

Annex 2 – Feasibility Study

Climate Resilient Fishery Initiative for Livelihood Improvement
The Gambia (PROREFISH)

Part 2: Project design

Table of Contents

Analysis of Climate Adaptation Barriers and Proposed Theory of Change	3
Climate change and technical aspects of proposed component 1 mangrove restoration activities	11
Prioritization of component 2 intervention sites	15
Stakeholder Analysis.....	19
Climate Vulnerability of Small Scale Fisheries Infrastructure and Options for Investment.....	54
1. EXECUTIVE SUMMARY	54
2. DEFINING CLIMATE CHANGE.....	55
2.1 FUTURE CLIMATE SCENARIOS.....	55
3. DEFINING IMPACTS AND MITIGATIONS.....	57
4. VULNERABILITY TABLES	61
5. ISSUES	66
6. RISKS	67
7. FOLLOW-UP AND TRAINING	67
Climate change and aquaculture in The Gambia – Options for investment.....	95

Analysis of Climate Adaptation Barriers and Proposed Theory of Change

1. The climate analysis demonstrated how the changes in multiple ecological segments of the Gambian fisheries would **reduce** the availability of fish in the near future, severely impacting the livelihoods of the artisanal fisher folk. Coupled with current rate of resource over-exploitation by the industrial fisheries segment, the sector's perspectives cannot assume further increases in fishing intensity by the project beneficiaries.
2. Assuming reduced capture fisheries potential, the adaptation responses can be three-fold: **first, increasing fish availability by reducing the high fish losses currently experienced by the artisanal sector, due to the climate vulnerability of the current infrastructure and equipment.** The project is proposing to improve the present situation by investing in climate-proofing and improving landing site infrastructure and equipment (especially fish handling and processing). These **interventions** would allow fisher folk to land in safer conditions the same amounts of fish, but preserving a higher percentage of the quantities and economic value. In addition, these investments would also support higher value addition and better marketing to the tourism sector and exports.
3. **Second, by supporting in the development of aquaculture production as an alternative to climate-induced decreases in capture fisheries.** As demonstrated by global experiences, the limits of capture fisheries in meeting increasing demand have been surpassed by the development of aquaculture production. When addressing climate change impacts on fish stocks, aquaculture can play a similar role as an adaptation measure to maintain or **increase** fish availability. As such, the project is proposing four aquaculture packages as adaptation measures: i) rice-fish integrated production, ii) integration of fish tanks in communal vegetable gardens, iii) fish culture in earthen ponds, and iv) sustainable clam and oyster production. In particular, the aquaculture-agriculture integrated activities present excellent co-benefits by reducing fertilizer and pesticide use.
4. **Third, by restoring degraded mangroves that play a key role as fisheries habitats.** As detailed in Part 1 (Climate rationale) of Annex 2, mangroves serve an important role in the protection, nutrition and reproduction of a large number of fish and shellfish species in the Gambia. Investing in mangrove restoration will reinstate and protect the conditions necessary for maintaining fish productivity and build the resilience of fisher folk to climate change.
5. Yet, the proposed adaptation to the climate change impacts on the Gambian fisheries sector is hindered by **several** issues:

1) Information barriers

- **Very limited data and analysis on CC impacts on the sector and weak knowledge on adaptation measures.** National institutions have a good general understanding of climate change, but lack the capacity to collect additional data and conduct the necessary impact analysis. Similarly, the public sector's ability to propose, implement and monitor adaptation measures is low and heavily dependent on donor-funded projects. There has been recent progress on improved weather and water resources data collection and the development of early warning systems, yet these outputs are not being translated into action.
- **Ambiguous separation between CC impacts and fisheries over-exploitation issues.** While the two issues cannot be fully decoupled, Gambian decision-makers are lacking the necessary analytical tools to identify the root causes of main issues currently affecting the sector and to take appropriate action.

- **Lack of systematic information relay mechanisms to reach fisher folk.** The MoFWRNAM has a network of fisheries extension officers, yet their outreach is limited. The available information is conveyed in an ad hoc manner to landing site committees, which are responsible to further communicate with the local actors. Yet, there are no systems in place to reach out to fisher folk and disseminate information.
- **Widespread lack of literacy and numeracy skills among women.** Women in the fishery sector have enough business acumen to generate more income than their husbands, but are forced to employ male treasurers for women's professional organizations because of their incapacity to deal with written information. They do not venture into formal business (e.g., with hotels, catering companies, supermarkets) as they see it a men's sphere, a perception that is aggravated by their inability to deal with various kinds of documents.

2) Technical barriers

- **Limited knowledge about technologies proven successful.** Several international or regional good practices and proven technologies for fish production have not yet been introduced. Most notably, the rice-fish integrated production has not been tried at scale, despite notable successes in neighboring countries and similar contexts. As such, fisheries officers and rice producers do not yet have the technical implementation capacity. The geographical size of the country and its economy has hindered technology transfer because i) the Gambia's coastline is rather small compared with its neighbors, ii) the number of fisher folk is much smaller compared with regional peers, iii) domestic public and private investments are very low or non-existent to contribute to technology transfer. For these reasons, the Gambia has not benefitted from the type of donor-funded projects targeting technology development and transfer like in Senegal or further south along the coast in Côte d'Ivoire, Ghana, etc. Nor have private enterprises invested in the sector, bringing along new technology.
- **Mixed past experience with improved fisheries and aquaculture technologies.** Previous donor-financed initiatives have attempted to introduce aquaculture activities, but design and implementation issues have resulted in variable results. Particularly, different earthen pond development efforts have yielded both positive and unsatisfactory results. For example, the boreholes were not drilled deep enough and with increased salinity intrusion due to climate change, the ponds did not have the necessary freshwater. In addition, some ponds were developed without the necessary lining, leading to water losses. The lessons learnt from past projects, including FAO's aquaculture projects in The Gambia have been incorporated in the design of the present project, in order to scale up the successful practices and address the weaknesses identified.¹
- **Insufficient availability of quality inputs for aquaculture production.** Recent investments in small-scale fish feed production units and in the development of the Jahally hatchery are starting to provide locally produced inputs for aquaculture. Yet, domestic production of fingerlings and feed is insufficient to supply Gambian producers. Therefore, aquaculture imports from Senegal continue to be the main source, hindering access, increasing costs and not ensuring availability throughout the country. Higher costs prevent more Gambians from engaging in aquaculture,

¹ Annex 2 – part 2 includes reference to the various relevant interventions. Among the most relevant, the "Unlocking the potential of sustainable fisheries and aquaculture in Africa, the Caribbean and the Pacific" FISH4ACP project (<https://www.fao.org/3/cb3979en/cb3979en.pdf>) or previous experience with the FAO financed TCP "Support to enhancing the capacity of youth and women for employment in aquaculture (2016-2019), and the FAO financed TCP "Development of the Artisanal Fisheries in The Gambia" (2015-2017).

given the already important fixed investment costs. If both aquaculture and input production would be kick-started, as proposed in the project, increased demand and increased supply would be matched: producers would have better, cheaper access, while input producers would be sure to have a market for the products. FAO confirms that the inputs have been proven to be environmentally safe and sustainable.

- **Lack of extension services for women's subsectors.** As the society focuses on men's activities and men are the ones who are formally responsible for cash crops, extension services for women's productive activities are rare.
- **Infrastructure for women's business receives less attention and finance.** Infrastructure used by women is of lower quality and the least maintained, which makes product quality control and running business difficult. When their infrastructure receives investment, the associated activity tends to be taken over by men.
- **Widespread lack of literacy and numeracy skills among women.** Given illiteracy, sources of information for women are limited to their immediate social circles, which are comprised of women of similar circumstances. The lack of access to technical information is thus perpetuated.

3) Financial barriers

- **No disposable income for investing and weak access to credit.** Gambian fisher folk are amongst the poorest and most vulnerable groups, and as a result they cannot meet the high costs of upfront investments in aquaculture development and climate-proofing fish landing and handling infrastructure. Women, in particular, while dominating the fish handling and processing segment, lack the necessary resources to invest in better equipment, even if profitability is demonstrated. The financial sector provides inadequate terms for agricultural financing, especially fisheries sub-sector, with high interest rates and very short duration. The portfolio for agriculture is limited, mostly for crop production and none for fisheries related activities, making the access to commercial financial products even more difficult for poor and vulnerable households lacking the required collateral.
- **Financial leeway for women is much smaller than for men.** There is a widespread lack of literacy and numeracy skills among women, causing difficult, if not impossible, access to formal finance. In addition, while women have complete autonomy over their incomes, they are the ones who pay for the everyday needs of the household, including school fees (men's contributions are on *ad hoc* bases).

4) Market barriers

- **Poor quality standards for fish products and insufficient linkages between fish value chain actors (producers) and buyers.** Current fish handling and processing practices result in products of inferior quality, which do not fully meet formal market specifications. Climate change, especially changes in precipitation, storms and increased temperature, are expected to further deteriorate the artisanal processing equipment and expose the fish products to the elements. In addition, the limited organization of the fisher folk into common interest groups/cooperatives prevents them from grouping their production and dealing with larger buyers, especially in the tourism and catering sectors.
- **Gender-based segregation of markets.** Women serve the domestic market with low profit margins, while export with higher margins are men's domain. Export business is more formal than local business, and hence the market segregation stems

from women's lack of literacy and numeracy skills and lack of access to infrastructure required.

5) Social barriers

- **Entrenched patriarchal norms among all in the society.** Not only men, but also most women think men are justified in beating women when men are dissatisfied with how the household is run or their conjugal relationship. The household chores and caregiving are entirely on the shoulder of women and as are the financial responsibilities related to household. Boys are given priority in education, and it is accepted that men engage in the most prestigious type of work and are given the most attractive productive assets. Such disparity in decision making, responsibilities sharing and social investment does not allow women to take up new activities, for example, mangrove restoration or aquaculture. Gender based violence is not uncommon.
- **Early marriages for girls borne by lack of viable life alternatives in rural areas.** As girls in the rural areas have very limited opportunities to study or earn a living, the only option left for them is usually early marriage, which perpetuates the vicious circle for women.

6) Institutional barriers

- **Insufficient capacity for natural resource monitoring and management.** The available public funding and technical capacity is often insufficient to meet the agreed upon mandates in the fisheries, water resources, environmental sector. Climate change is introducing an additional burden on the line ministries and agencies responsible for the governance and management of the complex fisheries sector. In particular, the line ministries lack capacity to act on their broad understanding of CC impacts on the fisheries sector and develop specific strategic and advisory actions. For example: there is a broad understanding that climate change increases salinity intrusion in the river, and will continue to do so, affecting mangroves and fish, but due to a lack of monitoring capacity, the exact extent is not known, nor are the implications for national planning and investment (for example, a mapping of brackish water zones where freshwater aquaculture would no longer be possible in the future).
- **Lack of systematic inter-sectoral coordination.** As the climate rationale has emphasized, the Gambian fisheries sector is dependent on multiple factors, which are often under the jurisdiction of different ministries and agencies. To date, no systematic coordination mechanisms exist to bring together fisheries, agriculture, forestry, environment, trade and economy decision-makers and to introduce climate change considerations in planning and implementation of public policy and investments.
- **Target beneficiaries and formulators of policies, plans and interventions.** The entrenched patriarchal norms among all in the society translates into men being the target beneficiaries and formulators of various policies, plans and interventions. They tend to pay little attention to the needs and strengths of women, not only because of the men-dominated culture, but also because of lack of information about women, especially on their part.

6. To ensure its impact and sustainability, the project will seek to address all these identified barriers, as summarized in table below, and as presented in the rest of the Funding Proposal.

Table 1 Summary of the adaptation barriers and the project's response interventions

	Adaptation barriers	How the project will address the identified barriers
Information barriers	Very limited data and analysis on CC impacts and weak knowledge on adaptation measures	Under Output 3.1 , the project will disseminate the comprehensive climate analysis study done as part of the project preparation and will train public sector experts on climate change and adaptation and mitigation measures.
	Ambiguous separation between CC impacts and fisheries over-exploitation issues	Under Output 3.1 , the project will also support the country's capacity for monitoring fish stocks and landings, data collection on water parameters, mangrove cover and degradation to better document and separate human action effects and climate change impacts.
	Lack of systematic information relay mechanisms to reach fisher folk	Under Output 3.1 , the project will introduce an e-extension for the fisheries sector, using automated text messaging. In addition, investments will be made in strengthening the linkages between the MoFWRNAM and the community fisheries committees in terms of information dissemination and data collection. In addition, fisherfolk, farmers and project beneficiaries will receive dedicated training, capacity development and knowledge transfer to ensure strengthening their capacities in relation to technology transfers and adaptation to climate change (in Output 2.1 and Output 2.2).
	Widespread lack of literacy and numeracy skills among women	Under Output 3.2 , rural women in the fishery sector will be trained on literacy and numeracy skills.
Technical barriers	Limited knowledge about technologies proven successful	The range of investments in coastal infrastructure and equipment (Output 2.1) and in aquaculture (Output 2.2) has been designed based on the best available practices and technologies in the West Africa region and beyond. Each investment is complemented by a series of trainings for producers (e.g. Fisheries/Aquaculture Field Schools (FFS) with technical, operation and maintenance, marketing modules). Under Output 2.2 , public sector agents will be trained in these practices and technologies.
	Mixed past experience with improved fisheries and aquaculture technologies	Site selection of aquaculture activities under Output 2.2 will be done in consultation with the local communities and after a full technical assessment, in particular in terms of water access and quality.
	Insufficient availability of quality inputs for aquaculture production	Under Output 2.2 , the project will support the upgrading of the Jahally Aquaculture Centre's fingerling production capacity and the scaling of fish feed production at four mills.
	Lack of extension services tailored to women's needs and capacities	Under Output 3.1 , rural women in the fishery sector will be consulted on their needs and be provided with voice-over e-extension services addressing these.
	Infrastructure for women's business receives less attention and finance	Under Outputs 1.1, 2.1 and 2.2 , infrastructure investments will be made for rural women in the fishery sector; mangroves for both women and men (Output 1.1), landing sites improvement for both women and men (Output 2.1), fish smoking and drying equipment for women (Output 1.1), aquaculture related infrastructure for both women and men (Output 2.2).

		Under Outputs 3.1 and 3.2 , public service personnel and technicians will be sensitized on gender issues. Under Output 3.2 , roundtable discussions on private investment will aim to discuss investment for women at least 40% of the time and rural women in the fishery sector will be trained on literacy and numeracy skills.
Financial barriers	No disposable income for investing and weak access to credit	<p>Recognising the financial difficulties that a matching grant approach would impose on beneficiaries, the project will fully finance the adaptation packages under Output 2.2. The four aquaculture and fisheries packages have been carefully designed with a focus on ensuring sufficient working capital and profitability and most suitable and interested farmers² will be engaged by the project. In addition, platforms to facilitate market access and linkages with subsequent segments of fisheries value chains will be facilitated in Output 3.2.</p> <p>Similarly, the investments under Output 2.1, which mostly represent communal equipment, will also be financed fully by the project. Completing these investments, the group trainings will focus on strengthening the local committees' capacity for fee collection and maintenance and replacement savings.</p> <p>Under Output 3.2 strengthening beneficiaries' financial literacy for improved access to finance if suitable financial products and system will be made available. Moreover, Output 3.2 will include dedicated public-private policy dialogue and capacity strengthening of public and private sector including financial institutions aimed at de-constraining the inclusive value chains development, thereby improving the availability of appropriate financial services for smallholder producers and their organizations. Under Output 3.1 policy dialogue will be active to stimulate policy and regulations reforms needed also to improve financial inclusion.</p>
	Financial leeway for women is much smaller than for men	Under Output 3.2 , women and men will examine their goals as a family and the roles they would play in reaching those goals, which serves as sensitization on the women's responsibilities, needs and strengths and creates understanding of gender issues by men.
Market barriers	Poor quality standards for fish products and insufficient linkages between fish value chain actors (producers) and buyers	Under Output 2.1 , the project will invest in improved fish processing equipment, designed to both reduce losses and to improve the quality of the products. Similarly, the improved water access will ensure that fresh fish is sold in more hygienic conditions. Fisher folk will also be trained in quality standards (including for export) under Output 2.1 and Output 3.2, as well as supported to organize themselves into common interest groups/cooperatives. In addition, linkages with the buyers (especially in the tourism and catering sectors) will be promoted under Output 3.2.

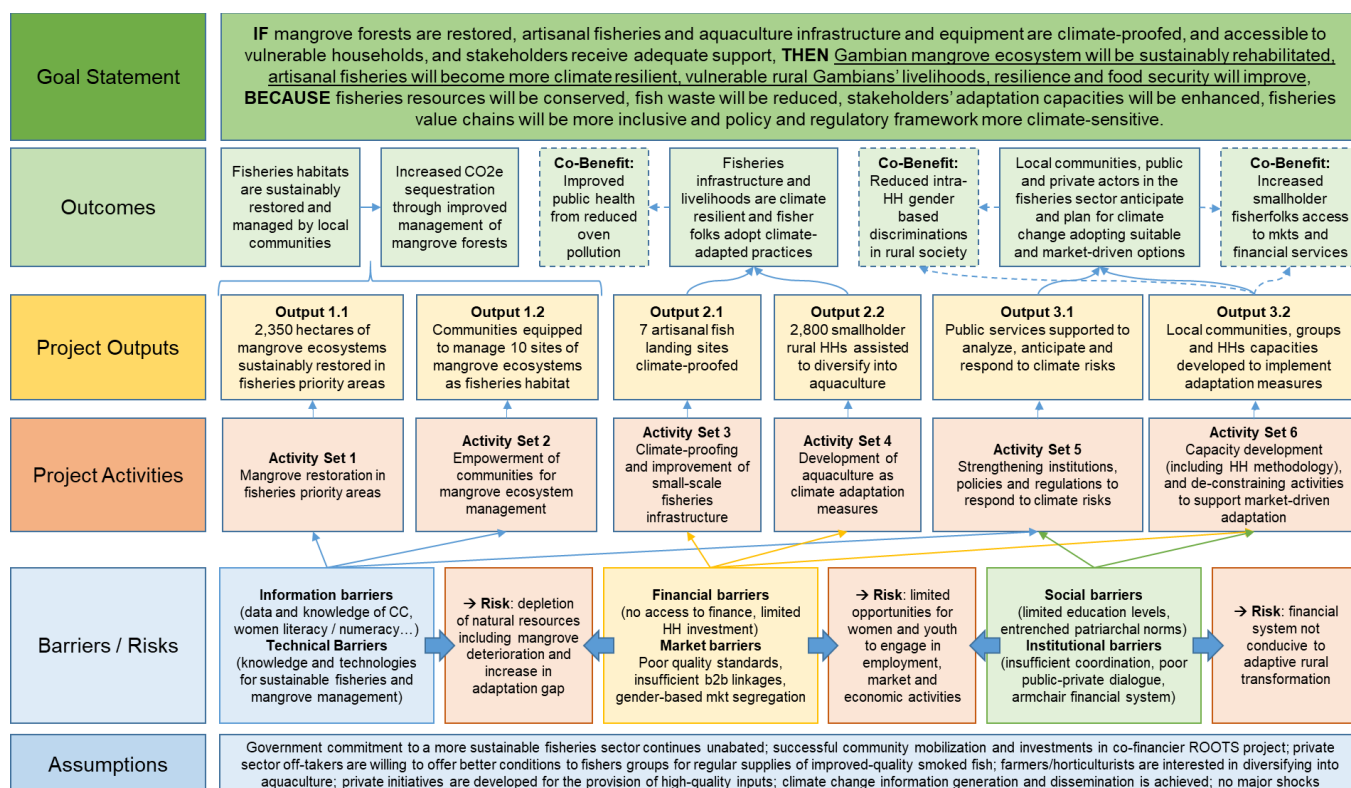
² Beneficiaries selection will be done also in collaboration with co-financier ROOTS project (IFAD), which has a strong focus on the poorest and most vulnerable households.

Institutional barriers	Gender-based segregation of markets	Under Output 3.2 , women and men will examine their goals as a family and the roles they would play in reaching those goals, which serves as sensitization on the women's responsibilities, needs and strength and creates understanding of gender issues by men. Sexual exploitation, abuse and harassment will also be discussed. As mentioned above, Under Outputs 3.1 and 3.2 , public service personnel and technicians will be sensitized on gender issues, and roundtable discussions on private investment will aim to discuss investment for women 40% of the time.
	Entrenched patriarchal norms among all in the society.	Under Output 3.2 , women and men will examine their goals as a family and the roles they would play in reaching those goals, which serves as sensitization on the women's responsibilities, needs and strength and creates understanding of gender issues by men. Sexual exploitation, abuse and harassment will also be discussed.
	Early marriages for girls borne by lack of viable life alternatives in rural areas	
	Insufficient capacity for natural resource management	Under Output 3.1 , the project will finance the identified capacity development activities to boost the ability of the public sector to better manage Gambia's natural resources, while integrating climate change in its policies and regulations, including climate-resilient construction standards for fish landing sites and related infrastructure. In addition, under Output 1.2 , the communities involved in the mangrove (fisheries habitat) restoration will be equipped to engage in sustainable ecosystem management at local level, with support from national institutions.
	Lack of systematic inter-sectoral coordination	As part of its coordination and implementation arrangements , the project will create a multi-stakeholder Project Steering Committee (PSC) and Technical Advisory Committee (TAC). The meetings and activities of these two bodies will be financed by the Government's in-kind contribution. The project will propose the gradual transformation of these two bodies into permanent inter-sectoral coordination mechanisms.
	Target beneficiaries and formulators of policies, plans and interventions	Under Outputs 3.1 and 3.2 , public service personnel and technicians will be sensitized on gender issues, including sexual exploitation, abuse and harassment. Under Output 3.2 , roundtable discussions on private investment will aim to discuss investment for women at least 40% of the time.

