

Fig 2: Kartong women building an oyster farm with rags

3.4. Coastal Wetlands

Wetlands consist of salt pans, lagoons, marshes, mangrove swamps, mudflats, saltwater rivers, fresh water reaches of rivers such as the Gambia River, flooded sand mines, watering holes for animals, paddy fields and ephemeral marshes with reed vegetation in flooded areas. Crustaceans, annelid worms and molluscs are the fauna in the wetlands where migrant birds and wading birds find their feed. Coastal wetlands are diverse ecosystems that play important roles both for land and ocean-based organisms.

According to the Wetlands International Africa Region, coastal wetlands are major sources of carbon sequestration and contain 50% of the carbon stored in the ocean's seabed. Wetlands act as natural sponges for the land-based communities around them by trapping and slowly releasing rain, ground and flood waters. Yet coastal wetlands continue to decline. Major threats to wetlands include climate-change effects, pollution, land use change, and invasive species. Rain, rivers and streams wash sediment off the land and into estuaries and the sea. This can be sped up by clearing land for buildings and industry. Sediment can build up and smother the seabed, killing creatures living in the mud. The River Gambia constitutes the major inland water ecosystem in the country. It originates from the Futa Djallon highlands in Republic of Guinea and runs through a length of 1130km to the Atlantic Ocean. The country also has an extensive network of wetlands, and there are different classifications of the Gambia's wetlands. The most common fish species in the freshwater ecosystems of The Gambia are the riverine fish species mostly found in freshwater parts of the River Gambia, its tributaries and wetlands. These include catfish (Clarias spp.), Osteoglossoids (particularly Heteroitis niloticus), Cichlids (Tilapia spp.) and Gymarchus (e.g. Gymnarchus niloticus). However, certain species such as the cynoglossidae and sharks etc cross the ecosystem boundaries.

Fig 3: Wetland in Niumi National Park

4. Marine Habitats and Species

Marine ecosystems can be defined as the interaction of plants, animals, and the marine environment. By "marine," we mean of, or produced by, the sea or ocean. The term encompasses the salty waters of the Earth, and is also known simply as a salt water ecosystem. Broadly speaking, the marine ecosystem refers to the oceans and seas and other salt water environments as a whole; however, it can be divided into smaller, distinct ecosystems upon closer inspection. There are various types of marine ecosystems, including salt marshes, estuaries, the ocean floor, the broad ocean, the inter-tidal zones, lagoons, and mangroves. Like all ecosystems, marine ecosystems are finely balanced and highly complex. Many different parts that make up an ecosystem, and each part plays a role in maintaining balance within the system. Organisms depend on, and are highly influenced by, the physiochemical environmental conditions in their ecosystem.

Below is an ecological map of the coastal and marine zones of the Gambia portraying the various ecosystems such as Marine Protected Areas, the sea turtle nesting sites, the seagrass meadows and major road network.

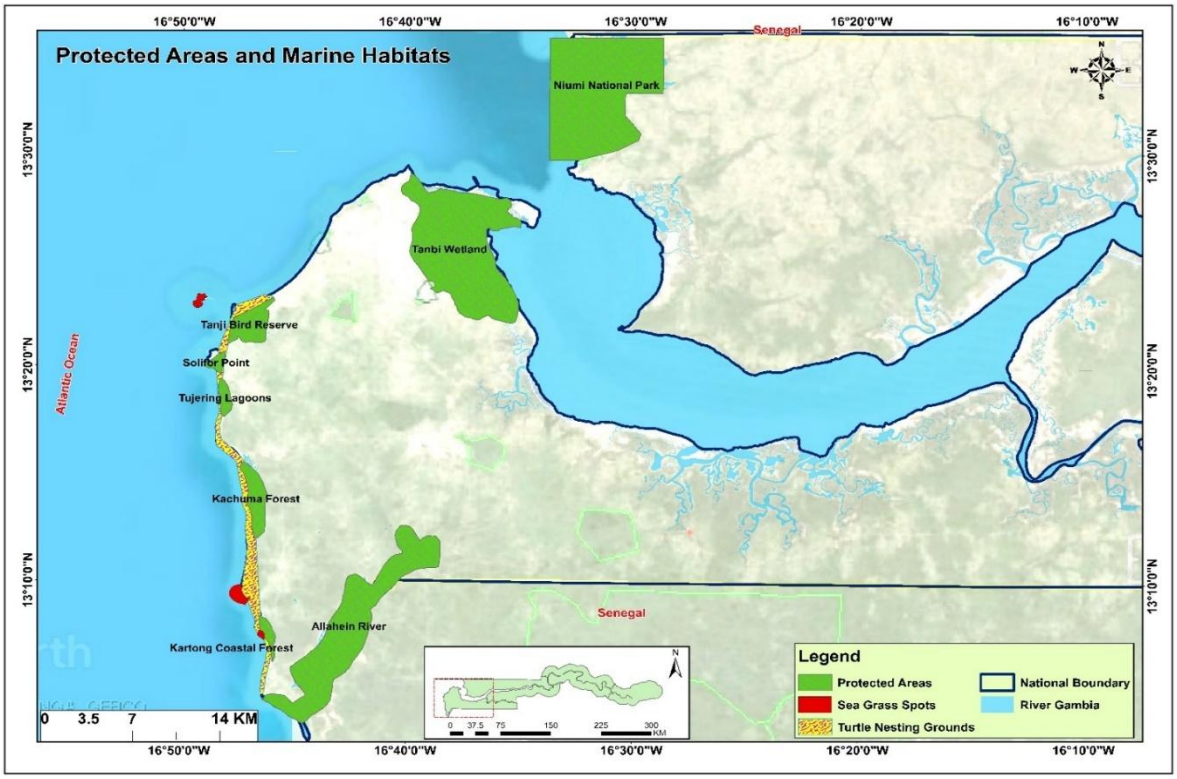

Fig 4: Ecological map of the coastal zones

4.1. Sea Turtles

Sea turtles are a fundamental link in marine ecosystems. They help maintain the health of seagrass beds that benefit commercially valuable species such as shrimp, lobster, and tuna. Five of the seven sea turtle species are found in The Gambia and are nesting on the beaches and feeding offshore, and are classified as threatened because of coastal erosion, tourism and infrastructural development: the loggerhead turtle (Caretta caretta), leatherback turtle (Dermochelys coriacea), green turtle (Chelonia mydas), hawksbill turtle (Eretmochelys imbricata) and olive Ridley turtle (Lepidochelys olivacea). Marine turtles occur along the coastal stretches from Niumi up to Allahein River around Kartong further south on the border with Casamance. Turtles also have major cultural significance and tourism value.

FIg 5: Sea Turtle hatchlings struggling to reach the sea.

4.2. Marine Mammals

There is limited information available on marine species diversity in The Gambia reflecting somehow the situation at the global level. However, marine species whose diversity is threatened include marine mammals, sharks, Molluscs, shrimps and lobsters. There is growing evidence that many of these marine species are becoming less abundant and less widely distributed, and therefore more vulnerable to extinction. It is pertinent to note that the protection and sustainable use of marine resources and biodiversity are governed by several international conventions, including the Convention on Biological Diversity (CBD). The waters of the Gambia contain

various types of whales (including humpback), dolphins (common, bottlenose,), seals, and of course, the threatened manatee, often seen in the waters of the river Gambia. It was reported that the coast of the Gambia is known as a winter breeding ground for numerous waders and migratory sea birds.

4.2.1 Sharks and Rays

Studies conducted on Sharks and related species in the Gambia show that, the country has more than 29 species of sharks and rays. Furthermore, fisheries experts have reported elsewhere that coastal areas support essential habitats and breeding grounds for many of the worlds' commercial and recreational fisheries. Several species caught and landed in The Gambia apparently spend an important part of their reproductive cycles in Gambian waters. Field observations and investigations indicate that this is probably the case. The composition of the shark and ray by-catches landed by artisanal fishermen is largely made up of juvenile sharks (Rhizoprionodon acutus) and reproducing adult females. Some ecosystems in The Gambia are known to function as habitats for critical stages in the lifecycles of several aquatic organisms.

Fig 6: some Sharks exploited by Ghanaian fishermen

The excessive fishing pressure exerted on shark populations in The Gambia over the past twenty years has resulted in considerable diminution in species captured as well as in total landings compared with those of the 2000s. Furthermore, the quantities as well as the individual mean sizes of sharks caught are getting smaller and exploited populations are decreasing with an overall diminution of the big reproducers, e.g. Rhinobatos cemiculus.