7. **The theory of change builds on the concept of resilience**, in this context applied to climate change.³ Livelihood resilience is defined by FAO as: *"The ability to prevent disasters and crises as well as to **anticipate, absorb, accommodate or recover** from them in a timely, efficient and sustainable manner. This includes **protecting, restoring and improving** livelihoods systems in the face of threats that impact agriculture, nutrition, food security and food safety."*

8. As such, the project seeks to contribute to all aspects of climate resilience of Gambian fisher folk, first by **investing** in the **restoration and protection of mangrove ecosystems** in order to maintain fish and shellfish habitats affected by climate change (Outcome 1) and in **equipping women with the fundamental skills of literacy and numeracy** (Outcome 3), then by **protecting small scale fisheries infrastructure** in order to reduce its climate vulnerability and reduce fish losses and **improving smoking and drying processes** conducted by women followed by **supporting the adaptation and improvement of livelihoods through aquaculture development** in order to respond to the decrease in capture fish availability resulting from the composite impact of climate change (Outcome 2). These interventions are underpinned by support to the local actors to anticipate and plan for climate change, as well as having the necessary capacities to implement adaptation measures and to accept gender equality so that the adaptation activities are effective (Outcome 3). PROREFISH will also create an enabling environment for increased private sector engagement (by off-takers, financial service providers) to support the sustainability of the interventions **Error! Reference source not found.** below summarizes the proposed paradigm shift (see also slides in **Annex 22**).

Figure 2 Theory of Change



³ In the context of the project, the concepts of adaptation, mitigation, vulnerability and resilience refer to the definitions utilized by IPCC ([link here](#))

Climate change and technical aspects of proposed component 1 mangrove restoration activities

Introduction

9. **Component 1** is designed to reverse the degradation of mangrove ecosystems in key fisheries areas by investing in the restoration of 2,350 hectares (ha) of mangrove forests, through replanting and assisted natural regeneration of more salt tolerant species, coupled with support to sustainable ecosystem management. As detailed in the climate rationale, mangroves play a key role in the life cycle of at least 10 key fish and shellfish species, in terms of reproduction, protection and nutrition. This component will have a positive impact on the sustainability of the fisheries sector by protecting essential fish habitat. In addition, mangrove forests trap sediments and in so doing protect coasts and riverbanks against erosion. They are thus essential for reducing the impact of climate-change induced Sea Level Rise (SLR) and increasingly frequent extreme weather events forecast for the Gambia. Finally, mangrove restoration will generate significant greenhouse gas emissions reductions of -261,068 t CO₂eq over the 20-year lifetime of the project (see detailed calculations in Annex 24).

10. Building on lessons learned from previous mangrove restoration activities in the Gambia, PROREFISH will adopt a community-driven restoration approach, working together with the local populations as detailed below, as well as invest in post-restoration activities designed to support sustainable mangrove management. PROREFISH will liaise with other on-going mangrove-related initiatives to avoid duplication of efforts.⁴

11. Alongside restoration, PROREFISH will also invest in empowering the local communities for sustainable ecosystem management, a key element of consolidating the mangrove restoration efforts implemented under output 1.1 above, and therefore of the project's exit strategy. The focus of this sub-component will be on raising awareness and incentivizing the local communities at the priority sites to participate in restoration activities and in the subsequent management of their natural resources, through the acquisition of formal rights and the development of income-generating activities. In this sub-component, PROREFISH builds on earlier successful experiences of FAO's Forest and Farm Facility (FFF) in The Gambia, which helped communities to form Forest and Farm Producer Organizations that engaged in income-generating activities and to obtain tenure over community forests, thus providing communities with incentives to restore and manage forest resources.⁵

The causes of mangrove degradation and loss in The Gambia

12. As noted in Part 1 of the Prefeasibility study (figure 5-9), remote sensing studies and National Forest Assessments have reached widely diverging conclusions about changes in mangrove cover in The Gambia over the past decades. What is certain, however, is that mangrove ecosystems are relatively sensitive to changes in hydrology and salinity, and that the Gambia River watershed, as across the Sahel, has experienced tremendous changes in the rainfall regime over the past fifty years. The significant mangrove die-back that happened as a result of the 1970's and 1980's drought, followed by recolonization of deforested areas by mangroves subsequently, is well-documented.

13. Unlike many other tropical mangrove countries, The Gambia has not suffered from large-scale conversion of mangrove areas to shrimp pond aquaculture or other unsustainable land uses. Similarly, man-made changes of freshwater flow into mangrove ecosystems have been fairly localized, and are not a major cause of mangrove degradation. For example, in the 1970s and 80s, a Senegalese "marabout" and his followers constructed a sand dam in the upper reaches of the Bintang Bolong, a tributary of the Gambia River, which drastically reduced the flow of freshwater to the lower reaches of the Bolong in Gambia, leading to mangrove dieback there. This sand dam has since been removed and there are no other examples of such dams anywhere in the mangrove systems along the River Gambia or its tributaries.

⁴ The UNEP Ecosystem-based Adaptation (EbA) project funded by the GCF in The Gambia also supports reforestation, but less than 10% of its target area is in mangroves, and it focuses on protected areas whereas PROREFISH will focus on community-managed areas without protected status.

⁵ For further details, please see <https://www.fao.org/3/CA0518EN/ca0518en.pdf>

14. More common causes of mangrove degradation include wood harvesting for poles and woodfuel, hence the importance of the proposed investment in obtaining secure community tenure over restored mangrove areas and building the communities' capacity to manage mangroves and develop non-destructive income-generating activities based on mangrove ecosystem services (such as honey production) in order to strengthen economic incentives for continuing to manage restored mangrove areas after the end of the project.

Prioritization of areas for mangrove restoration

15. The prioritization of areas for mangrove restoration was conducted in several steps:

- a. **Identification of mangrove areas most relevant to fisheries:** While all mangroves in the Gambia can be considered as fish and shellfish habitats, certain areas and species of mangroves are more critical to the fish and shellfish life cycle – in particular in the **estuary/river mouth** and the **middle river** segments. These two river segments are also the zones with the highest original mangrove cover and with most of the identified degradation (mouth/estuary 30% of total degradation, middle river 60% of total degradation). In addition, these segments are considered as most exposed to climate-induced degradation (sea level rise and coastal erosion especially in the estuary; increased sedimentation, salt intrusion and increased salinity in the middle river).
- b. **Identification of mangrove degradation/fisheries habitat loss areas in the River Mouth and Middle River segments:** in both segments, the priority was given to areas directly on the Gambia River (and not on its tributaries) and to waterfront/shore areas (and not to upland mangroves), given the focus on fisheries habitats.
- c. **Identification of areas outside non-protected mangrove areas.** Given the community-led approach and the approach of tenure transfer proposed by the project, the priority was given to areas outside the existing protected areas (for reference, marked in different colours on **Error! Reference source not found.**).

16. The project will invest in mangrove restoration of 2,350 ha (1,100 ha of full reforestation and 1,250 ha of assisted natural regeneration) in 10 areas prioritized during project preparation, as presented in Map 1 below.

Mangrove restoration site selection involving local communities

17. While the mangrove restoration areas have already been prioritized, no sites have been selected yet. This is because under a community-driven approach, site selection can only be done in collaboration with the local communities, and the latter cannot be mobilized until project funding has been secured.

18. Beneficiary communities for the mangrove restoration activity will be selected on the basis of three criteria: (i) Poverty level; (ii) Proximity to degraded (or deforested former) mangrove sites where restoration is possible; and (iii) willingness to engage in mangrove restoration and subsequent management. Proximity to oyster cultivation sites will be considered an advantage, but not an obligatory criterion for the selection of beneficiary communities.⁶

19. Once beneficiary communities have been selected, mangrove restoration site selection will be done based on a combination of expert assessment and community consultations. The Departments of Forestry and of Parks and Wildlife will be involved in community consultations and interactions at all stages, but in particular for site selection, training and monitoring.

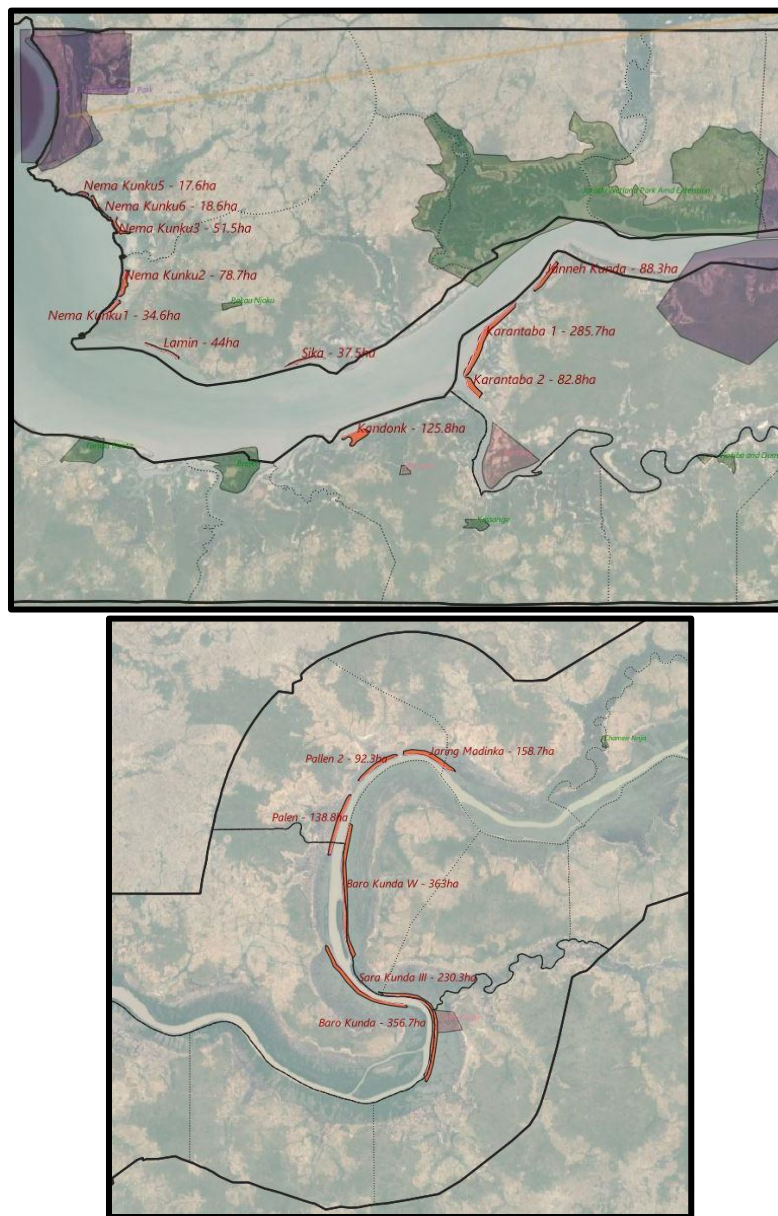
Mangrove tree species selection

20. While mangrove ecosystems as a whole are highly resilient to changes in salinity, many individual mangrove tree species are not. As explained in detail in Annex 2, Chapter 5, salinity can have considerable impact on mangrove vegetation and associated fish and shellfish species. This also provides an important rationale for mangrove restoration with a mix of species, including more salt-tolerant species, as envisaged by the project. For

⁶ While the majority of the community members are poor, not all of them are, e.g. the fisherfolk owning their own canoes are usually above the poverty line. All community members are, however, vulnerable to the impacts of climate change on the mangrove ecosystems their livelihoods depend on, which justifies their eligibility.

each particular project site, those mangrove species most suitable to the current and expected conditions will be selected.

Map 1 Targeted mangrove restoration sites (in red) in the estuary (left) and middle river (right) segments



Choice of restoration method and materials

21. Mangrove trees are unusual in that the seeds develop into seedlings of up to 30 cm long, called propagules, while they are still attached to the parent tree. Therefore, for mangrove reforestation no nurseries are required – participating communities will collect the propagules from nearby mangroves, either directly from mature trees or from the water, if the propagules have already fallen. Propagules should preferably be planted the same day that they are collected, but if this is not possible, they can be stored in closed sacks, in the water. If there are no propagules nearby, propagules will be collected from areas with similar ecological conditions and transported in sacks, by boat or by vehicle, depending on the location.

22. In moderately degraded mangrove areas, the focus will be on Assisted Natural Regeneration (ANR) wherever possible. ANR relies on the particular reproductive and dispersal characteristics of mangrove trees.

When the mangrove propagule (basically a seedling that develops from seed while still attached to the tree) matures, it drops into the water and remains dormant and horizontal while in the sea water. On reaching brackish water however, the propagules turn vertically, roots down and leaf buds up, making it easier for them to lodge in the mud at a suitable site. ANR consists of a number of different techniques varying from simple protection (“set-aside”) and propagule dispersal to allow mangroves to regenerate by themselves, to more intensive efforts such as enrichment planting in gaps in the mangrove vegetation.

23. In deforested or severely degraded mangrove areas, the focus will be on replanting. Where necessary, simple manual techniques may complement planting activity, e.g. mounding or re-opening drainage channels. Local communities will be supplied with restoration toolkits (rubber boots, gloves, spades, hoes, crates for transporting mangrove propagules etc.) to enable them undertake these activities.

Strengthening community capacity to manage restored mangrove areas

24. Community capacity development is a key element of the project’s exit strategy. The project will provide community-wide trainings on mangrove monitoring, conservation and sustainable resource use and will support the creation of community forest management committees (CFMCs) at each intervention site. The CFMCs will play a key role in ensuring the sustainable use of natural resources, but also in further developing the capacity of their communities to engage in livelihood diversification from mangrove restoration.

25. The project will work with the national agencies and the communities to promote the establishment of community forest status (where applicable) for the restored mangrove sites and the transfer of tenure to the local communities. This activity is based on the experience of FAO’s Forest and Farm Facility in the Gambia, between 2015 and 2017.⁷ During this period, 116 community forests covering 9 408 hectares (representing 30 percent of all community forest tenure agreements in The Gambia) was transferred to local communities and 100 forest management plans and 35 associated enterprise development plans linked to community forests were developed.

26. In terms of practical skills to improve mangrove management, communities will get training on the use of artificial substrates for cultivating oysters and of other non-destructive methods to avoid damage from oyster harvesting to mangrove tree roots, as the latter serve as a refuge for juvenile fish and crustaceans, which feed on the micro-organisms consuming the rotting plant materials (sunken leaves etc.). In addition, communities will be made aware of the importance of applying and enforcing regulations on minimum mesh size for fishing nets, to increase survival of fish and shellfish larvae and juvenile organisms as the basis for future catches.

⁷ Forest and Farm Facility – Gambia country factsheet: <https://www.fao.org/3/CA0518EN/ca0518en.pdf>.

Prioritization of component 2 intervention sites

On the basis of a set of selection criteria developed by the Department of Fisheries under the Ministry of Fisheries, Water Resources and Natural Assembly Matters (MoFWRNAM), a preliminary prioritization of project intervention sites was developed. A total of eight (8) project intervention sites have been selected spanning three Local Government Areas (LGAs). The selection criteria have also been closely linked to the potential areas for intervention that these sites urgently require for their improvement as could be seen from Table 3 below.

These preliminary sites have been subsequently evaluated in terms of climate vulnerability and in terms of options for investment (as described in the respective sections of this annex) and the final list has been revised accordingly.

Table 3: Criteria for the selection of project intervention sites and corresponding potential areas for intervention

Project Site	Intervention	Criteria for Site Selection	Potential Areas for Intervention
1. Banjul & Tanbi Wetland Area		Lack of improved drying and smoking facilities	Construction of improved fish smokehouses (FTT) for women and men, with appropriate layout, separate changing and sanitary facilities, receiving, fish preparation, processing, and storage areas
		Availability of underutilized coastline and construction space	
		Susceptible to climatic and oceanic conditions including rising temperature, salinity, ocean depth and current flow	Construction of improved fish drying facilities (solar drying tents) with hygienic fish preparation areas, platforms with handling and preparation equipment and facilities
		Lack of appropriate platform for landing and marketing of fish coupled with poor hygienic and sanitation conditions for dried and smoked fish products	
		Poor access to basic utilities such as water, electricity and toilet facilities	Oyster culture development and mangroves management (construction of cage and racks, harvesting, handling and processing facilities)
		Availability of oyster habitats and enough water column for cage and rack culture	Construction of fish handling and processing shed and platforms for landed and marketed fish with improved portable water supply, drainage system and back-up reliable electricity supply (solar)
		Accessibility to markets such as hotel and local restaurants in the Greater Banjul Area (GBA)	Strengthen the management capacity of the Center Management Committee and associated Processors Associations

<p>2. Brufut</p>	<p>Lack of improved drying and smoking facilities</p> <p>Availability of construction space</p> <p>Lack of appropriate platform for landing and marketing of fish between fish mongers and customers</p> <p>Poor hygienic and sanitation conditions for fresh, frozen, dried and smoked fish products</p> <p>Poor access to basic utilities such as water, electricity and toilet facilities</p> <p>Close proximity to the hotels and restaurants in the Tourism Development Area (TDA) to facilitate marketing of fish products</p>	<p>Construction of fish handling and processing shed and platforms for landed and marketed fish with improved portable water supply, drainage systems and back-up reliable electricity supply (solar)</p> <p>Construction of improved fish smoke houses for women and men, with appropriate layout, separate changing and sanitary facilities, receiving, fish preparation, processing and storage areas and equipped with improved smoking</p> <p>Construction of improved fish drying facilities (solar drying tents) with hygienic fish preparation areas, platforms with handling and preparation equipment and facilities.</p> <p>Strengthen the management capacity of the Center Management Committee and associated Processors Associations</p>
<p>3. Tanji</p>	<p>High post-harvest losses</p> <p>Lack of appropriate platform for landing and marketing of fish</p> <p>Lack of improved drying and smoking facilities.</p> <p>Poor hygienic and sanitation conditions for fresh, frozen, dried and smoked fish products</p> <p>Poor access to basic utilities such as water, electricity and toilet facilities</p> <p>Close proximity to the hotels and restaurants in the Tourism Development Area (TDA) to facilitate marketing of fish products</p> <p>History of flooding due to poor drainage and flood control systems</p>	<p>Construction of improved fish processing facilities for fish processors, with appropriate layout, separate changing and sanitary facilities, receiving, fish preparation, storage areas</p> <p>Construction of improved fish drying facilities with hygienic fish preparation areas, platforms with handling and preparation equipment and facilities.</p> <p>Construction of fish handling and processing shed and platforms for landed and marketed fish with improved portable water supply, drainage systems and back-up reliable electricity supply (solar)</p> <p>Strengthen the management capacity of the Center Management Committee and associated Processors Associations</p>
<p>4. Sanyang</p>	<p>Lack of appropriate platform for landing and marketing of fish</p>	<p>Construction of improved fish drying facilities (solar drying tents) with hygienic fish preparation areas, platforms with handling,</p>

5. Gunjur	Lack of improved drying and smoking facilities.	marketing and preparation equipment and facilities, including improved smoke houses(such as the FTT smoking ovens and other appropriate smoking technology), handling equipment and storage facilities.
	Poor hygienic and sanitation conditions for fresh, frozen, dried and smoked fish products	
	Poor access to basic utilities such as water, electricity and toilet facilities	Construction of improved toilet facilities, borehole with improved water points and back-up electricity supply through solar
	Close proximity to the hotels and restaurants in the Tourism Development Area (TDA) to facilitate marketing of fish products	Strengthen the management capacity of the Center Management Committee and associated Processors Associations
	Lack of appropriate platform for landing and marketing of fish	Construction of improved fish drying facilities (solar drying tents) with hygienic fish preparation areas, platforms with handling and preparation equipment and facilities.
	Lack of improved drying and smoking facilities.	Construction of improved toilet facilities, borehole with improved water points and back-up electricity
6. Kartong	Poor access to basic utilities such as water, electricity and toilet facilities	Construction of improved fish smoke houses (FTT) for processors, with appropriate layout, separate changing and sanitary facilities, receiving, fish processing, and storage areas
	Lack of appropriate platform for landing and marketing of fish	Construction of improved fish drying facilities (solar drying tents) with hygienic fish preparation areas, platforms with handling and preparation equipment and facilities.
	Lack of improved drying and smoking facilities.	
	Poor access to basic utilities such as water, electricity and toilet facilities	Oyster culture development and mangroves regeneration and management (construction of cage and racks, harvesting, handling and processing facilities)
	Availability of oyster habitats and enough water column for cage and rack culture	Strengthen the management capacity of the Center Management Committee and associated Processors Associations
	Good access road to the fish landing site	

7. Bintang	Access to good road network	Construction of improved fish smoke houses (FTT) for processors, with appropriate layout, separate changing and sanitary facilities, receiving, fish processing, and storage areas
	Lack of appropriate platform for landing and marketing of fish	
	Lack of improved drying and smoking facilities.	Construction of improved fish drying facilities (solar drying tents) with hygienic fish preparation areas, platforms with handling and preparation equipment and facilities.
	Poor access to basic utilities such as water, electricity and toilet facilities	
	Availability of oyster habitats and enough water column for cage and rack culture	Oyster culture development and mangroves management (construction of cage and racks, harvesting, handling and processing facilities)
8. Sapu/Jahally		Construction of improved toilet facilities, borehole with water points and back-up electricity supply
		Strengthen the management capacity of the Center Management Committee and associated Processors Associations
	Availability of abundant freshwater, soil, labour and electricity suitable for aquaculture.	Develop and expand freshwater aquaculture production, access to hatcheries, ponds, and buildings.
	Availability of basic on-site infrastructure	Strengthen the capacity of the National Hatchery to breed important local and ETP species and other improved varieties
	Availability of good transport infrastructure	Strengthen the management capacity of the Aquaculture Fish Farmers Association in Jahally
	A policy priority to increase resilience to food and nutrition insecurity in poor and vulnerable communities	

Stakeholder Analysis

As part of the identification of investment options and the implementation arrangements, a stakeholder analysis was prepared, focusing on key public and private partners that could be engaged in the project.

Capacity Profile of the Key Partners in Implementing Project Activities Institutional Profile of Enabling Government Agencies in the Fisheries Sector

Table 4: Institutional profile of the Department of Fisheries

VISION
To be recognized as one of three most critical contributors to national economic growth, food and nutrition security, employment creation and exchange earnings
MISSION STATEMENT
Through the recognition of fisheries and aquaculture potentials as natural economic resources and by ensuring responsible and ecologically sustained fishing and aquaculture practices, to optimally harness The Gambia's fisheries and aquaculture resources and to deliver employment, foreign exchange support, food and nutrition security in achieving accelerated national growth and development
GOVERNANCE AND ADMINISTRATIVE STRUCTURE
Fisheries Department is composed of the following administrative and technical Units:- (a) Directorate and Administration (b) Monitoring, Control and Surveillance (MCS) (c) Aquaculture (d) Extension (e) Fisheries Research and Development (f) Inspectorate
CORE RESPONSIBILITIES OF THE TECHNICAL UNITS
Monitoring, Control and Surveillance (MCS) Unit MCS tackles illegal, unreported and unregulated fishing activities happening at sea within the Gambian territorial waters, so as to ensure sustainable exploitation and utilization of the fisheries resources. In collaboration with the Gambian Navy, it conduct surveillance activities within the territorial waters of The Gambia. The Gambia Navy is responsible for enforcement of the fisheries laws relating to illegal, unreported and unregulated fishing through patrols, but obtains information on vessels from the Fisheries Department prior to any outing. Through its Observer Program , the MCS Observers are charged with the responsibility of collecting catch data onboard licensed fishing vessels and report to Government any illegal,

unreported and unregulated fishing activities happening at sea within the Gambian territorial waters.

As part of their duties, Observers ensure compliance to the Fisheries Regulation and Act. They also make sure agreements are respected and followed, maritime surveillance Inspections are conducted, and a register kept of infringements and violations and reported back to MCS Unit.

The MCS unit also carries out pre-licensing inspection of all fishing vessels applying fishing license. The unit monitors on daily basis and maintains a register of licensed fishing vessels, which is updated and given to the Navy when they are going out on patrols. In the course of the patrol vessels arrested in violation of the law are apprehended and escorted to the port and will be inspected by the MCS.

Pre-licensing inspections are important to ascertain the vessel's compliance with the Fisheries Act (2007) and the Fisheries Regulation (2008). The inspection includes the checking of nets and gears to ensure that they are of a size permitted and all illegal attachments, vessel papers, certificates, radio communication set, display of name and call sign, tonnage and seaworthiness certificate are all examined, and copies of which are kept in ship files for reference.

Aquaculture Unit

- Responsible for Aquaculture proliferation and diversification in the country;
- Provide technical support and advice to Aquaculturists;
- Provide support in the identification of suitable sites for different Aquaculture Production Practices;
- Conduct Research in different aspects of Aquaculture;
- Assist fish farmers in the design of fish ponds and related facilities;
- Assist fish farmers in selecting appropriate fish species in different culture environments;
- Conduct Aquaculture training programs to fish farmers and hatchery workers;
- Collect Aquaculture data;
- Collaborate with other Ministries/Departments/Agencies in implementing the Aquaculture components of their projects;
- Provide technical advice on feed formulations for different fish species and categories;
- Provide quality seeds/fingerlings to fish farmers at affordable prices; and
- Provide status reports on Aquaculture.

Extension Services Unit

- The Enhanced Integrated Framework Programme training on Good Hygienic Practices (GHP), Good Manufacturing Practices (GMP) and improved fish handling of fisheries value chain conducted;
- Routine inspection of fish processing establishments to ensure compliance with international food safety standards for export was carried out at The Atlantic Seafood Company c/o Barra Fishing Company, Rosamond Trade and International Pelican Seafood;
- Product inspection certificates issued to fish processing plants and for fishery products destined for exports to EU and non EU countries;
- Inspected fish landing sites issued with certificates on safety of products for vendors exporting fisheries products to West Africa sub-region;
- Over 100 fish operators sensitized and trained on GHP and GMP in fish handling;
- Fishermen and post-harvest operators at landing sites and fish markets sensitized on the importance of GHP and GMP in fish handling along the fisheries value chain;
- Awareness raising aids on good and bad practices in fish handling developed and displayed in the form of posters and pictures at fish landing sites and fish markets; and

- Sanitation procedures on fisheries operations, premises, equipment and utensils conducted for value chain operators.

Fisheries Research and Development Unit

- Undertake research/surveys to establish the potentials & biomass levels of the demersal and pelagic fish resources ;
- Strengthen capacity of the Fisheries Field Assistants on fisheries data collection and sampling methods;
- Creation of Statistical data base for processing, analyzing and reporting of all fisheries data;
- Conduct Catch Assessment Survey in collaboration with Extension Unit;
- Responsible for conducting stock assessment survey;
- Monitoring of Fish market prices;
- Advising on the status of the fisheries resources and reporting of the yearly statistics on production and export;
- Processing, analyzing and reporting of the fish production from artisanal and industrial fisheries subsectors;
- Regularly consult with other heads of units and prepare and submit monthly activity report; and
- Visiting the landing sites to monitor data collectors, see current problems and see how to alleviate them

Inspectorate Unit

- To sensitize fishermen about sustainable fishing through GRTS / Radio / Community Fish Landing Sites etc.
- Working with key stakeholder Institutions especially The Gambia Navy.
- Pre-Inspection of fishing gears of fishing vessels.
- Measurements of fish size and species;
- Inspection of fishing materials at the Ports/ stores / fishing communities / at sea / river such as mesh/hook size;
- To ensure that appropriate fishing gears and materials are used in all fisheries.
- To provide list of licensed fishing vessels to The Gambia Navy;
- To confirm offense and prepare reports;
- Check the log book to confirm the fishing position / catch by fish species etc.; and
- Obtain Information from the Fisheries Observers on a regular and systematic basis

GOVERNANCE AND ACCOUNTABILITY INSTRUMENTS

The following governance and accountability instruments have been developed and are being operationalised or enforced for the effective management of the country's fisheries resources and the efficient administration of the Fisheries Department

- i. Fisheries and Aquaculture Policy (2007)
- ii. Fisheries Act (2007)
- iii. Fisheries Regulations (2008)
- iv. Fisheries and Aquaculture Strategy and Action Plan (2017-2021)
- v. Scheme of Service serves as a Human Resource Manual designed to guide the hiring, management and development of resources of the Department of Fisheries

CORE MANDATE OF THE DEPARTMENT OF FISHERIES

Provide technical Advice to the Ministry responsible for fisheries matters concerning the planning, sustainable conservation, management and development of the fisheries sector and in the coordinating the development and enforcement of fisheries policies, legislation. And regulations

HUMAN RESOURCE CAPACITY OF THE DEPARTMENT

Regular Staff: Male (51) Female (37) Total Staffing Complement (88)

INSTITUTIONAL GOALS AND OBJECTIVES

To promote a vibrant Fisheries and Aquaculture Sector through research, sustainable management and utilization of the fisheries resources that would enhance employment and livelihood opportunities, income and foreign exchange earnings, food and nutrition security

KEY AREAS OF COMPETENCE

The Department of Fisheries is entrusted with the management, protection and development of the fisheries resources. Government has recognized that fisheries management systems should encompass all operators in the sector and that sound management measures must be in place for sustainable exploitation and utilization of the resources. Reduction and regulation of fishing effort especially that of industrial operators, targeting demersal fish stocks which are reportedly declining has taken centre stage. Currently, much emphasis is being placed on the exploitation of pelagic stocks which are known to occur in abundance in Gambian waters and are grossly under-exploited. Private sector investments in this area in the form of large scale fishing, processing and marketing are therefore encouraged.

The use of harmful fishing gears and methods; fishing in marine protected areas; destruction of the mangrove ecosystem and aquatic habitats, illegal, unregulated, unreported fishing both in the industrial and artisanal sub-sectors; the application of inappropriate processing and storage techniques and facilities which cause post-harvest losses are among the many issues being addressed by formulating and implementing effective management measures.

In order to engage artisanal fisheries operators in the management of activities in exploitation of the resources and fish utilization in their communities a co-management approach involving the Fisheries Department and community members has been introduced. Through this approach capacity building within these communities is being rigorously pursued in various fields of fisheries.

CURRENT FOCUS AREAS OF INTERVENTION

Within the framework of the government's major development blueprint, The National Development Plan (2018-2021) the following key areas are programmed for the government's intervention in the fisheries sector:

OUTCOME 1: ENHANCED INSTITUTIONAL EFFICIENCY AND EFFECTIVENESS IN THE FISHERIES SECTOR

Intervention 1: Strengthen the legislative, policy and regulatory framework

Intervention 2: Undertake capacity development

Intervention 3: Develop Fisheries Infrastructure

OUTCOME 2: IMPROVED VALUE CHAINS FOR FISHERIES AND AQUACULTURE TRANSFORMATION

Intervention 1: Capacity development for value chain operators/stakeholders

Intervention 2: Develop and implement a communications strategy to sensitize stakeholders

Intervention 3: Provide material and logistics support to stakeholders

Intervention 4: Establish a revolving loan scheme for industrial, artisanal and aquaculture operators

Intervention 5: Strengthen the micro biology lab for quality and standardization of fish and fishery products

Intervention 6: Establish value addition facilities

Intervention 7: Establish marine and fresh water fish hatchery

Intervention 8: Establish fresh water and marine water research centers to promote aquaculture development

Intervention 9: Develop and maintain partnerships and alliances for resource mobilization

Intervention 10: Reduction in carbon emission through Improvement in fish processing facilities

Intervention 11: Protect aquaculture establishments & fisheries resources against floods & other climate related hazards

MAJOR PROGRAMMES AND PROJECTS IMPLEMENTED

1. USAID funded Gambia-Senegal Sustainable Fisheries Project (Baa Nafaa project) which supported sustainable fisheries management including the shared marine and coastal resources between The Gambia and Senegal. More specifically, the project supported an inclusive stakeholder approach to develop the fisheries management plans for sole fish and oyster/cockles. It supported value chain studies of three fisheries value chain including the sole fish value chain. The project was implemented through University of Rhode Island Coastal Resources Centre in the US. The project phased out in 2014

Reference and link: Coastal Resources Centre - (<https://www.crc.uri.edu>).

2. FAO funded project -TCP/GAM/3502: Development of the Artisanal Fisheries in The Gambia. The overall objective was to develop the artisanal fisheries subsector through capacity building of fisher folks in improved fishing techniques, fish handling and processing skills, quality control and fish waste management and community - based organizations strengthened to be more effective in terms of sustainable resource management. The project phased out in December 2017.

3. Gambia Artisanal Fisheries Development Project, phased out in 2014. The project supported fishers and other community value chain operators in training and capacity building in post-harvest handling and preservation and related activities.

4. Water and Sanitation Project (WASH Project) component of the Baa Nafaa project provided sanitary facilities and hygiene training to fishing operators and processors at fish landing sites

KEY ACHIEVEMENTS, CHALLENGES AND FUTURE PLANS

Key Achievements:

- i. 2 Fish feed mills (1Kuloro, 1Madina Nfally/Jahally) constructed;
- ii. 2 Hatcheries (Catfish and tilapia) constructed
- iii. Administrative building (office, training Hall, Changing room, store) and toilets rehabilitated
- iv. Elevated water tank and solar power system under construction at the premises of the Department of Fisheries
- v. Review of Fisheries & Aquaculture policy in relation to the Food and Nutrition Security of The Gambian population (2018)
- vi. Upgrading of the Fisheries Data Collection and Information System (FIS) is completed and launched on 29 January 2020.
- vii. Equipment support rendered to Banjul Women Fish Smokers' Association in the first quarter of 2020
- viii. Arrangements for training of Centre Management Committees and fisherfolk associations at landing sites completed.
- ix. MOU partnership agreement signed between MFWR, MoD, Sea Shepherd and Yamasec Ltd to conduct surveillance operations along the coast of the Gambia including capacity development of Fisheries Department and Navy personnel.
- xi. Series of training have been conducted to develop the capacities of the Fisheries Department personnel ranging from data collection and fish value chain:
 - 225 fisherfolks (137 males & 88 females) in 10 fishing communities capacitated on co-management of fisheries resources;
 - 12 fisheries officers, 20 grow-out farmers, 4 fingerling producers, 1 fish feed producer have been trained in conducting
Aquaculture business;
 - 12 fisheries officers and 20 grow-out farmers have been trained in basic Aquaculture principles;
 - 2 CBOs (Kuloro and Jahally) 12 people (4 females & 8 males) capacitated on feed production.
(Through FAO TCP Support to Enhancing the Capacity of Youth and Women for Employment in Aquaculture)

xii. Improvement of fish smoking ovens (Thiaroye fish smoking Technology introduced in Gunjur with construction and installation of equipment followed by training of beneficiary operators on the adaptation of the technology and sustainability of the facility)

Major Challenges Encountered:

- i. Inadequate technical, physical and financial resources;
- ii. Poor Adaptation of new technologies by fisher folks;.
- iii. Outdated Fisheries and Aquaculture Policy, Act and Regulations, Fish & fishery products regulations.
- iv. Weak enforcement regime for the Fisheries Policy, Act and Regulations

Future Plans to Scale Up Activities by Expanding Coverage or Reaching New Groups:

- i. Review and update Fisheries and Aquaculture Policy, Act and Regulations and the fishery products regulations;
- ii. 8 fishing communities to be supported with the capacity to sustainably co-manage fish resources.
- iii. Build 4 aquaculture ponds and 1 fish feed mill plant equipped and functional
- iv. Upgraded Landing sites with solar powered storage facilities

NETWORKING AND ALLIANCE-BUILDING

Main Stakeholders and Collaborators in the Fisheries Sector

1.	Ministry of Trade, Industry, Regional Integration and Employment (MOTIE)
2.	Ministry of Environment, Climate Change & Natural Resources (Dept. of Parks and Wildlife / NEA)/ Climate Office)
3.	Association of Gambian Fisheries Observers
4.	Food Safety Quality Assurance Authority (FSQA)
5.	Association of Gambian Fishing Companies
6.	Fisheries CSOs/NGOs: (NASCOM, NAAFO, GAMFIDA, TOWA, National Fisheries Platform)
7.	Gambia Investment & Export Promotion Agency (GIEPA)
8.	Association of Gambian Sailors
9.	Surveillance Operations Coordinating Unit

Analysis of the Institutional Context of the Department of Fisheries

From the institutional profile presented above several issues emerged worth discussing and analysing primarily because the Department of Fisheries is the key government institution with the mandate for the management of fisheries, aquaculture and related resources and partly because that mandate has given it a unique position to be the lead executing agency for this project.

i. Policy environment

As can be seen from the above institutional profile, the Department has managed to successfully put in place all the required tools in the policy environment to provide for the appropriate enabling

environment for fisheries development, management and regulation, having developed a Fisheries and Aquaculture Policy, a Fisheries Strategy and Action Plan, a Fisheries Act and Fisheries Regulations. These tools together have provided the enabling environment to properly guide, direct, administer, manage and regulate fisheries, aquaculture and related aquatic resources issues. However, enforcement is a major drawback.

The profile has also shown that the institutional structure required to facilitate the enforcement of the above-mentioned tools in the policy environment have also been put in place. The Department has created and staffed five technical units to provide technical services ranging from monitoring, control and surveillance; extension services; inspection; fisheries research and development; and aquaculture. It has also created a very vibrant and active web-site, through FAO technical support, which serves as the window for enhancing its visibility. Efficiency of the structures is curtailed by inadequacy of the wherewithal.

However, there are few apparent drawbacks that is constraining the efficiency of the policy environment, worth mentioning:

- The Fisheries and Aquaculture Policy was developed in 2007 and as policies are normally cast over a ten-year implementation period, then ideally the policy implementation period comes to an end in 2016. At the end of the implementation period in 2016, a Terminal Evaluation of the previous policy should have been conducted and the evaluation report used as the basis to inform the development of a completely new policy framework for the sector. However, this process was not undertaken and since 2017 the country has been without a successor sector policy to the expired policy on fisheries and aquaculture.

In 2018 an attempt was made to review and effect some cosmetic amendments to an already expired policy. This policy review was sought by the Food and Nutrition Security Impact, Resilience, Sustainability and Transformation (FIRST) Project - GCP/INT/244/EC (commissioned by FAO under Strategic Objectives No. 1: Contributing to the eradication of hunger, food insecurity and malnutrition) in order to assess the contribution of National Fisheries and Aquaculture Policy to Food and Nutrition Security of the populations of ECOWAS member states. In this respect the review only introduced a new component into the old policy framework under the rubric: "Policy Area 8. Food Fish and Nutrition Security". The rest of the main body of the old policy document was left intact.

This means that there has been and still is a policy gap for the sector with the previous policy expiring in 2016 and four year thereon there is still no new policy framework in place. This policy gap also raises other important issues of strategic dimensions. The sector Strategy and Action Plan was developed in 2017 and expected to run up to 2021 but it is doubtful what informed the development of this Plan as Strategic Plans are meant to operationalise existing policies by translating the policy objectives and measures into workable activities. A sector strategic plan cannot draw directly from the Vision 2020, which is the country's long-term perspective plan. The vision informs the development of sector policies and the sector policies in turn inform the development of the sector strategies. So in actual fact the existing sector Strategy and Plan of Action should not have been developed before the development of a new policy framework and this is tantamount to "putting the cart before the horse".

In this respect, once a new policy is developed probably for the period 2021-2030, a new medium-term Strategic Plan would have to be developed to operationalise the new policy and this could be programmed to implement the new policy into two phases with phase one running from 2021-2025 and the second phase spanning over the period 2026-2030

Furthermore, with the new policy framework developed, then the existing Fisheries Act and Fisheries Regulations will also have to be reviewed and amended to bring them into alignment with the provisions of the new policy framework in order to avoid any mismatch between the new policy and supporting legal instruments.

ii. Land Allocation Authority for the Fish Landing Sites

The State Lands Act (1995) has granted legal authority for land allocation exclusively to the Ministry for Lands and Regional Government through its technical arm, the Department of Lands and Surveys. This means that until and unless the Department of Lands and Surveys grants lease or allocation authority to any entity any attempt by another entity other than DLS to allocate land is tantamount to an illegal action.

In this respect, entities such as the Gambia Tourism Board (GTB) has already been granted a long-term lease by the Ministry of Lands and Regional Government that enables the GTB to also sub-lease land for tourism –related construction purposes to other third parties.

From discussions at the level of the Department of Fisheries and the Department of Lands and Surveys, it emerged that the former never sought such legal authority from the latter and therefore putting into question the Department of Fisheries' mandate to be allocating land for construction purposes to third parties within the fish landing sites. Some arrangements were put in place during the era of the Second Republic due to an Executive Directive whereby the Department of Fisheries writes to the DLS seeking approval for applications for constructions within the fish landing sites. This arrangement was outside the prescribed legal provisions of the State Lands Act.

Table 5: Institutional profile of the Department of Water Resources

VISION

To achieve a sustainable water resources, weather and climate Management system for all by all.

MISSION STATEMENT

To regulate and manage the sustainable utilization of water resources, coordinate related policies and provide timely and accurate weather and climate data and information to safeguard population and promote food security through effective participation, monitoring and awareness creation for overall socio-economic development of The Gambia.