The proportion of gravid females and juveniles in the landings is also increasing. Some species belonging to certain families, that were abundant some three decades ago, are now scared or are no longer being caught. These families include the Squatinidae, Leptochariidae, Triakinida, Rhynchobatidae, Pristidae and the Torpedinidae. As a result, species such as Rhynchobatos lübberti and Pristis spp are believed to be threatened with extinction. Other species, such as Sphyrna mokarran, Negaprion brevirostris, Galeocerdo cuvieri, and all the big species belonging to the family Carcarhinidae in general seem to be threatened as they are becoming rarer and in landings.

4.2.2. Coastal and Seabirds

More than one hundred and nineteen species of migratory water birds occur in the country. The first quarter of the year is an important moment for birding and monitoring of the abundance, distribution and occurrence in important wetlands around the country. The Sahelian Upwelling Marine eco-region is an important area for birds, including resident and migrant species, such as the lesser Black back Gull, Great Cormorant, Sanderlings, small plovers (e.g. Kittlizts, Ringed plover, Little Ringed plover, Kentish plover, and white fronted sand plover). Royal Tern, Caspian Tern, Audoin's gull, Grey headed Gull, Slender billed Gull, Kelp Gull, Osprey, Grey Plover, Ruddy Turnstone, Bar tailed Godwit, Black tailed Godwit, Bridled Tern, Reef Heron, Grey Heron, Great White Pelican. Wintering birds migrating from Europe and Asia use the area as staging post, nesting and feeding grounds.

The Bijol islands known as the lone breeding ground of terns and gulls, is reducing in size due to sea level rise. The River Gambia is a hotspot for migratory species from Europe and Asia as well as being an important site for coastal wading birds. Seabirds play an important role in the marine ecosystem by providing an important connection between land and sea that can help maintain ecosystem balance of the estuarine zone. Threats to seabirds include fisheries, as depleted fish stocks challenge the seabirds in finding food, as well as from entanglement on fishing gear, poaching, oil spills, invasive species and conversion of coastal habitats for economic uses.

4.2.3. Other Marine Biota

As discussed in preceding sections, the Gambia marine habitats are home to an extremely rich rays and whales. But these same marine ecosystems are also home to other, much smaller, often forgotten and understudied/monitored marine life that is critical for marine ecosystems, including, octopus and freshwater fishes. Many of these species are data deficient or not evaluated by the fisheries department and are not accounted for in the Gambia ecosystem context, where, through overfishing or other local threats, can be threatened, vulnerable, endangered, etc. even though globally the species may be of least concern according to IUCN.

In all, almost 498 species of fish have been recorded, as well as 22 different species of shellfish (oysters, clams, bivalves). The other marine biota not only provide critical ecosystem services, but they have a lot of value to drive eco-tourism and research, create jobs and enhance not only community welfare, but community contribution to marine conservation.

4.3. fish species and resource base:

In the Gambia, "Fisheries" is here and hereafter intended to include the economic activities of capture or culture of aquatic animals and plants (i.e. fish harvesting). "Fish processing" covers two discrete segments: i) the industrial processing (washing, sorting, cleaning, processing, packaging and freezing) of fresh fish, mainly for export to the European Union (EU), but also to other international destinations; and ii) traditional smoking and drying processes (cured fish products), mainly for the domestic and regional markets -with some smoked fish for the European and other international niche markets. fish species are classed as demersal and pelagic. The demersal fish class has a wide and diverse range of species and this includes: Cephalopods (cuttlefish and octopus), Crustaceans (shrimps and lobsters) and finfish. The pelagic fish category includes large and small pelagic fishes.

With a continental shelf area of about 4,000 km2 and approximately 10,500 km2 of Exclusive Economic Zone (EEZ), The Gambia is believed to be particularly rich in terms of fish species abundance and diversity. This rich resource base offers great potential to make a substantial contribution to The Gambia's socio-economic development, if fish resources are managed sustainably.

Over 500 marine fish species have been recorded in Gambian waters; they are usually classified as demersals (bottom dwelling) and pelagics (surface dwelling). The demersals include: shrimps, groupers, sea breams, grunts, croakers, snappers, etc. The small pelagics group consists of the two sardinellas (*Saridnella aurita* and *Sardinella maderensis*), the bonga/ shad (*Ethmalosa fimbriata*), horse mackerels (*Trachurus trecae, Trachurus trachurus* and *Caranx rhoncus*) and mackerel (*Scomber japonicas*). The high value demersal species (shrimps, sea breams, lobsters and cephalopods, among others) are mostly supplied to fish processing factories for export, mainly to the EU, North America, and Asia. Small pelagics are mainly consumed locally in fresh or traditionally processed product form, or exported regionally.

In the inland sector, fish resources are found within The Gambia River system, which runs through the entire length of the country. They comprise mainly fresh water species, such as: the freshwater catfish, (*Clarias spp.*), tilapia (*Oreochromis niloticus*), the bony tongue (*Heterotis niloticus*), Gymnarchus *(Gymnarchus niloticus*), etc. It is important to note that the river and its ecology also serve as a transitional phase for many marine fish species: they spend part of their life cyclethere to reproduce, feed or as nurse. species include: shrimps, croakers, thread fins (locally known as the "kujali"), and other high value pelagic species such as the barracuda. The Gambian shrimp stock has its spawning grounds in the estuary/river. After hatching and metamorphosis to various larval stages in the river, the juvenile shrimp migrate upstream to shallow areas of the River Gambia for feeding and growth in the nutrient-rich mangrove areas. After three months, the adult shrimp migrate to the sea to spawn in the central - and deepest - part of the estuary.

The Gambia does not have the requisite financial, human, and technical resources to conduct scientific surveys on its own, but relies on assistance provided by international institutions and organizations, such as the FAO and the Norwegian Agency for Development Cooperation (NORAD). For several years, annual hydro-acoustic surveys of small pelagic fish stocks in The Gambia, Morocco and Senegal were conducted with assistance from the FAO and the Norwegian Institute of Marine Research (IMR). Estimates from these surveys are shown in Table 2. While relatively accurate information exists on the status of the pelagic fish stocks, very little information is available on the demersal fish stocks. The most comprehensive survey of the Gambian demersal fish resources was carried out by the Spanish Institute of Oceanography in 1986, which estimated the biomass at 43,645 tonnes.

4.3.1. **Demersal fish stocks:** The demersal finfish of commercial importance include (as examples) the main species of the following families Pseudotolithus spp. (Scianidae), Arius spp. (Arridae), Cynogolossus spp. (Cynoglossidae), Epinephelus spp. (Serranidae), Caranx spp. (Carangidae), Pomadasys spp. (Haemulidae), threadfin (Polynemidae), Dentex spp., Pagellus belottii (Sparidae), etc. Most of these species are found both in the marine and the Gambia estuary and most are trans-boundary in nature.

4.3.2. **Cephalopods (Molluscs) and Crustaceans:** The Common octopus (Octopus vulgaris), Cuttlefish (Sepia officinalis) and Squid (Loligo vulgaris) are the main species in this group they formed an important fishery in the Gambia. These species are shared with some member countries of the Sub-Regional Fisheries Commission (SRFC) especially Senegal. Lobsters and shrimps, mainly: the royal spiny lobster (Palinurus regius), pink shrimp (Penaeus notialis), Parapenaeus longistrostris are important commercial species shared between Senegal and The Gambia.

4.3.3. Small pelagic fish stocks: According to resources surveys conducted regularly within the framework of the Nansen Programme since 1992, the small pelagic are the most abundant fish stocks in the waters of the Gambia. The main small pelagic species of importance in the country are Bonga Shad (Ethmalosa fimbriata), flat sardinella (S. maderensis), round sardinella (Sardinella aurita), chub mackerel (Scomber japonicus) and horse mackerel (Trachurus trecae). These species are highly migratory and are shared between Morocco, Mauritania, Senegal and The Gambia.

4.3.4. Large pelagic fish stocks: The large pelagic are mainly tuna and tuna-like species and sharks. Four tuna species are of commercial value: bigeye tuna (Thunus obesus), yellow-fin tuna (Thunus albacares), skipjack (Katsuwonus pelamis) and sword-fish (Xiphias gladius). Coastal shark species, particularly the Sphyrnidea, Carchharhinidae, and Rhinabatidae are targeted by the artisanal fishermen (mainly Ghanaians) for their meat and fins in the Gambia. The large pelagic are straddling stocks shared by many coastal states.