GOVERNANCE AND ADMINISTRATIVE STRUCTURE

The Department of Water Resources is composed of the following administrative and technical Units:-

- i. Directorate and Administration
- ii. Hydrology Division
- iii. Water Quality Division
- iv. Meteorology Division
- v. Rural Water Supply Division
- vi. Communications and Data Analysis Division

CORE RESPONSIBILITIES OF THE TECHNICAL UNITS

Water Quality Division

The mandate of this division is to ensure that the nation's water quality is safe for use as desired, thereby safeguarding both public and environmental health. In this respect the Division has the responsibility to collect, process, store and disseminate accurate and adequate meteorological, hydrological, hydrogeological, and water resources data and information. Data is disseminated nationally and internationally. International exchange is via the WMO Global Telecommunication System. The accuracy, usability and timely availability of such data and information depend on the instrument, the observer, the analyst and the processing equipment.

Hydrology Division

The Division has responsibility for the collection of all hydrological and hydrogeological data relating to:

- River water levels;
- Groundwater levels;
- Physiochemical data (pH, Electrical Conductivity, Temperature, Salinity etc.);
- Ground water and surface water abstraction data either from statutory water undertakers or from private individuals, and
- Any other pertinent data resulting from drilling investigations and water resources studies (lithological logs, borehole constructions, pumping test data etc.)

Meteorology Division

The mandate of the Division is to observe, monitor and predict the weather and climate over The Gambia with the main objective being the protection of life and property, safeguarding the environment, contributing to sustainable development, meeting international commitments, etc.

The Division operates a network of observing stations comprising of both conventional and automated. Central Forecast Office serves as the nerve center where national data are compiled and exchanged with the rest of the world and in return receive data and processed meteorological products from the rest of the world and international weather centers, respectively.

The Division provides services to the following stakeholders:

- Public weather service through television, national and community radio stations;
- Publishes the Famine Early Warning Bulletin for decision-makers;
- Seasonal Rainfall Outlook for farmers, planners, etc.;
- Climate data to users (both in public and private sectors);
- Weather forecast for fisher folks; and
- Aviation forecast to Gambia Civil Aviation Authority.

Rural Water Supply Division

The overall functions of this division is to:

- Provide safe drinking water for the rural communities.
- Assess the coverage of safe drinking water supply to the rural communities through a regular inventory of water points countrywide.
- Sensitize and train the communities on the operation and management of water supply and sanitation facilities.
- Facilitate the establishment of maintenance contract between communities and service providers
- Monitor and supervise contract agreements between communities and service providers
- Organize refresher course for area mechanics to improve their capacities in maintenance of hand pumps.
- Monitor and supervise the availability of spare parts for water and sanitation facilities
- Provide technical support for the design and construction of water supply and sanitation facilities.
- Provide technical support to relevant institutions
- Work closely with water and sanitation sector partners to sensitize communities on water/hygiene promotion and environmental sanitation

Communications and Data Analysis Division

The Division is charged with the upkeep of instruments and processing equipment relating to communications and data analysis. The division is also responsible for the repair and maintenance of the department's computers, internal and external communication equipment, satellite receivers, instruments used in observation and collection of meteorological, hydrological hydrogeological, agro-meteorological data and laboratory equipment

GOVERNANCE AND ACCOUNTABILITY INSTRUMENTS

Currently, the Department of Water Resources is undergoing a structural reform programme through which the Department of Water Resources will be restructured into two separate specialised agencies with operational autonomy:

- (1) National Water Resources Management Authority; and
- (2) National Meteorological Agency

The Department of Rural Water Supply and Sanitation will remain directly under the purview of the Ministry

The Water Policy (2007) has expired and is due for review and the development of a new policy within the framework of the reform process. Currently the Department is using the Water Act of 1979 which has been reviewed and amended since 2014 but is yet to be enacted by the National Assembly.

CORE MANDATE OF THE DEPARTMENT OF WATER RESOURCES

- Collect and assess surface and groundwater data in both quantity, quality and in space and time;
- Provide guidance for the proper utilization and management of the national water resources;

- Provide flood and drought prediction and management;
- Observe, monitor and predict the weather and climate over the Gambia for the protection of lives and properties;;
- Contribute to sustainable development and meeting international commitments;
- Provide safe and clean water supply facilities for the rural and peri-urban communities;
- Sensitize communities on the operation and management of water supply facilities;
- Provide technical support for the design, construction and maintenance of water supply facilities; and
- Ensure that the nation's quality of water is safe for use as desired to safeguard public and environmental health.

HUMAN RESOURCE CAPACITY OF THE DEPARTMENT

Regular Staff: Male (19) Female (11) Total Staffing Complement (30)

Educational Levels of Senior and Middle-level Managerial and Technical Staff

Certificate Holders: (17) Diploma Holders (5) Bachelor Degree Holders (5) Master's (3) PhD (.....)

INSTITUTIONAL GOALS AND OBJECTIVES

1. Create awareness raising, sharing of information, and involvement of stakeholders;
2. Establishing of water user charges;
3. Ensure financial and organizational sustainability;
4. Developing, managing and monitoring the water sector;
5. Coordination of the water sector; and
6. Regulation of use and allocation of water resources

KEY AREAS OF COMPETENCE AND CURRENT FOCUS AREAS OF INTERVENTION

1. Water resources assessment;
2. Water resources planning;
3. Integrated Water Resources Management;
4. Water Quality Monitoring and Control;
5. Trans boundary Water Resources Management and Cooperation;
6. SDG 6 monitoring and reporting; and
7. Stakeholder mapping and engagement

MAJOR PROGRAMMES AND PROJECTS IMPLEMENTED

Water Sector Reform Project (2011 - 2015)

Climate Change Early Warning System Project Phase II (2015 - 2020)

KEY ACHIEVEMENTS, CHALLENGES AND FUTURE PLANS

Key Achievements and Successes:

1. Strengthened the human resources capacity through the support of World Meteorological Organisation (WMO);
2. Enhance hydrological and water resources data collection and processing; and
3. Actively participate in inter sectoral working groups

Major Challenges Encountered:

1. Inadequate financial and budgetary allocation
2. Lack of mobility and necessary equipment

Future Plans to Scale Up Activities by Expanding Coverage or Reaching New Groups:

Implementation of the Institutional reform programme by creating the National Water Resources Management Authority, the National Meteorological Agency and the Department of Rural Water Supply and Sanitation

NETWORKING AND ALLIANCE BUILDING

Major Stakeholders and Collaborators:

1. Ministry of Agriculture;
2. Department of Fisheries;
3. National Water and Electricity Company (NAWEC);
4. Rural Water Supply and Sanitation project;
5. Gambia Ports Authority-River Transport sector;
6. Soil and Water Management Unit , Department of Agricultural Services;
7. National Environment Agency (NEA);
8. Ministry of Health; and
9. Ministry of Energy

Membership of Networks and Professional Associations:

ECOWAS Hydromet Forum;
Organisation for the Management of the Gambia River Basin (OMVG); and
World Meteorological Organisation (WMO)

Table 6: Institutional Profile of the Department of Parks and Wildlife Management**VISION**

To conserve and promote the rationale use of the national biological diversity for the benefit of the present and future generations in the manner that is consistent with the overall goal of sustainable development.

MISSION STATEMENT

To create a society that sees itself as an integral part of nature, recognizes different life forms, sustainably uses natural resources and maintains for posterity a nurturing and dynamic world rich in biodiversity.

CORE MANDATE OF THE DEPARTMENT OF PARKS AND WILDLIFE MANAGEMENT

The duties and responsibilities of the Department of Parks and Wildlife Management are as follows;

- To conserve, preserve, protect and manage our wild fauna together with their habitats for now and posterity and minimize wildlife damage to human properties;
- To contribute to national development through the promotion of sustainable development and sustainable utilization of wildlife and biodiversity resources;
- To create recreational and educational facilities for present and future generations;
- To train adequate numbers of staff to ensure that wildlife resources and biodiversity is been managed along professional line;
- To educate and inform the public on the values and need for conserving wildlife and obtain the appreciation of wildlife conservation as a viable land use option;
- To set aside representative natural habitat types of the Gambia's fauna and flora with a view of preserving and conserving biodiversity; and
- To collect and remit revenue, accruing from sustainable use of wildlife resources and biodiversity to the Central Government and to retain 10% for the development of protected areas of the Gambia
-

GOVERNANCE AND ADMINISTRATIVE STRUCTURE**PROFESSIONAL CADRE
CADRE**

Director
Assistant Director
Principal Parks and Wildlife Officer
Senior Parks and Wildlife Officer
Parks and Wildlife Officer
Cadet Parks and Wildlife Officer

SUB-PROFESSIONAL

Warden
Assistant Warden
Senior Wildlife Ranger
Wildlife Ranger 1
Wildlife Ranger 2

CORE RESPONSIBILITIES OF THE TECHNICAL AND UNITS**Protected Areas Management and Planning Unit**

- Supervising the function of managers/warden
- Fund raising for park development

- Measure Protected Areas management effectiveness
- Supervise the patrol and surveillance sub-units of Protected Areas
- Facilitate protected management planning with the use of available data

Research and Development Unit

- Analyze resource use problems including wildlife conflicts in the fields
- Coordinate inventory, monitoring and survey activities pertaining to wildlife and biodiversity matters
- Lead the facilitation of national wildlife inventory
- Collect and manage data relative to wildlife and biodiversity issues
- Any other duty assigned

Environmental Education, Training and Public Awareness

- Public awareness and sensitization
- Formation and implementation of environmental education clubs
- Preparation and production of teaching aids and educational materials
- Facilitate audio visual presentation in schools and communities
- Facilitate environmental volunteerism

Patrol and Surveillance Unit:

- Facilitate park patrol
- Enforce park laws
- Supervise and regulate game hunting
- Organize confiscation campaign
- Work with wardens and rangers to collect data during patrol

Ecotourism Development Unit

- Raise funds to improve park facilities
- Design and implement bio-rights and livelihood projects and programme
- Promote benefit sharing through income generation
- Regulate and promote resource policing

IT Unit

- Manage DPWM website and CHM Portal
- Responsible for data management
- Manage IT
- Provide IT support to all officers
- Manage the data center with all it facilities

GOVERNANCE AND REGULATORY INSTRUMENTS

Due to growing awareness about the importance of conservation and what remained of our flora and fauna, the Wildlife Conservation Unit was upgraded into a government department (Wildlife Conservation Department) in 1977. The name of the Department was changed in 1994 to the Department of Parks & Wildlife Management (DPWM) to reflect its widening role into wildlife management as well as conservation.

The Banjul Declaration and Wildlife conservation Act of 1977, the Wildlife/Biodiversity Act of 2003, the National Parks and Wildlife Policy of 2013, the National Biodiversity Strategy and Action Plan of 2015 and the Tanbi Wetlands Management Plan of 2008 are all policy, legal and regulatory measures taken to protect the flora and fauna of the Gambia designed to govern;

- The establishment of Protected Areas
- Regulation and monitoring of hunting

- Prohibition of the sale of wild animals and;
- Strict control on the import and export of wild animals

Currently there are 22 wildlife Protected Areas, occupying a total area of 76,064 hectares, approximately 6.4% of Gambia's total surface area. Only 0.16% of the terrestrial and inland water is protected while 7.4% of the marine and coastal areas are under formal protection with the goal being set to increase this area to 10% by 2015. Eight of these Protected Areas are reserves and national parks while 14 are community based conservation areas under the mandate of the Department of Parks and Wildlife (DPWM)

This Department serves as the focal institute for several biodiversity/conservation related international treaties and agreements such as Conventional on Biological Diversity (CBD), Ramsar Convention on Wetlands (Ramsar), Conservation of Migratory Species (CMS), Convention on International Trade in Endangered Species (CITES), African-Eurasian Migratory Water bird Agreement (AEWA) among others. (Department of Parks and Wildlife Management)

HUMAN RESOURCE CAPACITY

Regular Staff Male (202) Female (38) Total Staffing Compliment (240)

Educational Levels: Certificate Holders (30) Diploma Holders (5) Bachelor's Degrees (2) Masters Degrees (3)

INSTITUTIONAL GOALS AND OBJECTIVES

Strategic Goal A: Address the causes of biodiversity loss by mainstreaming biodiversity across Government and society

Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use

Strategic Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services

Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building

KEY AREAS OF COMPETENCE

- (I) Effective management of natural resources;
- (II) Sustainable Land Management such as farmer packages in agro forestry and woodlots;
- (III) Community livelihood; and
- (iv) Habitat management and restoration.

CURRENT FOCUS AREAS OF INTERVENTION

- (i) Management of Protected Areas (PAs);
- (ii) Management of Wetlands such as Tanbi Wetlands; and
- (iii) Resource Management and Livelihoods

MAJOR PROGRAMMES AND PROJECTS IMPLEMENTED

A UNDP-funded project, PoWPA, focused on developing Protected Area network by connecting corridors between Parks and expansion of parks. The project also produced key results in Sustainable Land Management (SLM) in intervention areas.

KEY ACHIEVEMENTS, CHALLENGES AND FUTURE PLANS

Key Achievements and Successes:

- (i) Over 1000ha of degraded mangrove areas has been restored and it's ecosystems, services and process performing well;
- (ii) Protected area coverage increased from 42,000ha to 92,500ha and these include newly established Protected Areas ;
- (iii) Co-management system enhanced in many Protected Areas and livelihood schemes such as village gardening, women banking and income generation activities established in peripheral communities; and

(iv) Establishment of oyster culture in Protected Areas to address the issue of mangrove destruction

Major Challenges Encountered:

- (i) Inadequate human capacity both in quantity and quality;
- (ii) Lack of specific park budget to ensure effective management of natural resources;
- (iii) Policy conflict with other sectors (conflict of interest);
- (iv) Intervention conflicts in Protected Areas by other sectors in Protected Areas; and
- (v) Shortage of mobility and gears for field operations in Protected Areas

Future Plans to Scale Up Activities by Expanding Coverage or Reaching New Groups:

- (i) Wildlife Act is under review which amongst others is supposed to look at institutional mandate & strength of DPWM;
- (ii) National Biodiversity Strategy and Action Plan is expected to be reviewed for next five years; and
- (iii) Plans are underway to facilitate the establishment of other Protected Areas (GEF 6) and to facilitate access and benefit sharing on the utilisation of genetic resources (GEF 7)

NETWORKING AND ALLIANCE-BUILDING

African Eurasian Waterfowl Agreement;
Convention on Migratory Species;
Regional Marine Protected Area Organisation (RAMPAO),PRCM AND MAVA FOUNDATION FOR NATURE;
and
RAMSAR Convention on Wetlands

Table 7: Institutional Profile of the National Environment Agency (NEA)

VISION

To be an enterprising agency, embracing all in achieving a livable and sustainable environment for present and future generations

MISSION STATEMENT

To work with all stakeholders and communities to safeguard, nurture and promote sound environmental practices with passion and excellence.

CORE MANDATE OF THE NATIONAL ENVIRONMENT AGENCY (NEA)

The mandate of the NEA is largely coordination, advice and consultation, overseeing compliance and providing technical services. Under the NEMA, 1994, NEA is empowered to take direct implementation action in matters dealing with environmental impact assessment, establishing environmental quality and monitoring standards, and controlling the importation and use of pesticides and hazardous chemicals. In the area of environmental quality (mainly pollution control), the NEA has the mandate to enforce compliance with national standards and has the legal authority to seek redress whenever there is non-compliance under the guidance of the Polluter Pays Principle (NEMA, 1994)

INSTITUTIONAL GOALS AND OBJECTIVES

To promote, coordinate, and support the formulation of national environmental policies and to guide the execution of these policies in coordination and cooperation with other agencies of the Government, as well as to propose to the competent Government authorities any general or particular measures destined to facilitate the execution of Government's environmental policies;

To coordinate, monitor and evaluate the GEAP and to review and revise, as necessary, its goals and strategies; to ensure full public awareness of the GEAP framework and objectives and to carry out monitoring and review of all development activities to ensure full compliance with environmental regulatory requirements in The Gambia (NEMA, 1994)

GOVERNANCE AND ADMINISTRATIVE STRUCTURE

The NEA has organized its operational activities into two networks: Technical Services Network, and Inter-sectoral Network and a Finance Department. These institutional structures ensure coordination amongst participating institutions and the Working Groups to which the institutions belong. The Working Groups follow a programmatic approach, but their membership is broad-based constituted by members drawn from institutions with different but complementary mandates in the program areas being dealt with within the respective working groups. There are twelve program areas in the two networks

Technical Services Network:

- Environmental Quality (EQ)
- Environmental Legislation (EL)
- Environmental Impact Assessment (EIA)
- Chemicals and Pesticides Control and Management (CPCM)
- Ozone Depleting Substance
- Environmental Emergency, Management & Response

Intersectoral Network:

- Agriculture and Natural Resources (ANR)
- Environmental Information Systems (EIS)
- Coastal and Marine Environment (C&ME)
- Environmental Education and Communication (EE&C)

GOVERNANCE AND ACCOUNTABILITY INSTRUMENTS

The National Environmental Agency (NEA) was created by the National Environment Management Act (NEMA) of 1994 which provides the legal framework for the operations of the Agency. The NEA mandate is to ensure an environmentally sustainable economic and social development in The Gambia. The mandate involves largely coordination, advice and consultation, overseeing compliance and providing technical services. Under the NEMA, 1994, NEA is empowered to take direct implementation action in matters dealing with environmental impact assessment, establishing environmental quality and monitoring standards, and controlling the importation and use of pesticides and hazardous chemicals. In the area of environmental quality (mainly pollution control), the NEA has the mandate to enforce compliance with national standards and has the legal authority to seek redress whenever there is non-compliance under the guidance of the Polluter Pays Principle.

To operationalise the implementation of the NEMA Act, the Agency developed the Gambia Environmental Action Plan (GEAP) the second version of which is now being implemented.

However, currently, both the NEMA Act and GEAP II are under review with a view to updating them

HUMAN RESOURCE CAPACITY

The Agency has a well resources technical and professional capacity with a total staffing compliment of 150. Majority of the technical staff are graduates in various disciplines related to the mandate the institution.

CURRENT FOCUS AREAS OF INTERVENTION

- Environmental quality control
- Environmental legislation
- Environmental Impact Assessment
- Chemicals and pesticides control and management
- Environmental emergency, management and response
- Agriculture and natural resources (including fisheries)
- Environmental information system
- Coastal and marine zone management
- Environmental education and communication

CURRENT EFFORTS TO ADDRESS ENVIRONMENTAL CHALLENGES

- Developing a self-sustaining environmental management system for The Gambia;
- Improving the performance of municipal authorities in waste management through the drafting of a waste Management Bill due to be enacted into law this year;
- Sustainable management and protection of the coast and its resources;
- Support for decentralization and local government reform for community-based natural resource management and sustainable development planning;
- Improving the Environmental Impact Assessment (EIA) process and ensure that all projects undergo an EIA process;
- Upgrading of the pesticide analytical laboratory to become fully functional and prevent the importation of hazardous Pesticides/chemicals; and
- Promoting the Incorporation of environmental considerations into the economic decision-making framework

Institutional Profile of CSO/NGO Service Providers in the Fisheries Sector

For the effective and efficient management of the fisheries resources of the country, the Ministry of Fisheries and Water Resources through its technical arm, the Department of Fisheries, has entered into partnership agreements with certain Civil Society Organisations (CSOs) operating in the fisheries sector and delegated particular responsibilities to them. To name a few, it has particularly concluded Co-Management Plans with NASCOM for the sole fishing sub-sector and with TRY Oysters for the oyster and cockles sub-sector and MOU with NAAFO, which gives these three organisations exclusive rights in the exploitation and sustainable management of the fisheries and aquatic resources as it pertains to their respective areas of intervention.

In addition to working in partnership with the Department of Fisheries, for practical purposes these CSOs also work directly with the community-based processor associations operating directly from the fish landing sites as well as the Landing Sites Co-Management Committees established to jointly manage the infrastructure, facilities and services at the landing sites.

One fascinating feature of the modus operandi of these Fisheries CSOs is that their Co-Management Plans/MOUs give them the latitude to jointly participate in the implementation of each other's programs and activities, hence reinforcing that collaborative partnership among them and defeating the usual unfavourable practice of fierce competition for meagre resources, lack of cooperation and the tendency for each organisation to jealously guard and shield its programs/project and resources from other players in its operating environment. This tendency is an attribute that could play well for the project by capitalizing on the already existing healthy collaborative partnership among the fisheries CSOs for the delivery of certain project interventions.

The previous section dwelt on the institutional profiles of leading enabling government agencies which are key institutional stakeholders in the fisheries sector and hence expected to be key partners in the implementation of this project. In this section, the key Civil Society Organisations (CSOs) operating in the fisheries sector and which are expected to be key implementing partners in this project will be examined and their institutional profiles documented as a way of demonstrating their prior experience in implementing similar projects in the fisheries sector and a testimony to their capacity to participate in the effective implementation of this project.