Given The Gambia's vast ocean resources and that roughly two-thirds of its population live along the coast, it is no wonder that numerous fish species are important for food security and livelihoods. Sustainable fisheries are an essential component of a prosperous blue economy. According to fisheries records, over 33 000 tons of the selected species were landed in 2017 fetching an estimated D1,013,539,000 (U$46,069,955) in value. The estimated value added in the same year was D212,843,190 (U$9,674,690). The fisheries' contribution to the GDP is about

4.2%. The Bonga/shad was the single most important contributor to the turnover in 2017. In addition to shrimp, the industrial and semi-industrial fishing fleets also catch lobster, shrimp, tuna and various other commercial fish species such as sardines - a bulk of which is exported. Artisanal fishers also catch lobster, crab, shrimp, tuna and various commercial fish species, such as grouper, red snapper, rockfish, sardine, octopus, squid and others. In the interior waters, fishers will catch various river fish, such as tilapia.

Fig 7: Fisher stalls, vendors and mongers

5. Coastal and Marine Protected Areas (MPAs)

Protection of ecologically significant areas is critical to the long-term conservation of biological diversity. However, not all the ecologically significant areas are protected. Toll Point to Cape Creek and Oyster Creek mangrove swamp to Mandinari Point form part of Tanbi Wetland Complex, a Wetland of International Importance (i.e. Ramsar site) (Bakurin et al. 2010). Tanbi National Park is part of Tanbi Wetland Complex. Tanji Bird Reserve (Tanji and Bijol Islands Bird Reserve) is a government protected area. Brufut Wood and Kartong Point to Allahein river mouth are under some form of local community protection. However, the remaining ecologically sensitive areas are not under any form of protection.

The Department of Parks and Wildlife Management (DPWM) is the government institution responsible for the sustainable management of wildlife including the establishment of protected areas. The Department of Parks and Wildlife Management (DPWM) aims to have more areas under protection, including representatives of all major habitats in the country and with a proportional regional distribution. The current protected areas are: Abuko Nature Reserve (234 ha), River Gambia National Park (585 ha), Niumi National Park (7,758 ha), Kiang West National Park (11,526 ha), Tanji & Bijol Islands Bird Reserve (612 ha), Baobolon Wetland Reserve (22,000 ha) and Tanbi National Park (6,034 ha) (WWF 2011).

In addition to the DPWM protected areas, there is Bolon Fenyo Community Wildlife Reserve (320 ha), the first community wildlife reserve in the country. It is managed by the local community of Gunjur, Kombo South. Recently, The Kartong Allahein Marine Park , covering 3500 ha , is established as one of the important Marine Protected Area with the potential of becoming a transboundary Marine Indigenous Community Conserved Area (ICCA) with Abene community Marine sanctuary in Casamance (Senegal).

5.1 Niumi National Park

Niumi National Park (NNP), gazetted in 1986, is located on the north bank of the River Gambia, in the North Bank Region, at 13o 31' North, 16o 31' West (Republic of The Gambia 2011c). The park occupies the coastal strip north of the River Gambia, covering an area of 7758 hectares (Republic of The Gambia 2011c). The park also encompasses the southern tip of the Sine-Saloum Delta (Republic of The Gambia 2011c) and is contiguous with Parc National du Delta du Saloum (Delta du Saloum National Park) and Biosphere Reserve in Senegal.

These two parks form the Niumi-Saloum transboundary protected area. Niumi National Park was designated as a Ramsar Site in February 2009 (Republic of The Gambia 2011c). The park encompasses a mosaic of vegetation-habitat types ranging from mangrove forest, through coastal grass/scrubland, forested/woodland, salt marsh, freshwater marsh, freshwater lagoon, and intertidal mudflats, to estuarine and sand beaches (Republic of The Gambia 1997).

Thus the park supports a diversity of species: 300 bird species, 4 amphibian species, 46 mammal species, 21 reptile species and a variety of invertebrate species (Barnett 2000) (See annex 1). A Department of Parks and Wildlife Management (DPWM) checklist showed that 20 bird species, 9 mammal species and 26 tree species have been recorded from the park (DPWM 2012).

However, according to the Niumi National Park management plan, Republic of The Gambia 2011c, the park supports 130 plant species, 32 butterfly species, 22 Odonta species, 43 mammal species, 28 reptile species and 13 families of fish Mammal species found in the park include Bushbuck (Tragelaphus scriptus), Common Warthog (Phacochoerus africanus), Leopard (Panthera pardus), Spotted Hyena (Crocuta crocuta) and Western Red Colobus Monkey (Piliocolobus badius temmincki). Threatened mammals such as the West African manatee (Trichechus senegalensis) and the African Clawless Otter (Aonyx capensis), are also found in the bolongs (tributaries) (Republic of The Gambia 2011c). Reptile species that are commonly found in the park include the Bosc's Monitor (Veranus exanthematicus), Nile Crocodile (Crocodylus niloticus), Nile monitor (V. niloticus), Bell's Hinged Tortoise (Knixys belliana), Green Turtle (Chelonia mydas) (threatened) and Olive Ridley Turtle (Lepidocelys olivacea).

The most abundant fish species found in the park is Tilapia spp. and Mugil spp. (Republic of The Gambia 2011c). However, juveniles of African red snaper (Lutianus agennes), Giant African threadfin (Polydactylus quadrifilis) and shad (Ethmalosa fimriata) are also found in the park (republic of The Gambia 2011c).

5.2. Tanbi Wetlands National Park

Tanbi Wetlands National Park (TWNP), covering an area of 6,034 hectares was established in 2007. The national park is located within the administrative regions of Banjul, Kanifing and West Coast, at 13o 26' North, 16o 38' West. The national park is a lowland with a mean altitude of 1 m (Tanbi Wetlands Management Plan, Republic of The Gambia 2008a).

Tanbi Wetlands National Park has been designated as a Ramsar Site in 2002. Eighty per cent of the Tanbi Wetland Complex is composed of mangrove forest which are made up of several species of mangroves which includes *Avicennia africana*, *Conocarpus erectus*, *Laguncularia racemosa*, *Annona glabra* and the *Rhizophora spp.* with the occasional Baobab or *Borassius aethiopicus* standing on the drier ground.

The vegetation gradually changes to the west and south into bare flats, salt marsh and dry woodland, with agricultural land encroaching around the fringes of the complex. There is a lattice work of tidal creeks, known to locals as *bolongs* as well as tidal lagoons and estuarial saline mudflats. The complex has a role in retaining incoming water and rainfall, stabilizing the shoreline, the retention of sediments and nutrients and also controlling their erosion, groundwater replenishment and flood control, so Tanbi Wetlands acts as a hydrological buffer zone for the Banjul region.

The area is an estuarine and intertidal forested wetland, mainly of low mangrove forest, with a complex of vegetation types on its northern boundary and along the mangrove fringing the mainland (Republic of The Gambia 2008a). It provides an important fish breeding ground. The park is very rich in biodiversity with 362 bird species from 66 families recorded (Republic of The Gambia 1997). However, Barnett (2000) reported that the park supports 362 bird species including such interesting or charismatic species as Pel's fishing owl, brown-necked parrot, blue-bellied roller and pygmy sunbird; while in the northern winter Palearctic migrants such as osprey, black- tailed godwit and Caspian tern are found. Climate change and global warming pose a particular threat to wildlife in the wetlands as sea levels rise. It is an important breeding area for the shrimp *Farfantepenaeus notialis*, 1 amphibian species, 135 insect species, 6 crustacean species, 2 gastropod species, 30 mammal species, 23 reptile species and 24 fish species.

Moreover, a Department of Parks and Wildlife Management (DPWM) checklist showed that the park supports 78 bird species, 10mammal species and 40 tree species. This checklist appears to be incomplete and needs to be updated. Rare and endangered mammal species such as the West African Manatee (Trichechus senegalensis) and the African Clawless Otter (Aonyx capensis) occur in the bolons (tributaries) (Republic of The Gambia 2008a). Bell's Hinged Tortoise (Knixys belliana) has also been recorded from the coastal strip. Fish belonging to at least five families have been recorded from the park and the most abundant of these is the Tilapia spp. There are West African crocodiles as well as various snakes and lizards.

5.3. Jokadu Wetland National Park

Jokadu National Park (JNP) has an area of 19,293 hectares. JNP is a mangrove swamp fringing River Gambia about 50 kilometres from the River Mouth. This beautiful delta is developed through the combination of deposition of fluvial and marine sediments. It is an Estuarine with an Intertidal forested wetland primarily of mangrove forest. It has a complex of mangrove vegetation types on all sides of its boundary and along the riverbank. The JNP functions and services include coastal stabilization, breeding of aquatic species, river transport, stop-over for migrant species, agriculture and recreation.

Jokadou National Park is a wetland complex located on central coordinate N376493 W1495997. The area includes three districts located within North Bank Region. Jokadu National Park (JNP) is a newly-designated protected area. It is the wetland system fringing the river from Jurunku village in Upper Niumi to Jammeh kunda in Lower Badibou, located on the northern bank of the river. The PA is comprised of 90% of wetlands used mostly for fishing. The wetland ecosystems include creeks, swamps, vegetated islands, and one of the best mangrove areas in the Gambia. It also includes forested areas on the landward part near Tambana village, adjacent to Kumadi Forest Park.

The terrestrial and wetland habitat and species assemblage are overall similar to those in Bao Bolong Wetlands Reserves (BBWR). Five species of mangroves are recorded namely *Rhizophora mangle, Rhizophora harisonii, Laguncularia racemosa, Conocarpus erectus* and *Avicennia nitida*. Other species of flora include *Schoenoplectus* spp., *Paspalum vaginatum, Sesuvium portulacastrum, Typhae australis, Phragmites autralis, Pterocarpus erinaceus, Terminalia avicenoides, Terminalia macroptera, Nauclea latifolia, Combretum glutinosum, Combretum micrantum, Cassia siberiana, Detarium senegalensis, Strophantus samentosus, Lophira lancealata,* and *Schlerocaryabirrea* (also used to feed cattle).

The mammalian checklist is relatively rich with large mammals such as Bushbuck (*Tragelaphus scriptus*), Common Warthog *(Phacochoerus africanus)*, Spotted Hyena (*Crocuta crocuta)* are known to occur, but in a small numbers. Primates are still fairly well established; especially Callithrix Monkeys (*Cercopithecus sabaeus)*, Patas monkeys' (*C. patas)* and Senegal Galagos (*Galago senegalensis*), Guinea Baboons (*Papio papio)* and Western Red Colobus (*Piliocolobus badius temmincki*). Both West African Manatee (*Trichechus senegalensis)*, and African clawless Otter (*Aonyx capensis)*, are known to occur in the bolons.

The current list of bird species for Jokadu National Park stands at roughly 200 species from 63 families. Casual rangers' observations have shown a good number of migrating flocks of turnstone (*Arenaria interpres*) and sanderling (*Calidris alba*) in the area. Ospreys are present the all year round at the site. An increase of dry season oystercatchers (*Heamaropus ostralegus*) mixed with stands of gulls and terns are noted around the Babili Mansa Bridge. Four hundred individual species of Greater Flamingo, were recorded on the confluence of Wonkofala Creek in 2010.

5.4. Bijilo Monkey Park

Bijilo Forest Park & Nature Trail (*Monkey Park*) The Bijilo Forest Park is a fenced woodland which was gazetted in 1952 and covers an area of 51.3 hectares situated on the coast just south of the Senegambia area of Kololi. The park consists of mainly of closed canopy forest with a significant number of *Borassus aethiopum* palms. The park was opened to the public in 1991 and now receives over 23,000 visitors per year. The park lost part of its reserve status in 2018 during the construction of Sir Dawda Kairaba Jawara International Conference Center.

Bijilo Forest Park has a diverse fauna of invertebrates, reptiles and mammals. There are troops of green monkeys, Temminck's red colobus, Campbell's mona monkey and patas. The green monkeys have been fed by visitors and this has caused issues, and the park is nominally trying to stop this practice, though park staff still regularly sell visitors peanuts to feed to the monkeys There is also a population of the nocturnal Senegal bushbaby.

Other mammal species which can be seen include the Gambian sun squirrel, African civet, genets, mongooses, brush-tailed porcupine among other smaller, less noticeable species. The forest is also home to a diverse reptile fauna including agama, rainbow and monitor lizards, and some colourful insects and invertebrates including fire ants, dragonflies, termites, butterflies, and the golden silk orb-weaver.

Over 133 bird species have been recorded in the Bijilo Forest Park including such species as the black-necked weaver, red-billed hornbill, greater honeyguide, bearded barbet, oriole warbler, palm-nut vulture and long-tailed nightjar. These and the many other species make the area attractive to the many European birdwatchers who visit the Gambia. The birdwatching is most productive towards the coast where migrants such as Caspian tern and osprey can be seen.

5.5. Tanji & Bijol Islands Bird Reserve:

Tanji and Bijol Islands Bird Reserve (Tanji Bird Reserve, TBR), covering an area of 612 hectares, was gazetted in 1993 (Republic of The Gambia 2011e. Tanji Bird Reserve is centered on 16o 48.00' West, 13o 22.00' North on the West Coast Region of the Gambia, in Kombo North District. The reserve lies on the Atlantic coast, 15 km to the south-west of the main tourist centres of Fajara and Bakau and 1 km from the expanding town of Brufut. The reserve boundary encloses the tidal, saline reaches of the small Tanji river, which is bordered by 2 km2 of low mangrove forest, saltmarsh and mudflats. Long shore drift creates a shifting channel for the river as it reaches the ocean and is blocked by a sand beach parallel to the land. This has also created several small lagoons between the river's mouth and Cape Point. The point is the landward limit of a lateritic outcrop which reappears 2 km offshore to form the tiny Bijol Islands, which are included in the reserve. The two unstable islands are accumulations of sand trapped by laterite reefs. They were formerly lightly wooded, disappeared in the 1960s and have gradually reformed since then. The main island is now vegetated with the creeping halophytes Ipomoea pes-caprae and Sesuvium portulacastrum.

Tanji & Bijol Islands Bird Reserve is considered the richest site for birds in The Gambia, measured by the number of bird species recorded in the country (Republic of The Gambia 2011e). The mouth of the Tanji river and the Bijols Islands are the most important areas in the country for most species of gulls and terns (Republic of The Gambia 2011e). The Bijol Islands are the only known breeding site in The Gambia for Grey-headed Gull (Larus cirrocephalus), Caspian Tern (Sterna caspia) and Royal Tern (S. maxima) (Republic of The Gambia 2011e).

Tanji Bird Reserve comprises a wide diversity of habitat types including coastal scrub woodland, dry woodland savanna, freshwater, estuarine and marine (Republic of The Gambia 2011e). The Bijol Islands, the only offshore island in the country, located about 2 km offshore, provide an important breeding ground for waterbirds and marine turtles (Republic of The Gambia 2011e, Plate 2). The reserve supports a high biological diversity with 304 bird species recorded (personal observation). However, a Department of Parks and Wildlife Management (DPWM) checklist showed that the reserve supports 176 bird species and 17 mammal . Mammals of global conservation concern such as the Western Red Colobus monkey (Piliocolobus badius temmincki), the rare Mediterranean monk seal (Monachus monachus) and dolphins (Sousa teuzil) occur in the surrounding waters .

The Nile Crocodile (Crocodylus niloticus) also occur in the permanent water pools. Other reptiles that occur in the reserve include African Rock python (Python sabae) and the Royal Python (P. regius).

5.6. Bolong Fenyo Community wildlife Reserve

Bolon Fenyo Community Wildlife Reserve (BFCWR), covering an area of 320 hectares, was gazetted as a protected area in 2008. The Reserve is located along the Atlantic coast, in the West Coast Region, Kombo South District, 35 km from Banjul (republic of The Gambia 2008b). The central coordinates of the reserve are 16o 46'West-13o 09'North (Republic of The Gambia 2008b). The area has exceptionally high habitat diversity for its comparatively small area. These habitats include marine, estuarine, fresh water marsh, coastal dune, mangrove, woodland/savanna and thicket (Republic of The Gambia 2008b). The reserve is also in very close proximity to another area of high ecological significance, Dua Dula to Kartong. This area serves as a corridor linking Bolon Fenyo Community Wildlife Reserve with the ecologically significant Allahein River mouth. The reserve which includes 400 meters of coastline and open beach, has a high diversity of avifauna and is an important roosting and feeding area for gulls, terns and other species (Republic of The Gambia 2008b). It also has a high diversity of plant species, with 41 plant species recorded from casual observation of Rangers (Republic of The Gambia 2008b). Moreover, a total of 74 bird species from 61 families, 16 mammal species and 11 reptile species, have been recorded from the reserve (Republic of The Gambia 2008b).

However, a Department of Parks and Wildlife Management (DPWM) checklist showed that the reserve supports 100 bird species, 6 mammal species and 70 tree species. There is no official record on the status of amphibians and fish within the reserve. Although there has been no investigation of the diversity of invertebrates, a sporadic study of the Lepidoptera yielded 31 species. Mammal species recorded from the reserve include Gambian Epauletted Fruit Bat (Epomophorus gambiensis), Western Red Colobus Monkey (Piliocolobus badius temmincki), Calithric Monkey (Cercopithecus sabaeus), Senegal Bush Baby (Galago senegalensis), Bushbuck (Tragelaphus scriptus), Red flanked Duiker (Cephalophus rufilatus), Clawless Otter (Aonyx capensis), Porcupine (Hystrix cristata) and Spotted Hyena (Crocuta crocuta) (Republic of The Gambia 2008b).