Table 8: Institutional Profile of the National Association of Artisanal Fisheries Operators (NAAFO)

VISION	
-	Responsible fisheries management through behavior change
-	
MISSION STATEMENT	
Fishing and fish processing that is conducted responsibly to benefit now and future generations, taking into consideration the whole ecosystems.	
ORGANISATIONAL MANDATE	
To contribute to efforts being made to responsible fishing, poverty reduction and food security by promoting artisanal fishing and promoting greater national involvement and providing impetus for change and improvement in the artisanal fishery sub-sector	
ORGANISATIONAL GOAL AND OBJECTIVES	
Bring all fisher folks country wide under one umbrella in order to support government fisheries development initiatives as well as the plight of fishers.	
GOVERNANCE AND ADMINISTRATIVE STRUCTURE	

The National Association of Artisanal Fisheries Operators (NAAFO) is a national organization created and recognized by Government of The Gambia to coordinate the affiliation of Artisanal Fisheries association's country wide. NAAFO was formed in 2004 to better represent and defend the interests of all groups of the artisanal fishery. It has fifty three affiliated associations and an individual membership base of over 3,000 members comprising fishermen, fish processors (smoking & drying), fish traders, outboard engine mechanics, oyster harvesters, fish un-loaders, fish exporters and boat builders.

The structure of the organization include the following full-time and part-time positions: 1) President; 2) Vice-president; 3) Executive Secretary; 4) Assistant Secretary; 5) Treasurer; 6) Assistant Treasurer; 7) Organizer; and 8) Three Advisors.

NAAFO is partly funded by the Fisheries Development Fund and the National Assembly budget. The Fisheries Development Fund is managed by the Department of Fisheries and is funded by levies from fishing fines, registration of vessels and other sources

GOVERNANCE AND ACCOUNTABILITY INSTRUMENTS

As a Civil Society Organisation (CSO) NAAFO has developed a Constitution not only to guide and regulate its activities but also as a fulfillment of the requirement for formally registering the organisation with the Attorney General's Chambers. The main responsibility of CSOs is to complement the development efforts of government in any domain that relates to their organisational mandate. In this respect they are required to sign a Memorandum of Understanding or any other form of partnership agreement with the government agency that their mandate directly corresponds with.

NAAFO has signed an MOU with the Department of Fisheries documenting the areas of fisheries resource management that it intends to intervene in to support the Department 's efforts

HUMAN RESOURCE CAPACITY

Regular Staff: Male (4) Female (6) Total Staffing Compliment (10)

Educational Levels of Senior and Middle-level Managerial and Technical Staff

Certificate: (x) Diploma (.....) Bachelor's (.....) Master's (.....) PhD (.....)

For the implementation of its activities NAAFO relies on a pool of experts who are mainly operating either as independent consultants or working with established consultancy firms

AREAS OF COMPETENCE OF THE ORGANISATION

Organising training programmes for its membership in fish processing, hygiene and sanitation, fisheries instruments (binding and non-binding) and IUU fishing

CURRENT FOCUS AREAS OF INTERVENTION

- Training in fish processing, handling, packaging and marketing;
- Raising awareness against IUU fishing, and the impacts of fishmeal plants to food security;
- Training in landing site sanitation and hygiene management; and
- Training in basic organisational management such as basic bookkeeping, basic accounting, recordkeeping, organisation and recording of meetings, skills in community mobilisation and outreach, management of credit and savings schemes, developing and keeping assets inventory, etc.

MAJOR PROGRAMMES AND PROJECTS IMPLEMENTED

- Capacity building on Ecosystem approach to fisheries management, fish processing, fish trade and management of fish processing establishments;
- Credit revolving scheme, fish boxes and aprons for fish sellers at the Banjul landing site;

- Renovation of fish smoking houses and provision of fish drying racks at the Brufut landing site; and
- Renovation of fish smoking houses and construction of toilet facilities at the Bakau landing site (all activities were implemented in collaboration with GAMFIDA under the WADAF project).

KEY ACHIEVEMENTS, CHALLENGES AND FUTURE PLANS

Key Achievements and Successes:

- Creation of revolving credit scheme at Banjul fish landing site for the NAAFO membership (NAAFO & GAMFIDA);
- Establishment of WASH facility at Bakau fish landing site;
- Renovation of Fish smoking house at Brufut fish landing site and provision of fish drying racks;
- Training of fishermen, fish processors and traders on responsible fisheries management, handling and markets requirements/standards; and
- Organization of World Women's and Fisheries days

Major Challenges Encountered:

- Support by department of fisheries in terms of technical and financial either delayed or not forthcoming;
- Office space and well equipped office ; and
- Mobility to conduct countrywide outreach activities

Future Plans to Scale Up Activities by Expanding Coverage or Reaching New Groups:

- Countrywide outreach to strengthen affiliated members and put in place district and regional branches of NAAFO;
- Develop project proposals for acquisition of office/more functional office, mobility, etc.;
- Training in fish processing, packaging for the membership;
- Replicate credit scheme introduced at Banjul landing site to other inland fish landing sites; and
- Training in credit and savings (financial) management

NETWORKING AND ALLIANCE-BUILDING

Main Stakeholders and Collaborators:

Fisher folks (fishermen, fish processors, fish traders, National Fisheries Platform, Fisheries Department, NASCOM, GAMFIDA, Fisheries Cooperatives and aquaculture farmers)

Membership of Networks and Professional Associations:

CAOPA, WFFP, Coalition for Fair Fisheries Arrangement (CFFA)

Table 9: Institutional Profile of the National Sole Fishery Co-management Committee (NASCOM)**VISION**

The NASCOM envisages the responsible and safe exploitation of sole fish for conservation, management, protection and development of the fisheries resources for now and the future generation to enhance food production, poverty reduction, and improve livelihoods of fishing communities.

MISSION STATEMENT

- Close the gaps required by the Marine Stewardship Council (MSC) relating to the deficiencies for eligibility of Eco labeling of The Gambia's sole fish in the international market;
- Ensure that The Gambian sole fish reaches international quality standards (quality control, co-management, data collection and monitoring);
- Curb illegal, unreported and unregulated fishing (IUU fishing), and to intervene collectively in order to make a positive difference in the rehabilitation and transformation of resource users into responsible fisheries practitioners;
- Encourage the use of ecosystem approaches to fisheries management which includes ecological, social and economic factors.

CORE ORGANISATIONAL MANDATE OF NASCOM

As part of its operational framework NASCOM concluded and jointly signed a Co-Management Plan with the Department of Fisheries in January 2012. The legal basis for the co-management of artisanal fisheries is the Fisheries Act of 2007. Section 14 of the Act gives power to the Minister of Fisheries to declare "Special Management Areas" for the purpose of community-based fisheries conservation and management.

Within the framework of the Co-Management Plan, the core responsibilities of NASCOM and its partners are:

- Set management objectives;
- Establish fishing rights based approaches to management;
- Assist and be involved in enforcement;
- Update management plan;
- Assist in communication with all stakeholders; and
- Assist in research

In cooperation with the Department of Fisheries:

- Establish harvest rules appropriate to management objectives; and
- Participate in international fishing agreements

In cooperation with the LACOMs and the Department of Fisheries to jointly:

- Establish harvest rules for each landing site ;
- Assist in compiling landing information;.
- Conduct local periodic assessments based on sustainability criteria to be determined (not full stock assessment); and
- Assist with marketing and processing issues/improvements.

NAAFO and GAMFIDA will work jointly with NASCOM and the Department of Fisheries to:

- Assist in capacity building of co-management committees and partners;
- Assist in research activities needed for evidenced-based policy, planning and management decision-making;
- Assist in obtaining the MSC certification, other forms of processing and marketing; and
- Assist in distribution of materials for the communication and education programmes

ORGANISATIONAL GOALS AND OBJECTIVES

Economic

- Increase yield of catch (size of fish and number of fish);
- Increase profit to fishermen and processors;
- Improve quality of fish landed; and
- Increase market demand (MSC)

Biological

- Decrease catch of undersized fish (by catch and discards);
- Decrease catch of a by catch species that is overfished; and
- Allow more fish to spawn and grow

Social

- Increase safety at sea;
- Reduce conflict between fishermen;
- Increase compliance;
- Capacity building, education and training for fishermen; and
- Behavioral changes to act responsibly

Ecological

- To conserve the integrity and resilience of the aquatic ecosystem for continued productivity and sustained livelihoods for people dependent on the ecosystem.

GOVERNANCE AND ADMINISTRATIVE STRUCTURE

Chairman / Deputy Chairman;
Secretary / Assistant Secretary;
Treasurer / Assistant Treasurer; and
Auditor / Assistant Auditor

GOVERNANCE AND ACCOUNTABILITY INSTRUMENTS

As a Civil Society Organisation (CSO) NASCOM has developed a Constitution not only to guide and regulate its activities but also as a fulfillment of the requirement for formally registering the organisation with the Attorney General's Chambers. The main responsibility of CSOs is to complement the development efforts of government in any domain that relates to their organisational mandate. In this respect they are required to sign a Memorandum of Understanding or any other form of partnership agreement with the government agency that their mandate directly corresponds with.

NASCOM has signed a Co-Management Plan with the Department of Fisheries documenting the areas of fisheries resource management that it intends to intervene in to support the Department's efforts. To operationalise the implementation of the Management Plan, it also develops Annual Work Plans and reports on its performance on a quarterly basis through the preparation of quarterly Performance Reports.

HUMAN RESOURCE CAPACITY

Regular Staff: Male (4) Female (3) Total Staffing Complement (7)

Trainings undertaken by the Executive Secretary and other core staff include: Training at the University of Rhode Island- (USA) on Leadership in Fisheries Management in 2010; Pathobiology Laboratory on Manatee Necropsy, salvaging and conservation at the US Geological Survey in 2012; Biology and Ecology of Mangroves, fish processing and hygiene –HACCP; Biology and Ecology of Sea grass in Senegal under the "Resilience sea" Project in 2019; and fisheries binding and non-binding instruments, etc.)

KEY AREAS OF COMPETENCE OF THE ORGANISATION

- Conservation and management;
- Capacity building on resources management; and
- Awareness creation on fisheries instruments and IUU fishing

CURRENT FOCUS AREAS OF INTERVENTION

- (i) Closed Area, Monitoring, control and Surveillance; and
- (ii) Traceability and Sanitation and hygiene at landing sites and fish processing establishments

MAJOR PROGRAMMES AND PROJECTS IMPLEMENTED

- (I) Marine Stewardship Council for Eco label certification of the sole fishery (Pre-assessment);
- (II) Ice pilot project to promote traceability including murals painting to promote hygiene practices;
- (III) Closed area monitoring, control and surveillance;
- (IV) Data collection training for Fisheries staff; and
- (iv) Closed area impact assessment

KEY ACHIEVEMENTS, CHALLENGES AND FUTURE PLANS

Key Achievements and Successes:

- Enforcement of closed area;
- Data collection (closed area impact);
- Ice pilot – Traceability;
- Sensitization on the importance of conservation and impacts on IUU fishing;
- Acquisition of surveillance boats;
- Distribution of 50 life jackets to fishers in Gunjur, Sanyang, Brufut and Kartong Landing Sites; and
- Development of murals about hygiene at Gunjur, Sanyang, Kartong and Brufut Landing Sites

Major Challenges Encountered:

- Limited technical and financial support from Ministry and Department of Fisheries;
- Lack of staff stipend;
- lack of sustainable marker buoys for the closed area;
- lack of mobility for outreach programmes; and
- insufficient equipped monitoring boats for the closed area

Future Plans to Scale Up Activities by Expanding Coverage or Reaching New Groups:

- Strengthening and expansion of sole fishery activities to inland fishing communities;
- Sensitization on impacts of IUU fishing;
- Training on Human Rights- Based approach to Fisheries;
- Establishment of additional area closures;
- Acquisition of additional 6 equipped monitoring boats for effective closed area monitoring;
- Provision of additional WASH (Water, Sanitation and Hygiene) facilities at fish landing sites;
- Provision of life jackets (2000);
- Training on fish hygiene and traceability; and
- Purchase of sustainable marker buoys for closed area boundary indicator

Table 10: Institutional Profile of TRY Oyster Women Association (TOWA)

VISION

To raise the standard of living and improve livelihood opportunities for local women.

MISSION STATEMENT

Empowerment through action and education; teaching oyster harvesters how to balance sustainable harvesting with the management of delicate mangrove ecosystems.

ORGANISATIONAL GOALS AND OBJECTIVES

TRY Oyster Women's Association was formed in an effort to tackle the challenges facing women oyster harvesters, the related challenge of rapidly declining mangrove forest and coastal health, and the task of educating the local population about the relationship between environmental degradation and deepening poverty.

In this respect, the association aims to improve the quality of and expand the market for harvested oysters, restore mangrove forests, and provide training and education services to TRY members in small business development, financial management, food handling and hygiene.

GOVERNANCE STRUCTURE

The association is formally registered in 2007 and legally recognized as a community-based organization. Its governance structure consists of a Board of Directors, an Advisory Council, a Local Governing Board and an Executive Director. The Board of Directors provides general guidance and long term strategic planning, sets policy, and seeks funding and endowments. The intention is to maintain a group of individuals who are committed to the mission and have the leadership capabilities, influence and contacts to assist in fundraising, strategic planning, and small business development.

The Executive Director reports to the Board of Directors and is responsible for overall management, including development and implementation of programs, daily operations, accounting and purchases. The Board of Directors, Advisory Council and Local Governing Board assist the Executive Director in fundraising, strategy development, program growth, day-to-day operations, and financial oversight. The Executive Director is assisted by an Assistant Director and part-time bookkeeper. Currently, both of these positions are filled by volunteers, though the association is fundraising to hire paid staff for these roles as well as a coastal specialist with expertise in oyster aquaculture.

The Local Governing Board is made up of representatives from the association's 15 member communities. Officers of this body – including the President, Vice President, Secretary, Deputy Secretary, Treasurer, Deputy Treasurer, and community representatives – oversee the entire network of harvesters. Elections for these positions are held every two years, with some of the smaller communities joining together to elect one combined representative. General membership in the association is open to anyone from TRY's 15 member communities.

KEY AREAS OF COMPETENCE AND FOCUS AREAS OF INTERVENTION

- Working with its membership of oyster and cockle harvesters to improve the quality of collected products, harvesting methods, processing and storage, and market supply-chains in order to diversify the market for locally harvested oyster and cockle products to ensure consistent demand and a higher premium for local women;
- Working with harvesters on value-added secondary processing techniques that will improve the shelf life of their products, including storing oysters and cockles in oil, freezing them, and smoking them.
- Due to high demand from consumers, TRY installed an oyster-smoking oven at one of its main landing sites and has plans – should market demand continue to grow – to set up smoking ovens at each of its sites;

- Working with its women associations it undertakes mangrove reforestation with support from the Department of Parks and Wildlife Management;
- Since 2010, the association has operated a microfinance program designed to support association members with financial management skills and services, and to provide small, catalytic loans that enable members to start or improve upon small business ventures;
- The Association provides basic literacy training, financial management workshops, and a range of educational services, focusing not only on association members but on their families as well; and
- The Association introduced a health initiative focused on health education and awareness-raising, including on sexual and reproductive health, communicable diseases, malaria, and dietary health and nutrition

MAJOR PROGRAMMES AND PROJECTS IMPLEMENTED

- In 2010, TRY received funding from the UNDP-implemented Global Environment Facility (GEF) Small Grants Programme (SGP) for mangrove reforestation and aquaculture training, for a two-year period up to 2012. This modest investment enabled the association to train its members in mangrove conservation and reforestation. Following the training, and with support from the Department of Parks and Wildlife Management, association members planted more than 50,000 mangrove seedlings in different locations within Tanbi Wetlands;
- In 2013, the British High Commission in The Gambia provided funds to TRY Oysters Women Association to develop sustainable oyster production in 5 communities throughout the Tanbi National Wetlands Park. The funds will teach 5 different communities how to grow oysters on sustainable bamboo structures located within the river Gambia, eliminating the need for the female oyster growers to harvest and damage the fragile mangrove ecosystem. It is estimated over 300 female oysters growers will benefit from the project
- Since 2009, the University of Rhode Island (USA) Coastal Resources Center and USAID have been working in The Gambia and neighboring Senegal on a 5-year, multi-faceted Sustainable Fisheries Project called BaNafaa with the Association as one of its key implementing partners

MAJOR ACHIEVEMENTS AND SUCCESSES

One of TRY Association's biggest accomplishments to date has been its leadership in the development and implementation of the Oyster and Cockle Co-Management Plan for the Tanbi Wetlands National Park (TWNP), designated a "Special Management Area". The Plan was co-signed with the Department of Fisheries, the Department of Parks and Wildlife Management and the National Environment Agency. The Co-Management Plan, approved and launched on January 17, 2012, gives TRY Association exclusive use rights to the cockle and oyster fishery in the TWNP and delegates to the association the authority and responsibility of sustainable management and conservation of the oyster and cockle resources in TWNP.

Award winner for the Equator Prize at the RIO+20 Summit in Brazil in 2012. The Equator Prize is awarded biennially by the United Nations Development Program in recognition of outstanding community efforts to reduce poverty through the conservation and sustainable use of biodiversity.

FUTURE PLANS

- Plans are also in place to construct a Resource and Processing Centre, which would vastly increase the women's market access and the range of products they could offer; and
- To install oyster-smoking ovens at all the main landing sites
-

Capacity Profile of Community-Based Actors to Participate in Project Implementation

Institutional Capacity Profile of Community-Based User Groups in the Fisheries sector

Introduction

In The Gambia, local communities mobilise and organise themselves into local groupings known as “Kafo” in Mandinka and “Kompin” in Wolof. These groupings serve to guide and regulate the activities of members as well as promote the development of members and the local communities in which they are located.

During the implementation of earlier fisheries development projects, fisherfolks were sensitized and encouraged to organise themselves into user-group associations. Thus the professional fisherfolks at the landing sites, as direct beneficiaries of services provided by various projects at the landing sites and united by their common interests and use of the facilities at the Community Fisheries Centers (CFCs) drew inspiration from the informal groupings of the local communities (Kafos) to group themselves into Professional User Groups at the landing sites. Generally the structure of these grass roots associations is virtually the same at all artisanal fishing communities targeted by this project.

Generally, five user group associations are represented at the seven (7) landing sites targeted for project intervention and these are: (1) Fishermen Association; (2) Fresh Fishmongers Association; (3) Fish Smokers Association; (4) Fish Dryers Association; and (5) Fish Transporters Association. These makes the associations to be broadly representative of the various trades of the fisherfolk community at the landing sites and hence have the mandate to represent them at LACOMs.

Key features and characteristics of the User Associations

Box I: Key Characteristics of a Fisherfolks User Group

Association

- (i) A Constitution approved by the General Assembly of the Association at its AGM;
- (II) Registration as an Association with the Attorney General’s Chambers;
- (iii) Executives elected at its AGM as Office Holders of the Association;
- (iv) Office Holders are: President, Vice president, Secretary, Deputy Secretary, Treasurer, Deputy Treasurer and Auditor;
- (v) Membership fees paid to facilitate the running of the Association and funding of its programmes and projects;
- (vi) A Cheque-Book Bank Account opened with the nearest local bank;
- (vii) Regular meetings are held monthly, quarterly and annually to discuss issues affecting them or reports from executives;
- (viii) Operate their own credit and savings schemes through specific weekly or monthly cash subscriptions by members;
- (ix) From the accumulated funds, credit is given to members in a rotating manner to meet their operating costs;
- (x) Although the savings and credits schemes vary from one association to another, the associations nonetheless operate them on the basis of mutually agreed internal rules and regulations;
- (xi) Each Association nominates two representatives to the Landing Site Co-Management Committee (LACOM); and
- (xii) Each Association is a member of a federation of the fisherfolks association such as NAAFO , NASCOM or TRY Oyster Women Association (TOWA)

Source: Focus Group Discussion sessions conducted by the Consultant to the 8 landing sites targeted for project intervention

At the community fisheries centres, training programmes have been organised by CSO Service Providers, Department of Fisheries or other projects relevant to the fisheries sector for fisherfolk association members in various disciplines ranging from basic business and financial management; literacy and numeracy; simple bookkeeping; organisation of meetings and records keeping; credit and savings; social mobilisation and community outreach; fish handling, preservation, processing and marketing etc.

In spite of the efforts at organising the user groups into effective professional trade associations, the associations continue to be beset with series of capacity challenges such as weak organisational and management capacity in the running of their affairs, poor performance of the savings and credit schemes due to problems with loan recovery, low literacy levels resulting into poor entrepreneurial behaviour, poor sanitation and hygiene behaviour resulting in poor sanitary conditions at the landing sites such as resort to open defecation and indiscriminate littering of waste all over the landing sites.

Institutional Profile of the Landing Sites Co-Management Committees (LACOMs)

Background and conceptual framework for the creation of the LACOMs

Through an EDF funded project the Community Fisheries Centre (CFC) concept was introduced in The Gambia with the objectives: 1) to augment incomes of fish workers through improved catches; 2) to increase consumption of fish by improved processing, distribution and marketing; 3) to increase rural job opportunities; 4) to develop industrial and artisanal fisheries in an integrated manner; 5) to diversify the economy and intensify economic activities in the fisheries sector; and 6) to improve national socio-economic standards (Njie and Mikkola, 2001 quoted in M. Van Der Knaap, 2009).