Reptile species include African Rock and Royal Pythons (Phython sabae and Python regius), Puff Adder (Bitis ariens), Nile Monitor (Varanus niloticus), Nile Crocodile (Crocodylus niloticus) and Leatherback and Green turtles (Dermochchelys coriacea and Chelonia mydas) (Republic of The Gambia 2008b). Offshore fauna recorded from the area include Hump-backed and Bottlenose Dolphins (Souza teuzil and Tursiops truncatus), Pilot and Minke whales (Globicephala macrorhynchus and Balaenoptera acustorostrata) (Republic of The Gambia 2008b). The area is very fragile and provides critical roosting ground for both residential and migratory species of birds. It is also a breeding ground for green turtles. Coastal erosion is caused by both natural and anthropogenic factors. So unless effective coastal erosion combating measures are taken, the area will be seriously devastated in few years. The main threats or disturbance factors here are the highway (road, pollution, sand mining, coastal erosion, poaching, logging and beach driving).

5.7. Allahein Kartong community wildlife sanctuary

Kartong Allahein (Lat 133.0872299, Lon -11116.77766227) is located in the Southern tip of the West coast Region. The reserve is named after the Allahein River and was proposed as a protected area in 2023. The reserve covers an area of about 3,500 ha and this involving the marine part extending to the borders of Gambia and Senegal in the Casamance region. Kartong Allahein comprises a rich mosaic of habitat types with a rough zonation from the high mangroves of the Allahein River through permanent salt marsh, bare tannes, seasonal freshwater marsh, to wooded grassland, coastal beach and marine waters of the Atlantic Ocean. The Allahein river forms the border between The Gambia and southern Senegal. The river is half a kilometre wide where it meets the Atlantic Ocean. At its mouth is a sandbar, while extending to the north-north-west are 3 km of sandy beaches behind which lie shallow seasonal lagoons. The coastline then turns abruptly northwards to face west. One kilometer north of this bend is the border town of Kartung. There is a large area between the town and the coast that is quarried—the Kartong sand quarries, the country's main source of sand for building development. The quarrying has created several freshwater lakes. This part of the mine is being decommissioned.

The Marine Park is ecologically significant in that three distinct ecosystem types: mangrove forest, salt marsh and savanna woodland occur in very close proximity to each other. This resulted in a mosaic of habitat types, giving rise to a high incidence of ecotones, with high associated biodiversity. The reserve supports 71 bird species, 48 plant species, 1 amphibian species,

22 butterfly species, 11 odonta (insect) species, 3 crustacean species, 1 gastropod species, 22 mammal species, 9 reptile species and 9 fish species (ecological survey 2022).

However, a Department of Park and Wildlife Management (DPWM) checklist showed that 10 tree species, 10 mammal species and 10 tree species have been recorded from the Marine Park (DPWM 2022). Large mammals such as Bushbuck (Tragelaphus spekei scriptus) occur in the reserve. Primates recorded from the reserve include Callithrix Monkey (Cercopithecus sabeus) and Patas Monkey (Cercopithecus patas) (DPWM 2022). The area is relatively poorly known but there have been occasional records of *Larus audouinii* during the 1990s, with a maximum count of 38 birds. The area may prove to be an important roost site for other species of gulls, terns and waders. In addition to *Larus cirrocephalus*, the Kartung quarry lakes may also be important periodically for other waterbirds; numbers of *Tachybaptus ruficollis*, *Porzana pusilla* and *Porphyrio alleni* have been recorded.

Aquatic mammals such as the West African manatee (Trichechus senegalensis) and the African Clawless Otter (Aonyx capensis) also occur in the bolons (tributaries). Reptiles found in the community reserve include Nile Crocodile (Crocodylus niloticus), Bell's Hinged Tortoise (Kniyx belliana), Agama lizard (Agama agama), Nile monitor (Varanus niloticus), Bosc's monitor (Varanus exanthematicus) and African rock python (Python sabae) (DPWM 2022). Fish species belonging to at least six families have been recorded from the reserve. However, the most abundant species were Shads (Ethmalosa fimriata), Tilapia (Tilapis spp.) and Mullets (Mugil spp.)

5.8. The proposed Labour Canyon Marine Park (15,000 ha)

This is a deep sea Marine Protected Area yet to be gazette under the implementation of the GEF 6 Lamd/seascape planning and Ecosystems restoration project. This sub marine canyon was first discovered during the RAMPAO gap analysis in 2018. The site is used by marine mammals and pelagic for breeding and nurseries ground, Later the site was evaluated by the UNCBD secretariat and described as an Ecological and Biological Sustainable Area (EBSA) through application of scientific EBSA criteria. The site is located between 8 to 10 Kilometers away from the Bijol Islands.

The site was identified by government to be gazette during the implementation of the GEF 6 Project. Issues like petroleum and gaz exploration by the government is delaying its designation process.

The department of Parks and Wildlife Management has submitted a letter of intent to the Ministry of Environment and is planning to start administering the process framework for its official designation and a MPA.

6. Exclusion zones

These are critical Biodiversity areas, fragile ecosystems along the coastal strip of the Gambia that are recommended to be avoided for any infrastructural development. Together they form a range of unique ecosystems, breeding and feeding grounds for numerous endangered and threatened species of animals and probably the last sanctuaries for those critical wildlife species on the verge of extinction in the country.

6.1. Turtle nesting grounds:

Turtles have a vital role in maintaining the health of marine ecosystems. They contribute to the balance of biodiversity, control jellyfish populations, and help with nutrient cycling. Their survival is crucial not only for the ecological balance but also for the tourism industry, as turtle watching attracts visitors who appreciate the wonders of nature. The Gambia's coastline is home to several species of turtles, including the Green Turtle (Chelonia mydas), Hawksbill Turtle (Eretmochelys imbricata), Leatherback Turtle (Dermochelys coriacea), and Olive Ridley Turtle (Lepidochelys olivacea). Each species has its unique characteristics and nesting habits. Turtle populations face a multitude of threats in The Gambia. One of the biggest concerns is the destruction of nesting sites due to coastal development and erosion. The introduction of predators, such as feral dogs and mongooses, poses a significant risk to turtle hatchlings. Additionally, pollution, climate change, and illegal poaching further impact these vulnerable creatures. To protect nesting sites, efforts are made to create designated conservation areas where the disturbance is minimized. Volunteers and researchers monitor these areas during the nesting season to ensure that eggs are not tampered with or harmed. Community engagement and education play a vital role in turtle conservation. Turtle SOS The Gambia, Smile for Life the Gambia and many other CBOs are very active to raise the awareness and protect the nesting sites. Injured or sick turtles are often rescued and taken to rehabilitation centers. These rescue and rehabilitation efforts help to increase the chances of survival for injured turtles and contribute to overall conservation efforts. The area stretches from Kartong Allahein river mouth up to the eroded beaches of the Senegambia Hotel.

Fig 8: Sea Turtle nest

Fig 9: Turtle hatchery at Sanyang Beach

Fig 10: map of sea turtle nesting sites

Turtle Nesting Sites

No	Location	Latitude	Longitude
1.	Tanji Bird Reserve	13.381687	-16.783290
2.	Lamin's Happy Corner (Tanji Beach)	13.345555	-16.809408
3.	Kuke Beach Bar (Bato Kunku)	13.342441	-16.811572
4.	Batokunku Camp Beach Bar	13.325417	-16.804808
5.	Bob's Beach Bar (Tujereng)	13.315204	-16.802962
6.	Point 2 (Tujereng Beach)	13.290272	-16.804882
7.	Point 1 (Sanyang Beach)	13.288098	-16.805748
8.	Point 2 (Sanyang Beach)	13.275990	-16.806694
9.	Point 3 (Sanyang Beach)	13.255026	-16.787261
10.	Point 4 (Sanyang Beach)	13.236574	-16.784032
11.	Point 1 (Gunjur Beach)	13.229022	-16.783249
12.	Point 2 (Gunjur Beach)	13.154892	-16.783085
13.	Point 3 (Gunjur Beach)	13.150161	-16.777176
14.	Lamin's Santosha Bar (Kartong)	13.126625	-16.76777
15.	Kartong Hatchery	13.126490	-16.767684
16.	Duwa Dula Kartong	13.078448	-16.771002

6.2. Seagrass meadows

Two seagrass species occur in The Gambia, *C. nodosa* and *H. wrightii*, in both intertidal and subtidal areas, growing in monospecific and mixed meadows. *C. nodosa* is widespread in Kartong and Gunjur, and *H. wrightii* is widespread in Bijol Islands. *C. nodosa* in Bijol Islands occurs in sandy areas, also mixed with shell debris and around rocky areas. Bijol Islands have the largest continuous seagrass area in The Gambia, with the meadows of *H. wrightii* located northwest of the islands, while those of *C. nodosa* are located southwest of the islands. The average percentage cover of seagrass meadows at Bijol Islands is about 78%, of which *H. wrightii* constitutes 80% and *C. nodosa* 20%. Generally, the seagrasses at Bijol Islands appear less impacted by anthropogenic activities, given that this is a protected area, with no people living on the islands.