To attain the above-mentioned objectives the CFCs were provided with infrastructure consisting of fishing gear stores, fish product stores, fish drying racks, smoke houses, fish boxes and containers, water tanks, water wells, wind mills, fish marketing platforms, workshops, offices, etc. Subsequent projects added to the establishment of more CFCs and the creation of the Fisheries Development Unit at the Department of Fisheries and charged with providing technical backstopping to the fishing communities such as sensitization programmes and the setting up of functional community structures. (M. Van Der Knaap, 2009).

In 1987 the Community Fisheries Centres were transformed into the Fisheries Centre Management Committees in order to broaden participation into the work of the Committees and more so to institute the concept of co-management between the government and the community-based fisherfolks user groups operating at the landing sites. In this respect the nomenclature has been changed to Landing Sites Co-Management Committees (LACOMs) to reflect the joint management responsibility.

From the onset since their inception, the Community Fisheries Centres (CFCs) promoted the organization of the fishing industry into user group associations such as fishers, fresh fish mongers, fish smokers, fish dryers and fish transporters) following the traditional model of the "Kafo" (a group of people in the same trade) to address common concerns and pursue common interests. Each user groups nominates two representatives to the LACOM with no fixed terms limits for members. This gives them the reach and mandate to be broadly representative of the fisherfolk community and to represent their interests to other agencies/actors.

Representation to the LACOMs

At first, representation to the committees were voluntary and members did not receive any form of remuneration. Over time however, as some of the LACOMs became more independent and generated a fairly substantial amount of income, members of the Executive Committee who were on full-time engagement in some coastal LACOMs received allowances and were eventually placed on the Committees pay role. The representation to the LACOM is structured as in Box II below:

Box II: Character of representation to the Landing Sites Co-Management Committee (LACOM)

- (i) Two representatives from the Fishermen Association;
- (ii) Two representatives from the Fresh Fishmongers Association;
- (iii) Two representatives from the Fish Smokers Association;
- (iv) Two representatives from the Fish Dryers Association; and
- (v) Two representatives from the Fish Transporters Association
- (vi) The Village Head (Alkali) where the landing site is located;
- (vii) The Chairperson of the Village Development Committee (VDC) where the landing site is located; and
- (viii) Fisheries Extension Officer(s) posted at the respective landing sites, serving in advisory capacities

Source: Focus Group Discussion sessions conducted by the Consultant to the 8 landing sites targeted for project intervention

By 1992, much of the power and authority for the management of the LACOMs was devolved on to the Executive Committees (EC) in which case the Fisheries Officers who sit on the ECs only play much of a technical advisory role as well as liaison between the LACOMs and the Department of Fisheries. The Executive Committee constituting the office holders are charged with the day-to-day operation and management of the infrastructure, facilities and services at their respective landing sites and reporting to the general body of the membership at the monthly, quarterly and annual meetings. In preparing the LACOMs for operational and management autonomy of the infrastructure, facilities and services, committee members received interactive training in organisation and management related disciplines: business and financial management, literacy and numeracy, bookkeeping, credit and savings, organisation and recordkeeping of meetings, community outreach, etc.

The typical structure of the Executive Committees of the LACOMS is illustrated in Box III below:

Box III: Typical characteristics of the composition of the Executive Committee of a LACOMS

- (i) Chairperson
- (ii) Vice Chairperson
- (iii) Secretary
- (iv) Deputy Secretary
- (v) Treasurer
- (vi) Auditor

Source: Focus Group Discussion sessions conducted by the Consultant to the 8 landing sites targeted for project intervention

Operations and management of the LACOMS

In the operation and management of the Executive Committees, they are guided by Bye-Laws developed by the Department of Fisheries. At the landing sites, the infrastructure and facilities are rented to users and services provided for the fishing communities. Rental fees and service charges are collected and managed on behalf of the fishing community. Meetings are organised on monthly, quarterly and annual basis whereby matters concerning revenue from rental collections, expenditures, budgets and future developments at the landing sites are discussed and approved. For the proper up-keep and care of the facilities, the committees delegate responsibilities to various committee members to oversee the facilities, report damages, collect rental fees for onward payment to the Treasurer who is in-charge of the financial responsibilities of LACOM.

Typical facilities at the landing sites and operated and managed by the LACOMS on rental basis is illustrated in Box IV below:

Box iv: Typical infrastructure and facilities available to fishing operators/processors at the fish landing sites on rental basis

- (i) Ware house(storage rooms) for fishing gears;
- (ii) Ice plants;
- (iii) Canteens/restaurants;
- (iv) Stalls for vendors of other forms of merchandise;
- (v) Smoking houses;
- (vi) Drying racks;
- (vii) Toilet facilities;
- (viii) Waste collection and disposal;
- (ix) Fishing gears;
- (x) Lockers to keep the personal belongings of fish processors;
- (xi) Cold/ice boxes;
- (xii) Utilities (water and electricity); and
- (xiii) Ovens

Source: Site visits by the Consultant to the 8 landing sites targeted for project intervention

As can be seen from box (iv) above, the landing sites have now produced multiplier effects to fishing and related activities and have become bustling poles of attraction for a number of increasing spin-off activities. Apart from the fishing and related activities, there have been growing private entrepreneur activities: restaurants, canteens, mechanical workshops, petty trading, selling of primary and basic household supplies and increased transportation services and fuel stations etc. These additional business activities have increasingly become sources of local revenue for improved development of the fishing communities.

Before meetings of the LACOM, representatives of the fish processor associations consult with members of their groups to solicit inputs regarding issues of concern and suggestions to their respective trades. These inputs are passed on to the committee for discussions during committee meetings. Any decisions reached are then communicated back to the associations, thus following a two way communication channel. The day-to-day management of the facilities, technical services and organisation of meetings is supported by the fisheries extension officers posted to each of the landing sites

The LACOMs operate bank accounts in which revenue is deposited and withdrawn only by elected trustees (usually three members of the committee). Expenditures on maintenance and expansion of the facilities were prioritized. While some of the LACOMs (such as the ones at Gunjur, Brufut and Tanjei) operate profitably and that momentum could be sustained but some LACOMs periodically run into financial difficulties due to mismanagement on one part and unsustainable generosity by giving out charity to local institutions and organisation such as churches, mosques, village development committees and local youth groups at the expense of savings and investments in the development of their respective landing sites. In this respect, should there be a breakdown of any of the infrastructure or facilities these could not be afforded. This problem could be ascribed to a lack of appropriate monitoring and supervision as well as financial control and discipline (O. Sowe, 2017).

Challenges encountered by the LACOMs

In spite of the numerous developments and improvements that the LACOMs bring to their respective landing sites, several capacity challenges continue to curtail their ability to respond in a more sustainable manner:

- (i) Lack of easy access to improved water supplies at the landing sites. In most cases water supply is provided by NAWEC and which makes its distribution to the strategic locations difficult considering the enormous financial burden it will bring to the LACOMs. Provision of boreholes has been an option in some landing sites but the constant breakdown of the pumping machines poses other problems;
- (ii) Lack of easy access to improved sanitary facilities also constitutes a serious challenge for the management of the landing sites. In most cases the toilets are few and far apart. This situation encourages some to resort to open defecation within the shrubs just few meters from the processing structures and facilities, hence compromising the environmental health requirements under which the fish products should be processed;
- (iii) Lack of easy access to affordable and reliable electricity supplies. The supply of electricity is either from the national grid or from generators. It was believed that connection to the national grid would be less costly than the purchase of fuel for the generators, but the National Water and Electricity Company (NAWEC) charges the landing sites at the commercial rate which is much more expensive than the domestic rate and as a result the electricity bill is an enormous burden to the LACOMs;
- (iv.) Lack of transport not only for fishery products but also for persons. A number of coastal landing sites had obtained trucks from donors to market their produce inland, but maintenance is expensive and some of them ceased operations;
- (v) Lack of access to micro-finance to repair or replace broken-down structures and facilities. Almost all the landing sites have experimented with the creation of micro-finance schemes mainly initiated by donor-funded projects. Most of them have now been made dysfunctional due to problems of loan recovery encountered with the initial disbursements;
- (vi.) Access roads to some of the sites are in very deplorable conditions and gets worse during the rainy season, particularly for Brufut, Gunjur and Sanyang landing sites. This situation discourages many customers from visiting these sites and this has a negative effect on the revenue flow of the fish processors at the sites and by extension the respective LACOMs
- (vi) From the aforesaid shortcomings two main lessons could be drawn:
 - Well-functioning user group associations are essential to the operation of strong LACOMs as they would ensure representation of different shades of opinion in the community and permit free flow of information between management and users; and
 - Community-based management success should not be judged too early to warrant giving total independence. Management monitoring, audit and supervision are essential and should be a continuous process in order to sustain any success registered (Njie, 1993; quoted in O. Sowe, 2017).

Capacity situation of the community-based beneficiary (user) groups

Table 11: Capacity situation of community-based user groups

USER GROUP	EXISTING CAPACITY	CAPACITY NEEDS
Fish smokers Fish Dryers Fresh Fish Mongers Plate 1: Fish Smoking House & Drying Racks  <p>Source: Study of Community Fisheries Centers In the Gambia, AFDB(2009)</p>	<p>Smoking houses are in dilapidated conditions and this situation coupled with the use of firewood or cartons for smoking poses serious health threats to the smokers</p> <p>Conditions in the smoking houses and the smoking gears and clothing are also considered to be below the minimum standards of basic sanitation and hygiene</p> <p>Drying is normally done outside in the open thus exposing the racks to the elements and making it extremely difficult for the dryers to operate during the rainy season or during heavy wind storms.</p> <p>Equally the presence of flies and other insects around the drying racks makes the environment for drying very unhygienic</p>	<p>The introduction of the FTT Kiln will not only be an improvement to the current smoking methods used but also improve the efficiency of smoking by eliminating the use of charcoal and cartons which reportedly expose smokers and the consumers of the smoked fish products to undesirable health conditions</p> <p>The introduction of the solar tents will be a major improvement to the current drying methods and conditions. Not only will it enable the dryers to operate in all seasons, but the menace of flies and insects will be eliminated. To ward off flies from the fish, dryers use several bags of salt as a deterrent but with the new technology the amount of salt used will also be reduced, hence cutting down on the cost of drying</p>
Plate 2: Fish processing in the open  <p>Source: Study of Community Fisheries Centers In the Gambia, AFDB(2009)</p>	<p>Both the smokers and dryers require adequate water supplies to facilitate their operations. The inadequacy of improved water supplies, particularly in terms of water points at the landing sites, meant that they have to travel far and wide sometimes to fetch water hence causing unnecessary burden and delays to their work</p> <p>The lack of platforms for the handling of fresh fish especially where they have to deal with customers is a major inconvenience for the processors. These meant that handling invariably takes place on the sandy beaches exposing the fish, the handlers and customers to poor sanitary and unhygienic conditions</p>	<p>To address the water shortage challenges smokers and dryers currently encounter, there is the need to provide boreholes at each of the 8 project intervention sites to be equipped with a standard reticulation system. To improve the water supply coverage the number of water points could be increased and strategically located</p>
Plate 3: Toilet facilities at the landing sites  <p>Source: Study of Community Fisheries Centers In the Gambia, AFDB(2009)</p>	<p>Toilet facilities at the landing sites are very few and far apart. This situation encourages certain individuals to practice open defecation in the nearby shrubs within few meters from the smoking houses and drying racks. This adds to the poor sanitary and unhygienic conditions at the landing sites.</p> <p>The lack of easy access to reliable electricity supplies is also a major challenge for the smokers and dryers who sometimes have to work at night under very poor lighting conditions only with the aid of very dimly-lit torchlights. Not only is it</p>	<p>During the FGD sessions, participants at Brufut, Tanjel, Sanyang and Gunjur landing sites lamented the lack of a suitable platform for handling fish and for interactions with the customers in an environmentally healthy condition. Platforms or fish markets with modest facilities might be required to meet their needs for the handling and marketing of fish and other aquatic resources.</p> <p>To address the inadequacy of toilet facilities and the resultant open defecation, there is the need to construct more improved VIP toilet facilities at the 7 landing sites and have them strategically located to avoid congestion, in collaboration with the Appropriate Technology Unit of the Department of Community Development</p> <p>The lack of easy access to electricity supplies could also be addressed with the installation of solar power systems to complement the existing electricity supply system through the national grid, which is expensive</p>

difficult for them in having to work in darkness but also when going back to their homes at night

At the landing sites there is also a tendency for indiscriminate littering of wastes of different genres anyhow and anywhere thus adding to the unsightly and unhygienic situation at the sites.

In addition, the lack of appropriate handling and trading facilities at the landing sites meant that fresh fish mongers and customers conduct business in the open sandy beaches

With the introduction of the improved fish smoking and drying facilities at the landing sites, the knowledge and skills of the processors to efficiently operate the facilities need to be enhanced. Currently they are operating the conventional methods of smoking and drying which requires limited technical skills unlike the new technologies

as the landing sites are billed on the basis of commercial tariffs.

To address the issue of indiscriminate littering of waste all over the landing sites, there is the need to ensure the setting-up of WASH (Water, Sanitation and Hygiene) Committees and task them with supervising and coordinating the cleanliness of the sites.

The collection and final disposal of waste from the sites could be done in collaboration with Banjul City Council and Brikama Area Council Sanitation Units respectively

Training and awareness-raising programmes on basic sanitation and hygiene could be organised for the processors in collaboration with the WASH Unit of the Ministry of Health

Once the improved smoking and drying facilities are installed then the processors need to be trained on how to use them by organising study visits for few of them to Senegal and for the leadership to Ghana and Sierra Leone where the processors there have gained considerable experience in the operation of these technologies

Landing Sites Co-Management Committees

Plate 4: Warehouse for fishing gear storage



Source: Study of Community Fisheries Centers In the Gambia,, AFDB(2009)

Plate 5: A Landing Site Co-Management Com



Source: Study of Community Fisheries

Typical facilities currently available at most of the 7 landing sites for rental purpose to processors include the following: (i) Warehouse(storage rooms) for fishing gears; (ii) Ice plants; (iii) canteens/restaurants;(iv) Stalls for vendors of other forms of merchandise; (v) Smoking houses;(vi) Drying racks;(vii)Toilet facilities;(viii)Waste collection and disposal;(ix) Fishing gears;(x)Lockers to keep the personal belongings of fish processors;(xi) Cold/ice boxes;(xii) Utilities (water and electricity); & (xii)Ovens;

Major challenges relating to the up-keep of the infrastructure and facilities at the sites include (1) misuse of the facilities; (2) gradual deterioration of the facilities over the years due to lack of regular care and maintenance; (3) lack of adequate capital to replace the deteriorated facilities or ensuring their regular up-keep and maintenance; (4) poor record of rental charges collection

The LACOMs constitute a broad-based representation of all the five user groups present at the landing sites and hence takes on a

As a result, revenue that use to accrue from these facilities dwindled sharply and thereby reducing the ability of the LACOMs to plough back accrued revenue to ensure regular up-keep and maintenance.

To partly address the continuous deterioration of the facilities, business plans including provisions for depreciation and replacement of equipment (including those of the proposed new technologies) need to be developed

In addition, the enforcement and compliance regime for the provisions of the bye-laws on the use of the infrastructure and facilities and payment of rental charges is somehow weak and needs to be vigorously strengthened and pursued through the development of new and stringent regulations to enforce the said provisions of the bye-laws

To address the operational and management challenges besetting most LACOMs currently, there is the need to provide training programmes for them on organisational management issues including: project design and

Centers In the Gambia,,
AFDB(2009)

Plate 6: Convergence point at beach
side



Source: Study of Community
Fisheries

Centers In the Gambia,,
AFDB(2009)

coordinating and supervising role
for the activities of the user groups
operating at the landing sites.
However, they are beset with
operational and management
challenges

To ensure their effective
management, bye laws have been
developed but there are two key
challenges relating to their
enforcement:

(1) First they are obsolete and
outdated and need to be reviewed
and updated to enable them keep
abreast with new and emergent
trends within the fisheries sector;
and (2) the bye-laws of LACOMs at
the different landing sites do not
manifest uniform standards across
the board, thus making
comparability in terms of the
performance of the LACOMs
somehow difficult

management, fund-raising and
resource mobilisation, financial
management, human resources
management, assets inventorying
and management, infrastructure
management, social mobilisation
and community outreach

To address this challenge there is
the need for the Department of
Fisheries to develop a generic bye-
law that meets the standard
requirements and takes note of new
and emergent trends in the
management of fisheries and other
aquatic resources. The generic bye-
law could serve as a prototype that
individual LACOMs could adapt to
their different circumstances
without compromising the standard
elements of a LACOM bye-law

The same could be done for the user
group associations that fish
processors at the landing sites have
grouped themselves into. A glance
at some of the Constitutions of
these groups also reveal the same
tendency as the LACOMs. There is
no uniformity in standards among
their constitutions and in many
cases standards have been
compromised. A generic
Constitution to serve as a prototype
that individual user groups could
adapt to their circumstances could
be envisaged with technical
assistance of the Department of
Fisheries is required.

Oyster and Cockle Harvesters

Plate 7: Women in mangrove
conservation



Source: UNDP, Equator
Initiative(2012)

Plate 8: TRY Oyster women oyster
harvesters



Due to high demand from
consumers, TRY installed an
improved oyster-smoking oven at
one of its main landing sites

Working with its women
associations it undertakes
mangrove conservation and
reforestation with support from the
Department of Parks and Wildlife
Management

The association operates a
microfinance scheme designed to
support association members with
financial management skills and
services, and to provide small,
catalytic loans that enable members
to start or improve upon small
business ventures

The Association provides basic
literacy training, financial
management workshops, and a
range of educational services for
association members and their
families

The Association provides health
education and awareness-raising
training for members on sexual and
reproductive health, communicable

To set up more smoking ovens at
its landing sites in Banjul, Kartong
and Bintang & more training on
oyster processing and storage

The need to provide more training to
association members in mangroves
conservation and reforestation in
collaboration with the Department
of Parks and Wildlife Management

In 2013, the British High
Commission in The Gambia provided
funds to TOWA to develop
sustainable oyster production in 5
communities throughout the Tanbi
National Wetlands Park. The funding
was designed to teach 5
communities on how to grow
oysters on bamboo structures
located within the river Gambia,
eliminating the need for the female
oyster growers to harvest and
damage the fragile mangrove
ecosystem.

Go to scale with this initiative by
replicating it in the remaining
ten(10) communities that the
Association is operating from

Source: UNDP, Equator Initiative (2012)	diseases, malaria, and dietary health and nutrition Working with harvesters on value-added secondary processing & storage techniques to improve the shelf life products	Expand the training program on basic literacy, health education and skills acquisition for association members and their families
--	--	---

Climate Vulnerability of Small Scale Fisheries Infrastructure and Options for Investment

1. EXECUTIVE SUMMARY

A comparison of current and future risks has identified areas where resilience can be improved and where existing assets can be adapted or re-located. This risk assessment is based on an understanding of how the climate is expected to change the climatic parameters that impact the infrastructure, namely, rise in sea level, rise in extreme wind speeds, rise in extreme wave heights, rise in precipitation and fall in precipitation.

The potential impact of these five parameters has been analysed vis-à-vis the existing infrastructure at the seven Government-designated sites of Bacau, Brufut, Tanji, Sanyang, Kartong and Bintang. These potential impacts have been summarised in a set of vulnerability tables together with recommendations for weather-proofing the existing infrastructure.

The sites at Bacau and Tanji are the worst affected by the rise in sea level and due to the lack of foreshore, require the re-location of the canoe landing area to a safer area in the case of Bacau and the re-location of some fish processing in the case of Tanji. The rest of the sites are mainly affected by a potential change in humidity levels resulting from a change in the rainfall patterns. The site at Kartong has already experienced flooding events at high tide and the site at Bintang is critically exposed to rise in river flow.

Potential risks have also been identified. These include the continuation of the uncontrolled sand mining from the beaches, the continued fabrication of the metallic components of the FTT ovens in cheap steel by unqualified metal workers and failure in the organisational set-up at village level (CFC) to exploit the new equipment (ovens and driers) to its full useful life when designed and built according to specification.

2. DEFINING CLIMATE CHANGE

Coastal communities around the world are experiencing temperature increases, rising sea levels and changes in seasonal atmospheric conditions: More frequent and severe extreme storms (hurricanes, cyclones and the like) are associated with extremes in surges, wind speeds, precipitation and wave heights. Hence the impact of climate change on these parameters and processes will exacerbate existing risks and introduce new ones, including impacts associated with:

- changes in wind speed/strength, direction, or duration;
- changes in intensity and duration of precipitation;
- overwhelmed drainage systems or high groundwater levels resulting in flooding;
- overtopping and flooding due to high river flow levels, high tide or storm surge;
- high river flow velocities or sea state changes (currents, extreme waves);
- low river flow conditions, drought leading to reduced water supply;
- changes in bathymetry or in sediment or debris transport, erosion or accretion;
- river or sea bed or bank erosion leading to change in river mouths;
- fog or other reduced visibility, for example due to prolonged humidity, or sandstorms;
- extreme cold;
- extreme heat or humidity (magnitude, duration or frequency);
- changes in water chemistry (acidity, salinity);
- changes in the biological environment (vegetation growth, invasive species)

A comparison of current and future risks will help to identify areas where resilience can be improved or where existing assets need to be adapted or re-located. This risk assessment is based on an understanding of how the climate is expected to change as many of the climate-related changes that matter most are temperature-driven. However, there remains a great deal of uncertainty about how quickly temperature will change. This level of uncertainty increases significantly beyond the statistical ten years from the present time and in order to develop a medium-to-long term strategy, a range of possible future climate scenarios needs to be considered.

2.1 FUTURE CLIMATE SCENARIOS

Following the first reconnaissance mission to Gambia, the fisheries infrastructure at the selected sites may be impacted by the following climate change scenarios:

- Rise in sea level;
- Rise in extreme wind speeds;
- Rise in extreme wave heights;
- Rise in precipitation;
- Fall in precipitation.

2.1.1 Rise in sea level: The rise in sea level is caused primarily by the water added from melting ice sheets and glaciers and the expansion of sea water as it warms. Figure 1 illustrates satellite data for the period 1993 to present, whereas Figure 2 illustrates ground data from 1870 to 2013. Most sites in Gambia are shallow beaches, and for every 100mm increase in sea level rise, the corresponding permanent loss of dry beach ranges from 3 to 6 times this value.

This permanent loss is further exacerbated by simultaneous weather occurrences during storms.

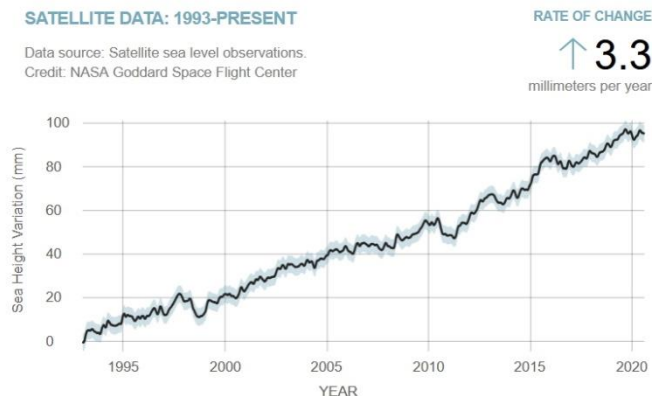


Figure 1 – Change in sea level since 1993
Source : www.climate.nasa.gov/vital-signs/sea-level/

2.1.2 Rise in extreme wind speeds: The predicted changes in wind speeds due to global warming are expected to be modest but are large enough to cause damage to flimsy structures.

An analysis of wind speed records collected between 1978 and 2017 from more than 1,400 weather stations shows that wind speeds decreased by about 2.3% per decade, but since 2010 they have increased at a rate nearly three times faster (www.weather.com/science/environment/news/2019-11-19-global-wind-speeds).

In addition to the direct impact that wind speed has on structures, it also gives rise to storm surge.

Storm surge should not be confused with storm tide, which is defined as the water level rise due to the combination of storm surge and the astronomical tide. This rise in water level can cause extreme flooding in coastal areas particularly when storm surge coincides with normal high tide. Storm surge is produced by water being pushed toward the shore by the force of the winds moving cyclonically around the storm. The impact on surge of the low pressure associated with intense storms is minimal in comparison to the water being forced toward the shore by the wind. This combination of events often leads to loss of beach area through erosion phenomena, which, though distinct from the loss of beach area due to sea level rise alone, often accelerates the process. Large scale mining of sand for the construction industry (very common in Gambia) is also depleting further the amount of sand within the nearshore coastal zone available to keep beach formation stable.

2.1.3 Rise in extreme wave heights: The rise in sea level coupled to extreme weather conditions increases the instantaneous depth of water close inshore and deeper water translates into higher waves. Higher waves imply greater energy at the water line, which in turn means more sand movement (which may be longshore or offshore). Hence besides the direct impact and/or overtopping of the waves against any structures along the shore line, this phenomenon also exposes sandy coastlines to erosion, thereby exacerbating the loss of beach area due to sea level rise alone.

2.1.4 Rise in precipitation: The rise in precipitation may affect the infrastructure in many ways:

1. The increase may be transient, such as a very heavy downpour in a storm, leading to flash flooding in areas where there is poor surface water drainage;
2. The increase may be medium-to-long term, such as longer wet seasons, leading to loss of fish drying capacity of the traditional fish drying racks;
3. In both cases, riverine landing areas may see higher water flow currents, erosion of river banks and loss/submergence of fixed mooring jetties.

A rise in precipitation, however, also has advantages: Rainwater harvesting becomes very economical and the salinity in riverine sites, and hence corrosion rates, drops dramatically.

2.1.5 Fall in precipitation: The fall in precipitation may manifest itself as a drought, and the longer the drought the more impact it has on the fresh water table. Sites that depend on borewells may be impacted over the medium to long term. In riverine sites, it may also lead to a recession of the water line and a rise in salinity levels.

GROUND DATA: 1870-2013

Data source: Coastal tide gauge records.
Credit: CSIRO

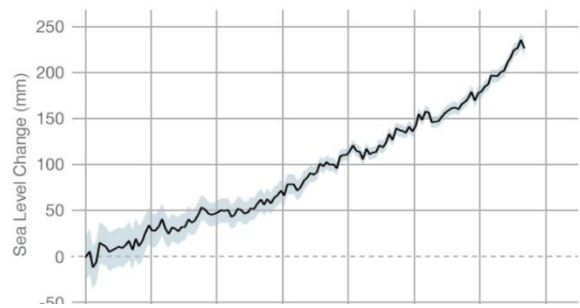


Figure 2 – Change in sea level 1870-2013

Source : www.climate.nasa.gov/vital-signs/sea-level/

3. DEFINING IMPACTS AND MITIGATIONS

3.1 IMPACT OF LOSS OF BEACH AREA ON LARGE CANOES

In this context, the loss of beach is defined as loss of dry area due to a single or a multiple number of scenarios acting in unison as defined under Section 2.



Figure 3 Unloading a large canoe

Large canoes need at least 0.75 m draft when fully loaded and so cannot be beached to unload their catch. Unloading crews, Figure 3, are normally employed to wade up to the beach line to carry the boxed catch to the traders. In the worst-case scenario, If erosion exposes underlying rock this operation becomes very difficult and risky for the canoe owner. After unloading, these canoes are normally moored up to 100m offshore until the next fishing trip.

MITIGATION – In the worst-case scenario, landing should be moved to a calm and protected area and floating pontoons installed as shown in Figure 4.



Figure 4

MAJOR CONSTRAINT – The offloading crew will lose their job as a result and as they are paid in-kind with fish, this will impact their families' food security.

3.2 IMPACT OF LOSS OF BEACH AREA ON SMALL CANOES



Figure 5 Unloading a small canoe is a family affair

Small canoes, when fully loaded, are still light enough to be hauled up a sandy beach. Unloading is a family affair and involves everyone. The fish traders normally come up to the canoe and buy directly. If the beach recedes, they will beach the canoe further away. If it disappears completely and exposes the underlying rock surface, this operation becomes impossible. These canoes are normally hauled further up the beach until the next fishing trip.

MITIGATION – This type of canoe and the family unit it supports is very difficult to move to another area as it often means moving house as well. The only technical mitigation in a worst-case scenario would comprise re-instating the beach via sand replenishment and reversing the anthropogenic activities that caused the erosion in the first place, like sand mining for the construction industry and damming of rivers that throttle the flow of sediment to the coast.



Figure 6 Sand replenishment on a large beach (by pumping) and a small beach (by dumping)

MAJOR CONSTRAINTS – The major constraint is cost. Only small beaches may be viably replenished from land if quarries are available locally. Pumping sand from offshore is normally prohibitively expensive and needs a regional approach, see for example the World Bank's West Africa Coastal Assets Project (WACA).

Hard structures, like offshore breakwaters and groynes, are incompatible with shallow beaches, as they tend to disrupt the longshore transport of sand and simply move the problem elsewhere.

3.3 IMPACT OF INCREASED PRECIPITATION ON FISH DRYING



Figure 7 Traditional fish drying rack

Currently, fish drying is carried out over traditional reed and timber racks as illustrated in Figure 7 above. Plastic sheets are used during rainy days. Obviously, when it is wet and the humidity high, this may lead to spoilage as the flow of air through the rack is limited.

MITIGATION – Replacing the traditional rack with the CEAS Kiraye drier should see increased productivity and much less spoilage during periods of high humidity. This also increases the level of hygiene during the drying process as insects cannot come into contact with the fish.



Figure 8 The CEAS Kiraye solar drier in use throughout Senegal

MAJOR CONSTRAINTS – The CEAS Kiraye solar drier comes at a cost (circa €3,000) but is perhaps one of the best and more robust models suited for the harsh coastal environment.

Given the high individual cost of the drier it is normal practice to promote the use of shared or communal facilities owned by the CFCs and rented out to the individual fish driers. This system appears to function in certain communities but not in others, as some driers insist on having their own drier next to their dwelling irrespective of the availability of proper solar driers. Hence, the introduction of solar driers may present a social impact on local traditions. In other cases, the rental fee is set too high, discouraging their use in favour of traditional racks.

3.4 IMPACT OF INCREASED PRECIPITATION ON FISH SMOKING



Figure 9 Banda ovens in use at the moment

Currently, fish smoking is carried out over traditional banda ovens as illustrated in Figure 9 above, both indoors and outdoors. Many of the covered facilities are in disrepair with leaking roofs and outdoor facilities open to the elements are now in common use in some locations. In other parts of West Africa, this type of oven is being replaced with more energy-efficient models (improved Chokor and FTT models) in a bid to reduce the amount of firewood required. Gambia is also experimenting with these new types.

MITIGATION – Replacing the traditional ovens with the newer models illustrated below in Figure 10 and moving these into properly designed smoke houses is no longer an option for many locations.

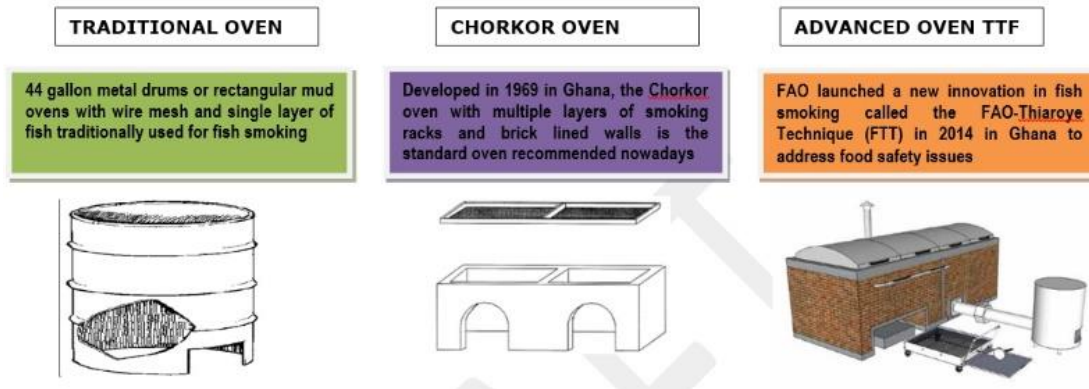


Figure 10 The improved Chokor and FTT ovens

MAJOR CONSTRAINTS – The TTF oven comes at a cost (circa €4,000) but is perhaps the best suited to reduce deforestation and improve quality.

Given the high individual cost of the smoker it is normal practice to promote the use of shared or communal facilities owned by the CFCs and rented out to the individual fish driers. This system appears to function in certain communities but not in others, as some smokers insist on having their own oven next to their dwelling irrespective of the availability of proper ovens. Hence, the introduction of communal smoke houses may present a social impact in some localities. In other cases, the rental fee is set too high, discouraging their use in favour of traditional racks.

4. VULNERABILITY TABLES

NOTES FOR READING THE VULNERABILITY TABLES

- The vulnerabilities listed in the tables refer to each separate site as assessed during the first reconnaissance site visit;
- A second site visit will be required to confirm what additional studies (topographic, cadastral, land-use, borewells, etc) will be required to confirm the infrastructure upgrading being proposed;
- Only 5 climate change parameters directly impact the infrastructure under study;
- The “***Perceived Importance of Potential Impact***” is considered low-to-nil when the parameter does not impact the infrastructure component directly but may impact the fisheries operations, like for instance higher extreme wave action: In some cases, the wave impact directly affects some structures and the importance is *high*;
- The “***Duration of the Impact***” is considered *long and permanent* when it is not reversable and *very short and intermittent* when transient, like a severe storm: If the parameter impacts a component over a long period of time, like for instance a drought or a longer wet season, the duration of the impact is considered as medium;
- The “***Overall Significance***” is considered as *high* when the parameter relative to the given site is considered as a clear and present danger to the infrastructure in question when considering similar event occurrences elsewhere (worldwide);
- The mitigation measures recommended do not include the construction of either hard or soft sea defence measures like breakwaters, land reclamation or beach nourishment. These are either not sustainable or have a large environmental impact footprint beyond the terms of reference of this project;

INFRASTRUCTURE VULNERABILITY TABLES

<i>Climate change parameters</i>	<i>Type of Expected Impact on the infrastructure</i>	<i>Perceived Importance of Potential Impact</i>			<i>Duration of Impact</i>			<i>Overall Significance</i>	<i>Mitigation Measures</i>	<i>Proposed climate change proofing measures</i>
1. Bakau		<i>Low to nil</i>	<i>Moderate</i>	<i>High</i>	<i>Very Short intermittent</i>	<i>Medium</i>	<i>Long permanent</i>			
Rise in sea level	Loss of beach area, inundation/deterioration of existing structures, increase in corrosion rates, loss of equipment.			✓			✓	High	Lack of land inland of the eroding beach landing is unavailable. Landing needs to be relocated.	Move the fish landing and shore based infrastructure to Banjul fishing port inside the estuary.
Rise in extreme Wind speeds	Damage to structures, roofs and equipment.			✓	✓			High	None at Bakau.	All buildings designed for extreme wind speeds.
Rise in extreme Wave heights	Erosion of coastline, damage to canoes,			✓	✓			High	None at Bakau.	Extreme wave heights no longer problematic in new location.
Rise in precipitation	No noticeable impact expected	✓			✓			Low-to-nil	None at Bakau.	Good surface drainage.
Fall in precipitation	No noticeable impact expected	✓				✓		Low-to-nil	None at Bakau.	Multi-redundant water supply system, including sanitary seawater.
2. Brufut										
Rise in sea level	Loss of beach area.		✓				✓	Low	No sustainable solution that is not prohibitively expensive. Canoes will beach over a wider area	None recommended.
Rise in extreme Wind speeds	Damage to structures, roofs and traditional fish drying and smoking equipment.			✓	✓			High	All shore infrastructure must be wind-proofed, especially roofs and drying racks.	Re-design and re-construct buildings and drying racks to resist extreme wind speeds.
Rise in extreme Wave heights	May impact canoe mooring offshore.	✓			✓			Low	No sustainable solution that is not prohibitively expensive. Canoes will moor further offshore.	None recommended.
Rise in precipitation	Erosion along internal road, damage to traditional fish drying racks and loss of product.		✓		✓			Medium	Paving of main access road, good drainage, and shift to solar driers.	Paving of main access road, good drainage, and shift to solar driers.
Fall in precipitation	May impact water supply borewells.			✓		✓		Medium	Multi-redundant water supply including seawater, rainwater harvesting and storage.	Multi-redundant water supply including seawater, rainwater harvesting and storage.

INFRASTRUCTURE VULNERABILITY TABLES

<i>Climate change parameters</i>	<i>Type of Expected Impact on the infrastructure</i>	<i>Perceived Importance of Potential Impact</i>			<i>Duration of Impact</i>			<i>Overall Significance</i>	<i>Mitigation Measures</i>	<i>Proposed climate change proofing measures</i>
3. Tanji		<i>Low to nil</i>	<i>Moderate</i>	<i>High</i>	<i>Very Short intermittent</i>	<i>Medium</i>	<i>Long permanent</i>			
Rise in sea level	Loss of beach area, inundation/deterioration of existing structures, loss of equipment.			✓			✓	High	Lack of land inland of the eroding beach landing is unavailable. Landing needs to be relocated.	Move some of the fish landing and shore based infrastructure to Sanyang.
Rise in extreme Wind speeds	Damage to structures, tin roofs and drying racks.			✓	✓			High	Windproof all structures.	All buildings designed for extreme wind speeds.
Rise in extreme Wave heights	Erosion of coastline, damage to buildings and fish drying racks at the waterline.			✓	✓			High	None at Tanji.	None recommended.
Rise in precipitation	No noticeable impact expected except potential loss of dry product.	✓			✓			Low-to-nil	Waterproof all structures.	All buildings designed for extended precipitation.
Fall in precipitation	No noticeable impact expected as site is on mains.	✓				✓		Low-to-nil	Multi-redundant water supply including seawater, rainwater harvesting and storage.	Multi-redundant water supply system, including sanitary seawater.
4. Sanyang										
Rise in sea level	Loss of beach area.		✓				✓	Low	No sustainable solution that is not prohibitively expensive. Canoes will beach over a wider area	None recommended.
Rise in extreme Wind speeds	Damage to structures, roofs and fish drying and smoking equipment and loss of product.			✓	✓			High	Windproof all structures.	All buildings designed for extreme wind speeds.
Rise in extreme Wave heights	May impact canoe mooring offshore.	✓			✓			Low	No sustainable solution that is not prohibitively expensive. Canoes will moor further offshore.	None recommended.
Rise in precipitation	Erosion along internal road, damage to fish drying equipment and loss of product.		✓		✓			Medium	Waterproof all structures.	All buildings designed for extended precipitation.
Fall in precipitation	May impact water supply borewells.			✓		✓		Medium	Multi-redundant water supply including seawater, rainwater harvesting and storage.	Multi-redundant water supply including seawater, rainwater harvesting and storage.

INFRASTRUCTURE VULNERABILITY TABLES

<i>Climate change parameters</i>	<i>Type of Expected Impact on the infrastructure</i>	<i>Perceived Importance of Potential Impact</i>			<i>Duration of Impact</i>			<i>Overall Significance</i>	<i>Mitigation Measures</i>	<i>Proposed climate change proofing measures</i>
5. Gunjur		<i>Low to nil</i>	<i>Moderate</i>	<i>High</i>	<i>Very Short intermittent</i>	<i>Medium</i>	<i>Long permanent</i>			
Rise in sea level	Loss of beach area, inundation/deterioration of existing structures, increase in corrosion rates, loss of equipment.	✓					✓	Low-to-nil	None at Gunjur.	Actual landing far from long beach
Rise in extreme Wind speeds	Damage to structures, roofs and equipment.	✓			✓			Low-to-nil	None at Gunjur.	Actual landing far from beach. Existing buildings are new and already perform well
Rise in extreme Wave heights	Erosion of coastline, damage to canoes,		✓		✓			Low-to-nil	None at Gunjur.	Actual landing far from beach
Rise in precipitation	No noticeable impact expected	✓			✓			Low-to-nil	None at Gunjur.	Existing buildings are new and already perform well
Fall in precipitation	May impact water supply borewells.		✓			✓		Medium	None at Gunjur.	Existing buildings are new and already perform well
6. Kartong										
Rise in sea level	Loss of beach area along the river bank.			✓			✓	High	Level of platform raised and edge reinforced. Floating pontoon installed.	The landing area level raised and contained inside a retaining kerb. A floating pontoon installed to form a proper jetty.
Rise in extreme Wind speeds	Damage to structures, roofs and fish drying and smoking equipment and loss of product.		✓		✓			Low	None recommended.	None recommended. All buildings are in masonry.
Rise in extreme Wave heights	May impact canoe mooring offshore.	✓			✓			Low	None recommended.	None recommended.
Rise in precipitation	Flooding and increased flow along river bank.			✓	✓			High	Level of road raised and edge reinforced. Floating pontoon installed.	The landing area level raised and contained inside a retaining kerb. A floating pontoon installed at current dilapidated jetty.
Fall in precipitation	River bank may recede out into river. Rise in salinity may impact water supply borewells.		✓			✓	✓	Medium	Multi-redundant water supply , rainwater harvesting and storage. New borewell.	Multi-redundant water supply including, rainwater harvesting and storage..New borewell

INFRASTRUCTURE VULNERABILITY TABLES

<i>Climate change parameters</i>	<i>Type of Expected Impact on the infrastructure</i>	<i>Perceived Importance of Potential Impact</i>			<i>Duration of Impact</i>			<i>Overall Significance</i>	<i>Mitigation Measures</i>	<i>Proposed climate change proofing measures</i>
7. Bintang		<i>Low to nil</i>	<i>Moderate</i>	<i>High</i>	<i>Very Short intermittent</i>	<i>Medium</i>	<i>Long permanent</i>	<i>Low to nil</i>		
Rise in sea level	Loss of beach area along the river bank may not be so pronounced.			✓			✓	Low	None recommended.	None recommended.
Rise in extreme Wind speeds	Damage to structures, roofs and fish drying and smoking equipment and loss of product.			✓	✓			Low	None recommended.	None recommended. All buildings are in masonry.
Rise in extreme Wave heights	May impact canoe mooring offshore.			✓	✓			Low	None recommended.	None recommended.
Rise in precipitation	Flooding and increased flow along river bank.		✓		✓			High	Level of road raised and edge reinforced.	The landing area level raised and contained inside a retaining kerb. A floating pontoon installed at current dilapidated jetty.
Fall in precipitation	River bank may recede out into river. Rise in salinity may impact water supply borewells.		✓			✓		High	Multi-redundant water supply , rainwater harvesting and storage.	Multi-redundant water supply including, rainwater harvesting and storage.