At Gunjur, three meadows have been documented, but their extent is smaller than that at Bijol Islands, this last one with around 2/3 of seagrass meadows. *H. wrightii* meadows observed at Gunjur have been observed to be decreasing (from 2020 to 2022, during the beginning of the year) in density likely due to a combination of identified pressures and activities, including pollution, deposition of waste materials (old clothing, old nets, plastic bags and bottles), drag net fishing, and increased presence of macroalgae. At Karfaya-Kartong, two meadows have been documented, both of which are monospecific and consist of *C. nodosa.* the Bijagós Islands complex) where extensive seagrass meadows of *H. wrightii* have been restored.

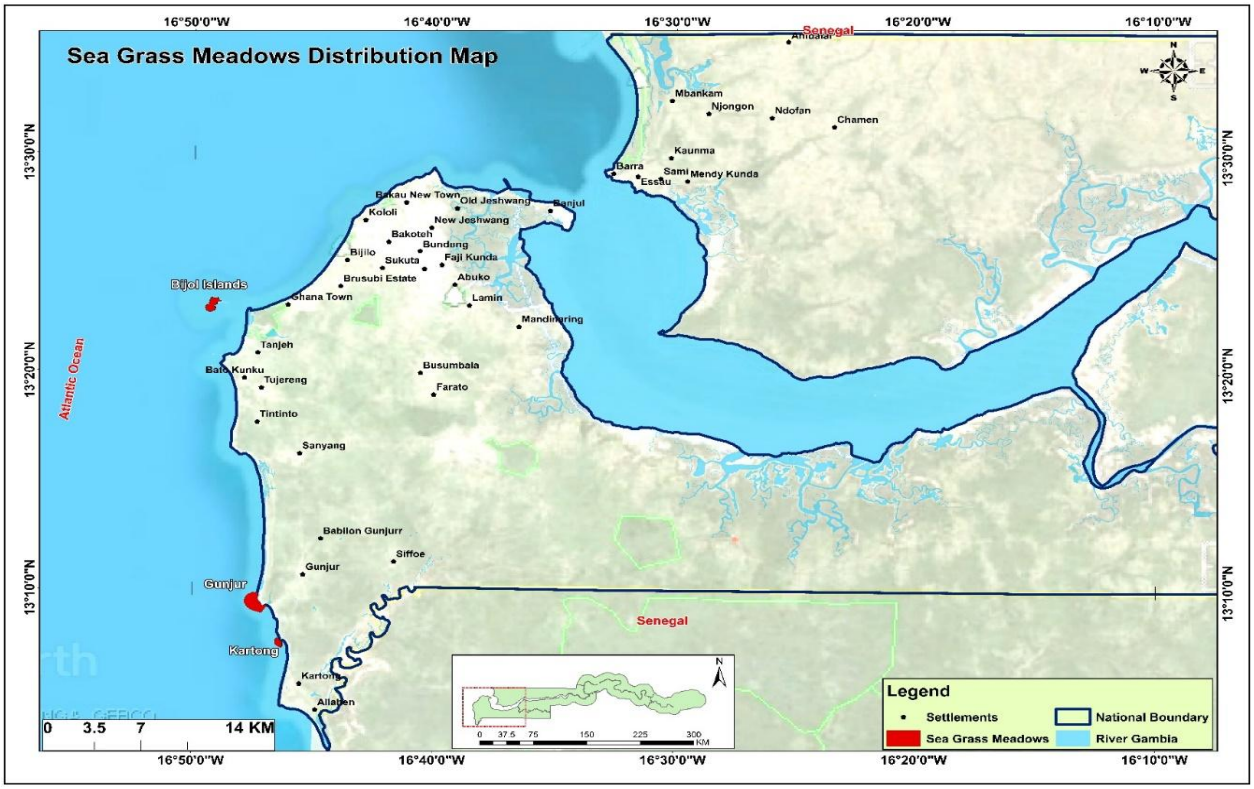

Fig 11: seagrass meadows map

Seagrass meadows coordinates

	Location	Latitude	Longitude
1.	Bijol Islands	13.387403	-16.816727
2.	Gunjur	13.155353	-16.78602
3.	Kartong	13.127838	-16.772102

6.3. Mangroves:

These are found along Kartong (Allahein), Gunjur (Bolong Fenyo) Bijol Islands (Tanji Bird Reserve) in Tanbi representing a group of unrelated tree species that are grouped together because they can tolerate having their roots submerged in salt water. Their prop roots provide a surface of attachment for marine organisms in a muddy environment where hard surfaces are in short supply. Mangroves also trap and bind sediments and filter land-based nutrients, promoting water clarity. Mangroves, like seagrasses, serve as nursery grounds for the juveniles of many commercially important fisheries species, while also providing habitat for a variety of small fishes, crabs and birds. Mangroves protect coasts against erosion by breaking storm waves and dampening tidal currents.

Wetlands, riparian vegetation, closed forests, grasslands, and barren lands are less perceptible. Croplands and cropland/natural vegetation mosaics are mostly found in North Bank region around Bao Bolong Wetlands and Farafenni town towards the border with Senegal. Forests are mostly found in the Western Region where open forests extend westwards towards the Bintang Bolong River into Senegal. Closed forests are limited to the coastal region following the coastline into Senegal. Western Region is the most populated region in the Gambia, with most of the build-up areas concentrated in the coastal part of the region, particularly in the greater Banjul Showing a rapid urbanization sprawl. The most developed mangroves of the Gambia are found in the Western Region particularly in Tanbi Wetlands and the upper part of the Niumi National Park.

According to the National Forest Inventory 2020, it appears that mangroves, open forests, woody savannahs, grasslands and wetlands have been steadily decreasing over the last 2 decades.

Fig 12: Mangrove of Tanbi Wetlands

6.4. Estuaries and wetlands:

Estuaries, coastal lagoons, and other inshore marine waters are very fertile and productive ecosystems. They serve as important sources of organic material and nutrients, and also provide feeding, nesting and nursery areas for various birds and fishes. These ecosystems act as sinks of terrestrial run-off, trapping sediments and toxins, which may damage the fragile ecosystems offshore. The vegetation pattern of the Gambia River Basin varies from its mouth to its source. Mangrove forests stretch inland for about 97 kilometers from the mouth of the river. The middle of the course of the river supports freshland swamps and salt flats, and these serve as ideal breeding places for a large number of insects. Salt mud flats, Sudanian-Guinean riverine forests, and tall grasslands are also found along the course of the river. Around 1,500 plant species, 80 mammalian species, and 330 avian species inhabit the Gambia River Basin. 150 species of freshwater fish and 26 species of reptiles are also supported by the riverine habitat. A large number of semi-aquatic animal species, including reptilian crocodiles and mammalian Spotted Neck otters and hippopotamuses, inhabit the waters of the Gambia River. African Sacred ibises, Long-crested eagles, Yellow-billed storks, and Grass warblers are some of the bird species commonly sighted in the region.

High rates of poaching prevail in the Gambia River Basin, and certain species of crocodiles, manatees, and hippopotamuses have almost been hunted to extinction in The Gambia. Currently, there is a plan to construct a dam on the river at the border between Senegal and Guinea with the potential to generate 400 Gigawatt-hours (GWh) of electricity annually. However, the proposed dam also threatens to damage the sediment balance of the river, destroy the mangrove swamps, and adversely affect the life cycle of the aquatic species of the river.

Fig 13: Wetlands around Banjul.

6.5. Beaches:

The coastal region is a flat and monotonous area of loose marine sands with low dunes being common. These Holocene mineral deposits are underlain by tertiary ferruginous sandstone of the "Continental Terminal", which is occasionally laid bare along the coast as rocky platforms or cliffs. The continental shelf is relatively narrow, the 200 m isobath being about 80 km offshore. The beach serves as a buffer zone between the land and the water. It is usually made up of unconsolidated sediments, such as sand, stones, cockle shelves, and boulders. Beaches are dynamic environments, constantly changing as a result of natural processes, including storms, tidal changes, and sea level rise. Beaches also change as a result of man's actions. Removing sand from the beach for construction, vegetation clearance, and building of seawalls are major problems. Animals occupying this environment have adapted to the constant motion of the sand, gravel, or shell. The beach also provides habitat for a multitude of burrowing species, such as crabs, clams, and other invertebrates.

Fig 14: Sandy beach around cape point, Bakau

7. Preferential areas

The use of fiber optic networks has a number of advantages over satellite, while microwave transmissions and radio have largely been phased out due to restricted bandwidth and poor data transmission. Modern fiber optic networks transmit high volumes of voice and data traffic with higher security and reliability and at lower cost than satellite systems. Cable also has a more dependable installation and repair record. Bandwidth demand, particularly as a result of internet activity far exceeds satellite capacity at the present time (Hogan and Hartson, 1999). Although there are potential environmental and social impacts associated with marine optical cable systems, for the Gambia deployment of a second submarine cable will provide a substantial increase in internet bandwidth and speed at minimal cost.

As per the presentation of the different ecological niches along the coastal zone of the Gambia, from the northern point of the Tanji Bird Reserve (Sanneh Mentereng cultural site) up to the southern tip of the Allahein River in Kartong (adjacent to the Abene Community Marine Park), this stretch of the coast in saturated with hotspots of endangered species of fauna and flora not compatible with fiber optic cable laying. This part of the coast is demarcated as a no-go zone for the planned project. The bare portion of the coast stretching from the former Sheraton hotel and Spa in Brufut , going through the chain of hotels around Senegambia and Kairaba Beach Hotels, Kololi, Bijilo, Bakau New Town and Cape Point (South of the Tanbi Wetlands National Park) can host the project through the proposed options discussed below and highlighted in the map. This area seldom used by some marine turtles as nesting sites has been tempered over the years by hotels and beach bars for the benefit of tourists, by the bright lightening from vehicles and use of hotel services. The sea turtles have since avoided the area for suitable breeding grounds further in the southern part of the coastline.

The ecosystems present in the area have been seriously degraded by the concentration of hotels, beach bars and regular cultural events along the beach. The sites can be used to host the BMH and any other related infrastructure of the cable laying project if proper measures are taken to protect the corridor and the infrastructure. The consultant and the GIS expert paid a visit to the site to assess the feasibility of these selected points for a potential cable laying option. The coordinates of the proposed options are tabulated in the Table for the Potential Cable Laying Options, under the map (fig 15).

Potential Cable Laying Options

The map below features the six possible options for submarine cable laying and Beach Man Hole establishment along the coastal zones of the country.

Six sites are selected to be proposed for the submarine optic cable laying project and they are as follows:

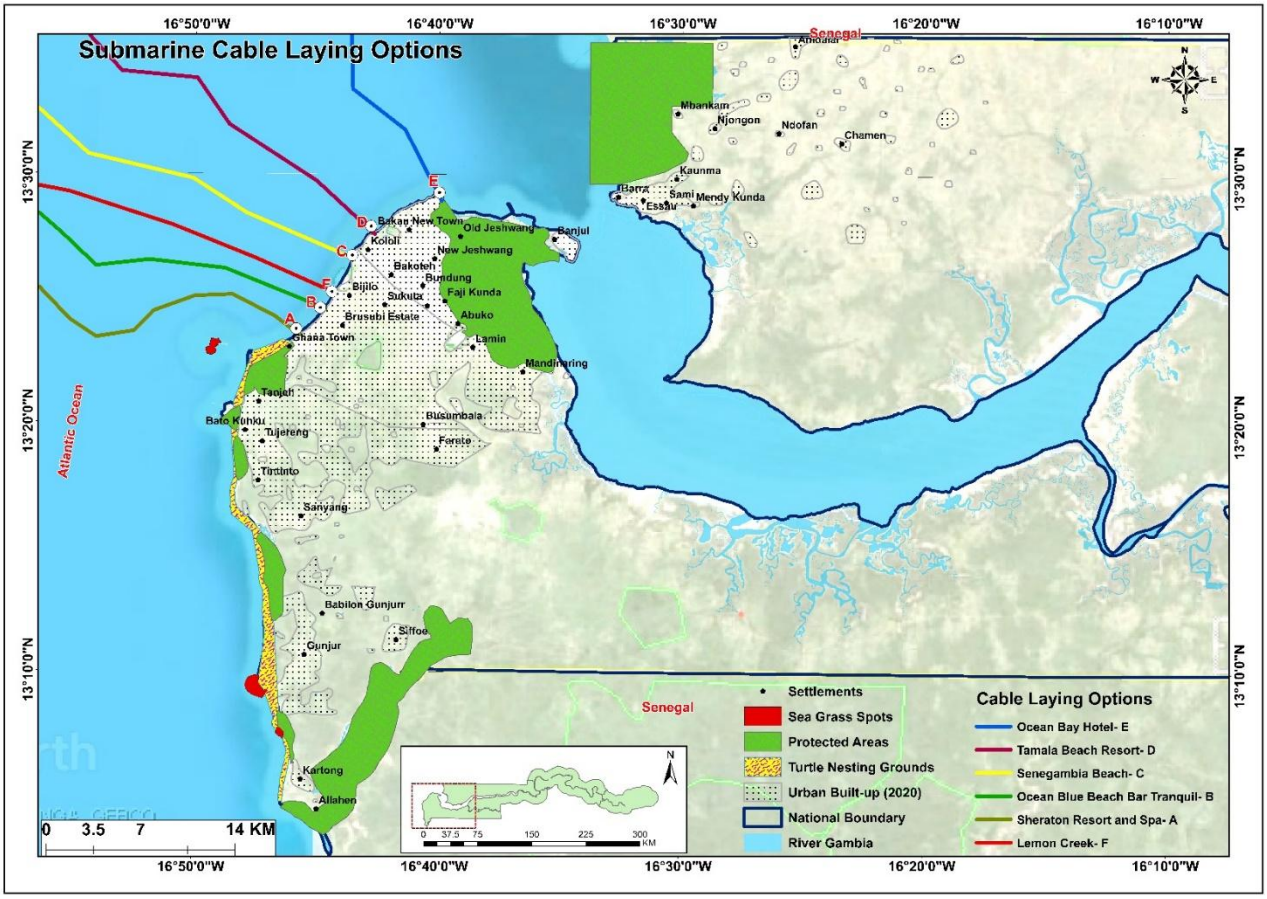

Fig 15: Ecological map of the coastal and marine zones

Table of coordinates of submarine cable laying options

No	Location	Latitude	Longitude
1.	Former Sheraton Resort	13.392730	-16.761641
2.	Senegambia Beach	13.444094	-16.724739
3.	Tamala Beach Resort	13.460148	-16.710226
4.	Ocean Bay Hotel	13.484546	-16.664665
5.	Ocean Blue Bar (Tranquil)	13.409586	-16.743851
6.	Lemon Creek	13.419697	-16.736437

a. **Former Sheraton Hotel and spa (Brufut**) area

This area is located between the northern tip of the Tanji Bird Reserve and the coastal residential area of Brufut Hights. It is a stretch of sandy beach with some beach bars and restaurants seldomly used by tourists residing in the vicinity. This is a suitable site for the project, there is no ecological feature present in the area.

b. Ocean Blue Beach Bar (Tranquil) area

The site is located at the beach front at tranquil village next to Brufut . There is no obstacle to the sandy beach. the area is surrounded by a small bushy area. This could be an ideal site for the Submarine Power Cable project. The proposed ESIA is to explore the social impacts due to the proximity of the tourist areas.

c. Senegambia Beach Hotel (Bijilo)area

The site is located on the sandy beach of the Senegambia hotel. Bolder stones are placed along the sea front for erosion control. This option could be explored but erosion might occur in the long run and unless this is taken into consideration, the project might suffer some set back in the future. The ESIA should explore all possibilities before selecting the site. The social aspect (tourist leisure) is to be examined thoroughly in this scenario

d. Tamala Beach Resort (Kololi) area

The selected site, located around Kololi, at the beach front with sandy area and some scanty trees in the vicinity. The area is next to hotel /camping facilities and can affect the tourist activities in the area. This also can be a potential site for the project. The next study should consider thoroughly its feasibility options and prepare a management plan for future monitoring of the possible impacts it can avail to the tourist activities.

e. Ocean Bay Hotel (Cape Point) area

This scenario is located behind the Ocean Bay Hotel, at the tip of the cape point. It is adjacent to the Tanbi wetlands National Park. The site has less interaction with the ecology of the area. It is observed that there is no tourist activity in the area except beach walk and bird sighting in the adjacent bushy area. This should provide an option for the ESIA to look into the socoal impacts of those activities with the SPC Project

f. Lemon Creek (Brusubi Estates) area

In 2011, Under the ACE Connectivity project, a lateral submarine cable was laid to connect to the ACE submarine cable which was laid off the coast of the Gambia in international waters. In addition, a landing station and the Beach Man Hole (BMH) were constructed at Brusubi Institutional Area and Bijilo Beach near the Lemon Creek Hotel respectively. This can be contemplated as an option to use the same area for the new cable to be laid down.

Fig 16: Beach ManHole of the ACE Cable

Fig 17: Cable laying with the boat offshore

8. Conclusion and recommendations:

Submarine Power Cables (SPC) have been used since the mid-19th century, but environmental concerns about them are much more recent. With the development of marine renewable energy technologies, it is vital to understand their potential impacts. The commissioning of SPC may temporarily or permanently impact the marine environment through habitat damage or loss, noise, chemical pollution, heat and electromagnetic field emissions, risk of entanglement, introduction of artificial substrates, and the creation of reserve effects. While growing numbers of scientific publications focus on the impacts of marine energy harnessing devices, data on impacts of associated power connections such as SPC are scarce and knowledge gaps persist.

After considering the historical record that the ACE submarine cables had at the country level, very minimal level of environmental and social impacts were registered during consultation with stakeholders. The compelling scientific evidence, the long positive track record of submarine cables in the marine environment, and the vital role of cables as critical international infrastructure merit a similar consideration in the process for developing the second cable in the Gambia. Submarine cables, with their small footprint, positive contribution to reducing greenhouse gases, and well-studied neutral to minor environmental impact, stand uniquely apart from high impact uses that are of concern to the area beyond the limits of national jurisdiction such as shipping, deep seabed mining, fishing, pipelines and energy.

The knowledge presented in this report is unequivocal in concluding that the project should support the preparation of a preliminary **Environmental and Social Impact Assessment** and further examine those six options in the area of : the Lemon Creek (Bijilo), the former Sheraton Hotel and Spa (Brufut), behind the Ocean Blue Beach Bar (Tranquil), at the Senegambia Beach Hotel (Bijilo), adjacent to the Tamala Beach Resort (Kololi), and the Ocean Bay Hotel (Cape point) presented in this report. The Proposed preliminary ESIA to be conducted is to integrate the following recommends:

(i) Assess and manage the potential direct and indirect impacts of the project on marine biodiversity, and socio-economic activities surrounding the six proposed locations. This will help identify the most suitable site for the landing of the cable.

(ii) Prepare a management plan of the most suitable route selected and set recommendations

for better monitoring and mitigating the most significant impacts.

(iii) Adopt and implement the management plan during the Design, Installation, Operation and Decommissioning phases of the project.

Overall, ecological impacts associated with the Submarine Power Cable can be considered paramount, although many uncertainties remain, particularly concerning electromagnetic effects.

References

Camara A. 2012. National Data Collection Report - The Gambia. UNEP-WCMC technical report,http://www.unep-wcmc.org.

Barlow, C.R., Wacher, T.J. and Disley, A.S. (1997) A Field Guide to Birds of the Gambia and Senegal. Pica Press.

Carter, L., D. Burnett, S. Drew, G. Marle, L. Hagadorn, D. Bartlett-McNeil and N. Irvine, Submarine Cables and the Oceans—Connecting the World, UNEP–ECMC Biodiversity Series No. 31, 2009.

Carter, L., R. Gavey, P.J. Talling and J.T. Liu, 'Insights into submarine geohazards from breaks in subsea telecommunication cables' (2014) 27(2) Oceanography 58–67, at: http://dx.doi.org/10.5670/oceanog.2014.40

Barbier, E.B., Acreman, M and Knowler, D. (1997) Economic Valuation of Wetlands.A Guide for Policy makers and Planners.Ramsar Convention Bureau, Gland, Switzerland.

Collar, N.J. and Stuart, S.N. (1985) Threatened Birds of African and Related Islands. Part 1 ICBP/IUCN. Cambridge.

Department of Parks and Wildlife Management, (2015) National Biodiversity Strategy and Action Plan, National Policy on Biodiversity , Banjul, The Gambia submitted to UNCBD Secretariat 2015)

Department of Parks and Wildlife Management, (2022) Ecological assessment of wild fauna and flora in ICCAs of CRR Region and the Allahein River- kartong Marine Protected Area.

Eckert, K. L., Bjorndal, K.A., Abreu-Grobois, F.A., and Donnelly, M. (1999) Research and Management Techniques for the Conservation of marine Turtles. IUCN/SSN Marine Turtle Specialist Group. Publication No. 4.

Jones, M. Flowering Plants of The Gambia (1994) A.A. Balkema/Rotterdan/Brookfield.

Kasper, P. (1999) Some Commoner Flora of the Gambia.Edited by StiftungWalderhaltung in Afrika and Bundesforschungsanstalt fur Forst – und Hollzwirtschaft. Hamburg, Federal republic of Germany.

Lykke, A.M. (1994) The Vegetation of Delta du Saloum National Park, Senegal. AUU Reports,33.Aarthus University Press.

Lykke (1996) Structure, Floristic Composition and Dynamics of Woody Vegetation – Studies from Fathala Forest in Delta du Saloum National Park, Senegal. PhD Dissertation submitted to the Faculty of Science, University of Arrthus, Denmark.

National Environment Agency (2010). State of the Environment Report. Banjul, the Gambia: NEA

Ramsar Wetland Study. The Gambia (1997) Report produces by The Department of Parks and Wildlife Management under The Ministry of Fisheries and Natural Resources with The Ramsar Bureau.

Touray, O; Njie Ebrima ; Cham , Mbenga Cham, Review and update of the Tanbi Wetlands Management Plan, Republic of The Gambia 2008, RAMPAO technical review

Van Waereveeke, K, Ndiaye, E, Dhiba, A, Diallo, M, Murphy, P Jallow, A, Ndiaye, P and Tous, P. (1999). A Survey of the Conservation Status of Cetaceans in Senegal, The Gambia and Guinea- Bissau. Report to Secretariat of the Convention of Migratory Species of Wild Animals (UNEP/CMS)

Virginia Lee, James Tobey, Kathy Castro, Brian Crawford, Mat Dia Ibrahima, Ousman Drammeh, Tanvi Vaidyanathan, 2009, Marine Biodiversity Assets and Threats Assessment, Gambia-Senegal Sustainable Fisheries Project, Coastal Resources Center, University of Rhode Island.

Fig 18 : Pictures for field visits





Fig 19 : List of experts consulted and who provided data, inputs and comments

Names	Address	Contacts
Momodou L Kassama	Director, Department of Parks & Wildlife Management, Abuko HQ	[redacted] Mlkassama2@gmail.com
Omar Sanneh	Head of Research & Dev Unit, DPWM	[redacted] sannehmar6@gmail.com
Modou Lamin Manneh	Staff at Kartong MPA , Kartong village	[redacted]
Bakary Njie	Staff, GEF 6 Project, NEA	[redacted]
Mariama Sanneh	Manager, Kartong Allahein River MPA	[redacted]
Omar Sanyang	Director, Smile for life, the Gambia	[redacted], [redacted] omarsanyangba12@gmail.com
Sulayman Jabang	Park Manager, Bolong Fenyo Community Wildlife Reserve	[redacted] sulaymankuto@gmail.com
Hammang Colley	Park Ranger , BFCWR , Gunjur	Not known
Jerreh Njie	Park Manager, Tanji Bird Reserve	[redacted] Jerrehnjie7@gmail.com
Dembo Kassama	Ass Park Manager, Tanji Bird Reserve	[redacted]
Lamin Bojang	Staff at Tanji Bird Reserve	[redacted]
Ahmet Fall	Task Team Leader, World Bank office	[redacted] afall2@worldbank.org
Ndey Sireh Hydara	Environmental specialist, WARDIP Project	[redacted] nshydara@wardip.gm
Serign Omar Lowe	Project Coordinator, WARDIP project	[redacted] slowe@wardip.gm
Omar Manjang	Admin Officer, WARDIP Project	[redacted] omanjang@wardip.gm
Felicia Rosamond Mendy	Social Safeguards Specialist	[redacted] frosamond@wardip.gm
Sulayman Jawo	GIS Expert, NEA	[redacted] Jawosulay@gmail.com
Abdoulie Jallow	Expert, Department of Fisheries	[redacted]
Sarjo Manneh	Park Manager, Niumi National Park	[redacted] sarjomanneh42@gmail.com