5. ISSUES

In the course of the site visits, the following issues have been identified that need to be tackled at both the local level as well as at Government level:

- The illegal and unsustainable sand mining from the beaches for the construction industry is depleting the sand budget along the coastline;
- The lack of public land in general will seriously impact development recommendations;
- In at least one location, over-crowding has now reached saturation levels and some of the fish processing needs to be re-located elsewhere;
- The change-over from the current *banda*-type smoking ovens to the more efficient FTT ovens needs to be implemented sooner rather than later to lower PAH residue on the smoked fish.

Sand mining : With the current threat to beach stability due to climate change, the uncontrolled illegal mining of beach sand is exacerbating an already dire situation. In the event of a regional effort like the WACA project to replenish eroded coastline, all the sand being removed from the coastline needs to be replaced at a cost to the offshore environment.



Figure 11 Sand mining along the coast

Copyright *The Standard* 6 May 2020 Banjul

Public land : Apart from the Banjul jetty area, all the sites visited appear to lack enough public land where development can take place and unless tackled at Government level, this is seriously impacting any recommendations made under the project.

Over-crowding : Localities like Tanji have now reached saturation with fish drying racks practically at the water's edge. Perhaps some thought has to be given to relocating people to a more serene and less stressful environment like Sanyang. Hence, depending on how much needs to be relocated (fish processing only or fish processing and dwellings) a Relocation Action Plan needs to be drawn up.

FTT ovens : Polycyclic aromatic hydrocarbons (PAHs) are an important group of compounds of major environmental concern. PAHs are found in food as a result of food processing techniques like curing, drying, smoking, roasting, grilling, barbecuing and refining. These food processing steps are known to generate and increase the level of PAHs in the food. One significant food source of PAHs is smoked fish. According to the Code of practice for the reduction of contamination of food with polycyclic aromatic hydrocarbons (PAH) from smoking and direct drying processes (CAC / RCP 68-2009) of the Codex Alimentarius (CAC/RCP 68-2009), the formation of PAHs during smoking and direct drying depends on a number of variables, including:

- smoking or drying method (direct or indirect);
- smoke generation process;
- the distance between the food and the heat source;
- position of the food in relation to the heat source;
- fat content of the food and what happens to it during processing;
- duration of smoking and direct drying;
- temperature during smoking and direct drying;
- cleanliness and maintenance of equipment;
- design of the smoking chamber.

The need for better control of these factors has prompted the development of the FAO Thiaroye Processing Technique (FTT-Thiaroye), to ensure that processing operations first comply with food safety requirements, and that they also may be carried out regardless of weather conditions.

6. RISKS

The following risks have been identified as potential threats to the success or outcome of the proposed recommendations:

1. Continuation of the uncontrolled sand mining from the beaches;
2. Continued fabrication of the metallic components of the FTT ovens in cheap steel by unqualified metal workers;
3. Failure in the organisational set-up at village level (CFC) to exploit the new equipment (ovens and driers) to its full use.

The sand mining issue needs central planning by Government to identify land-based deposits which can be better exploited without the long-term consequences associated with coastal erosion.

The metallic parts in the FTT ovens need proper specifications as to the type of steel (food grade stainless steel), minimum thickness of the components and standard of the welding in the made-up components. The parts must be fabricated in a controlled workshop environment employing qualified welders.

The different CFCs have different sources of income, ranging from a simple landing fee to a long list of activities that generate revenues. The majority of the CFCs charge fees for the use of smoke houses, ovens, drying racks, gear storage boxes and canteens. The risk of charging high fees for the new smoking (FTT) and drying (CEAS) equipment will limit their use. The proposed specifications for the new equipment will ensure a much longer useful working life and hence fees should be commensurate with the actual depreciation period.

7. FOLLOW-UP AND TRAINING

Once the new infrastructure has been installed, the existing CFCs will need training to bring them up to speed with the new technologies and all matters relating to its maintenance, amortisation as well as sanitary fish handling and processing guidelines.

Business Planning : The individual CFC structures at beach landings need to be assessed for their basic accounting structures, assets, liabilities and member ownership. From this assessment, business plans need to be reviewed and strengthened were necessary. Particular attention should be given to the rates of amortisation of the newly installed equipment, taking into consideration the longer useful life of the equipment installed under the project. The practise of charging very high rental rates without due consideration to the real depreciation rate of the new ovens is a serious risk to the success of the project.

Operations Manual : The CFC structure to be installed in Banjul to run the floating jetties, ice plant, chill stores, workshops and slipway and other shore infrastructure will need a far more comprehensive business plan than those for the beach landings. A harbourmaster needs to be appointed to run the facility as a whole and specific training is required. The harbourmaster, who should have some nautical experience, will need additional training in:

- compliance with the laws, regulations and other environmental directives governing the fisheries sector (over-fishing legislation, sizes of nets, closed seasons, etc.);
- compliance with the regulations for the use of the facility (landing fees, bulk handling charges, sale of potable water, etc.);
- compliance with environmental conservation measures adopted by the environment planning authorities (waste recycling, spent-oil recovery, wet wastes disposal, etc.);
- compliance with food safety and hygiene requirements, especially for water and ice;
- integration with other users as in the case of a non-exclusive facility for fishing vessels (floating jetties may double as a landing stage for other commodities moving up-river, including tourist canoes);
- transparency in the decision-making process (to prevent private interests from taking over the facility through unfair practices);
- Basic maintenance schedules for the pontoons and the buildings;
- Implementing Health and Safety regulations among the workforce running the facility.

The full port operations manual (POM) for Banjul cannot be developed before the shore infrastructure is installed and running. The operations manual for the beach landing sites, on the other hand, may be developed along the lines of the CFC structure with the added emphasis on maintenance, personal hygiene and fish processing and handling.

Training : Once the CFC business structures have been strengthened and brought up-to-date, the following training should be imparted on a national scale:

- Fish processing (drying and smoking) using the new equipment;
- Food handling and personal hygiene;
- Basic maintenance of solar ovens and smoking ovens.

ANNEX 1 – DATA SHEETS

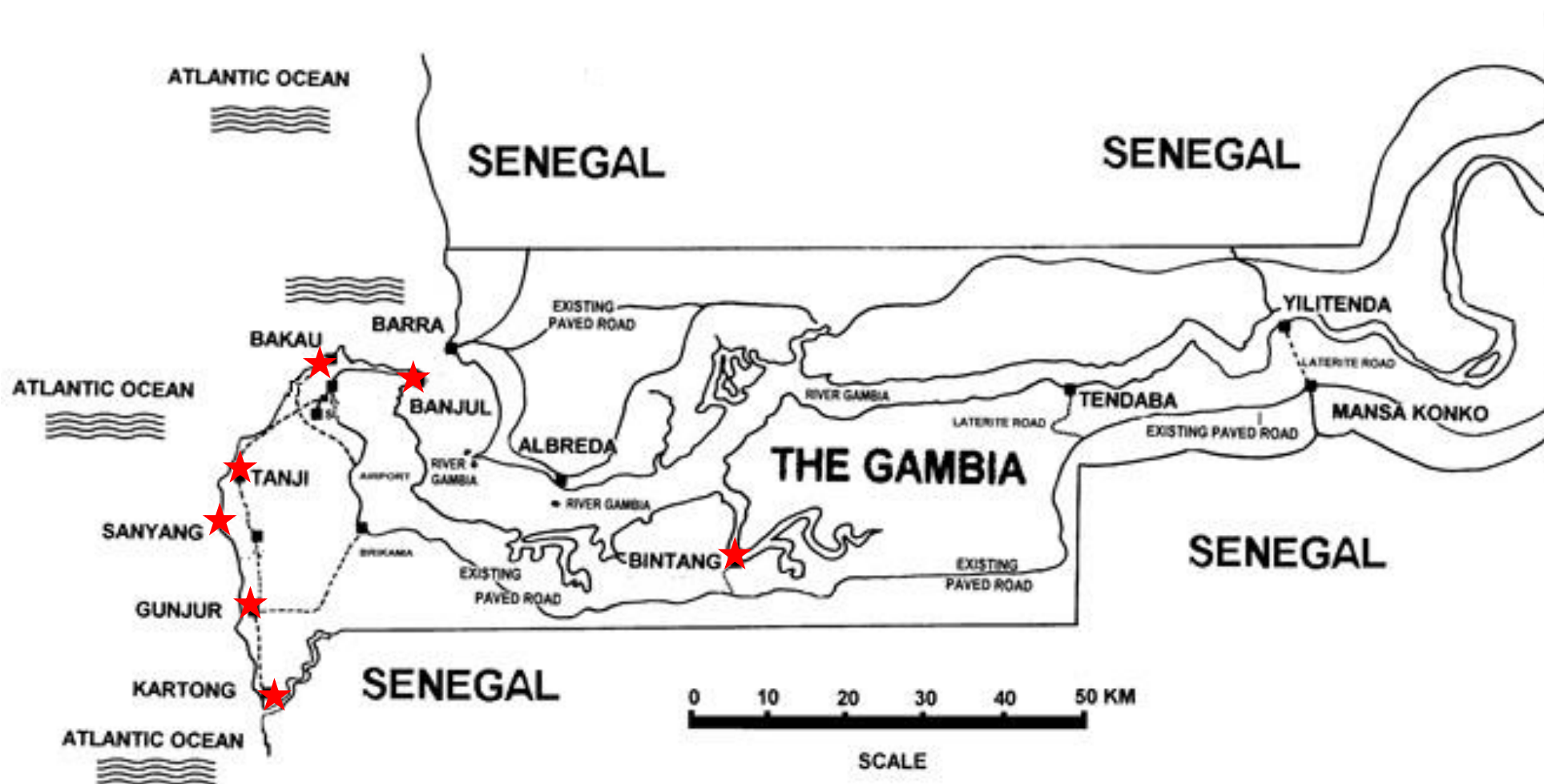


Figure 1 - Location Plan of project sites

DATA SHEET No 1

PARTIAL RELOCATION OF FISHING VESSELS FROM BAKAU TO BANJUL SITE : BANJUL JETTY

ESTIMATED OUTLINE COST

U\$ 3,054,100

ITEM	DESCRIPTION	ESTIMATED COST U\$
Mobilisation & Dredging	ESIA, EMP, Design and bidding documents, mobilisation and dredging.	758,000
Piling works area D	Piling of all pontoon guides and shore access	72,790
Floating pontoons area D	4 No x 50m long floating pontoons and dredging	1,001,060
Buildings	CFC office, gear stores, workshops, net mending, chill store and ice plant	555,000
Liquid Waste handling	Liquid waste treatment in areas A & B	74,750
Equipment and ancillaries	Sub-station, winch, ice plant, chillers, ice store, PV panels and fish handling	442,500
Contingencies		150,000

INFRASTRUCTURE TABLE



Figure 2–The existing Banjul floating jetty

PROPOSED INVESTMENTS

AREA A Equipped with small boat yard for large canoes, including slipway with winch, engine workshop, a 20 Ton ice machine, a 50/100 Ton chill store and net mending runways.

AREA B Gear stores to include 1 communal structure plus 20 individual gear stores of 4 m² each.

AREA D Additional 4 floating pontoons, 50 m long, including dredging to -2.0m below LAT.



Figure 3–Timber deck on existing jetty requiring maintenance



Figure 4 Area A behind the Port Authority building to be equipped as a boatyard with workshop and ice plant and cool store

DATA SHEET No 2

CLIMATE CHANGE MITIGATION MEASURES

SITE : BRUFUT LANDING SITE

ESTIMATED OUTLINE COST

U\$ 672,500

ITEM	DESCRIPTION	ESTIMATED COST U\$
Fish smoking sheds	3 smoking sheds with FTT ovens and fish gutting and rinsing stations	333,879
Fish drying platform	Concrete slab with 30 CEAS solar ovens	216,190
Sea water fish rinsing	Borewell, storage tank, header tank and structure, solar panels and pumps	87,365
Contingencies	Wet waste handling and drains	35,566

INFRASTRUCTURE TABLE



Figure 5–The existing layout at Brufut

PROPOSED INVESTMENTS

AREA A Existing sheds demolished and re-constructed to house new ovens.

AREA B Cleared, levelled and paved to be equipped with CEAS type solar driers

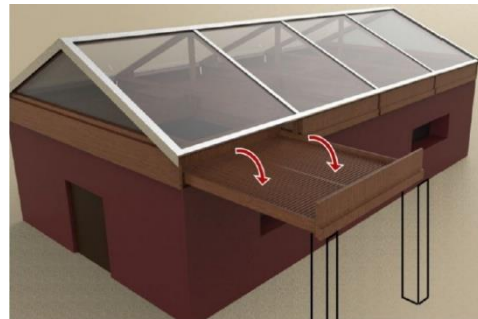
In between building A and building B, a fish rinsing and gutting station will be installed to run on seawater from a solar-powered borehole.



Figure 6–Bright and airy smoke house – Oven type TTF



FTT oven



CEAS Kiraye type solar drier



Solar powered seawater borehole for fish rinsing

Figure 7–Proposed equipment

DATA SHEET No 3

CLIMATE CHANGE MITIGATION MEASURES SITE :TANJI LANDING SITE

ESTIMATED OUTLINE COST

U\$ 672,500

ITEM	ACTIVITY	ESTIMATED COST U\$
Fish smoking sheds	3 smoking sheds with FTT ovens and fish gutting and rinsing stations	333,879
Fish drying platform	Concrete slab with 30 CEAS solar ovens	216,190
Sea water fish rinsing	Borewell, storage tank, header tank and structure, solar panels and pumps	87,365
Contingencies	Wet waste handling and drains	35,566

INFRASTRUCTURE TABLE

PROPOSED INVESTMENTS



AREA C – This area is the most exposed to climate change in that it is used for drying and smoking. Its proximity to the waterline renders it very vulnerable to any noticeable change in weather conditions and all operations should be moved to areas A and B.

AREA A Levelled and paved for solar driers.

AREA B Buildings for smoking ovens.

Figure 8–The existing landing at Tanji



Figure 9–The crowded environment down by the water’s edge



Figure 10–Proposed solar oven drying field at A (*left*) and airy and bright smoking building at B (*right*)

DATA SHEET No 4

CLIMATE CHANGE MITIGATION MEASURES SITE :SANYANG LANDING SITE

ESTIMATED OUTLINE COST

U\$ 526,020

ITEM	ACTIVITY	ESTIMATED COST U\$
Fish drying platform	Concrete slab with 60 CEAS solar ovens	413,660
Sea water fish rinsing	Borewell, storage tank, header tank and structure, solar panels and pumps	87,360
Contingencies	Wet waste handling, drains, contingencies	25,000

INFRASTRUCTURE TABLE



PROPOSED INVESTMENTS

Existing smoke houses using banda ovens.

AREA A Possible site for new driers.

AREA B Exposed drying racks in Area B moved to Area A and equipped with CEAS solar driers.

Figure 11–The existing situation at Sanyang



Figure 12–The existing smoke houses in Area A



Figure 13–Proposed new smoke houses using new ovens (FTT)

DATA SHEET No 5

CLIMATE CHANGE MITIGATION MEASURES

SITE :GUNJUR LANDING SITE

ESTIMATED OUTLINE COST

U\$ 50,000

ITEM	ACTIVITY	ESTIMATED COST U\$
Upgrade of FTT ovens	Replace all metallic parts with new material components	50,000

NO GOOGLE MAP OF
CURRENT SITUATION
AVAILABLE

Figure 14–The existing situation at Gunjur



Figure 15–The newly constructed smoke house at Gunjur



Figure 16–FTT ovens of artisanal construction – Very poor materials and standard of fabrication

DATA SHEET No 6

CLIMATE CHANGE MITIGATION MEASURES

SITE :KARTONG LANDING SITE

ESTIMATED OUTLINE COST

U\$ 1,286,900

ITEM	ACTIVITY	ESTIMATED COST U\$
Mobilisation	ESIA, EMP, Design and bidding documents, mobilisation.	170,000
Piling works	Piling of all pontoon guides and shore access	47,060
Floating pontoons	2 No x 10m long floating pontoons	119,250
Raising level of platform		409,560
Fish drying platform	Concrete slab with 30 CEAS solar ovens	306,190
Fish smoking sheds	2 smoking sheds with FTT ovens and fish gutting and rinsing stations	197,055
Sea water fish rinsing	Borewell, storage tank, header tank and structure, solar panels and pumps	87,360
Contingencies	Wet waste handling, drains, contingencies	25,000

INFRASTRUCTURE TABLE

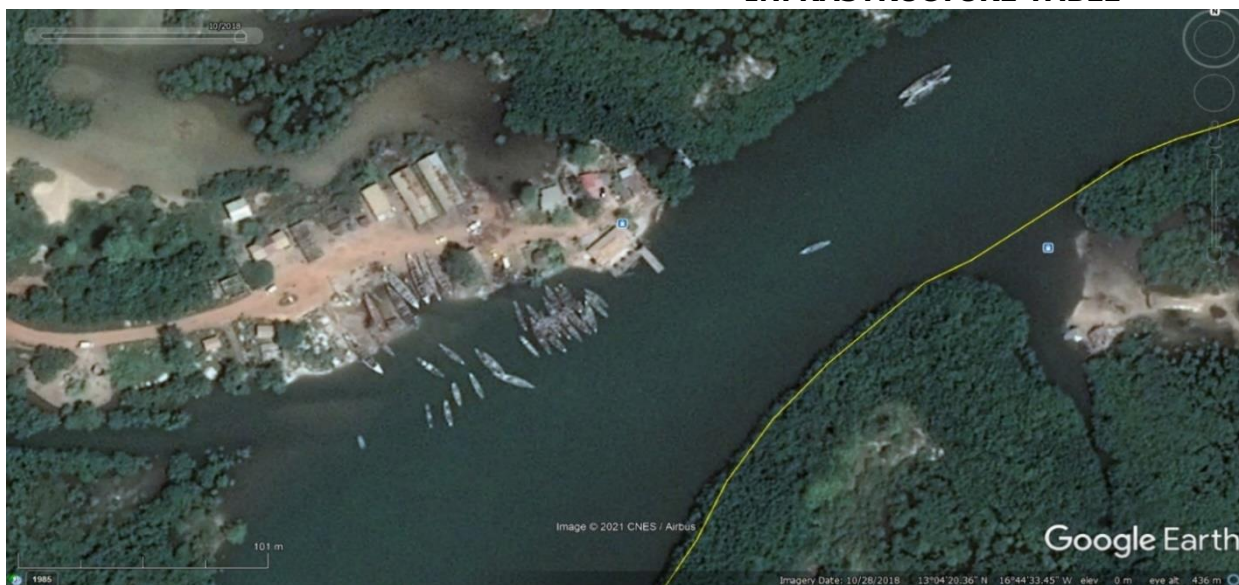


Figure 17–The existing situation at Kartong

PROPOSED INVESTMENTS

Raise the level around the work area as required to avoid flooding.

Install a 20m long floating jetty and a solar-powered borewell with a water storage tank.

Build 2 new smoke houses and 1 drying platform.



Figure 18–The canoe landing area (left) and the fish gutting process without running water to rinse fish



Figure 19–Traditional fish drying racks and banda smoke ovens

DATA SHEET No 7

CLIMATE CHANGE MITIGATION MEASURES

SITE : BINTANG LANDING SITE

ESTIMATED OUTLINE COST

U\$ 777,560

ITEM	ACTIVITY	ESTIMATED COST U\$
Mobilisation	ESIA, EMP, Design and bidding documents, mobilisation.	160,000
Piling works	Piling of all pontoon guides and shore access	57,060
Floating pontoons	2 No x 10m long floating pontoons	119,250
Raising road level & rehab	Retaining wall and backfill and paving, water supply borewell, maintenance	411,250
Contingencies	Rehabilitation of existing masonry structures.	30,000

INFRASTRUCTURE TABLE



Figure 20–The existing situation at Bintang

PROPOSED INVESTMENTS

Train root of existing dilapidated jetty and raise ground level as required.

Install a 20m long floating jetty and a solar-powered borewell with a water storage tank.

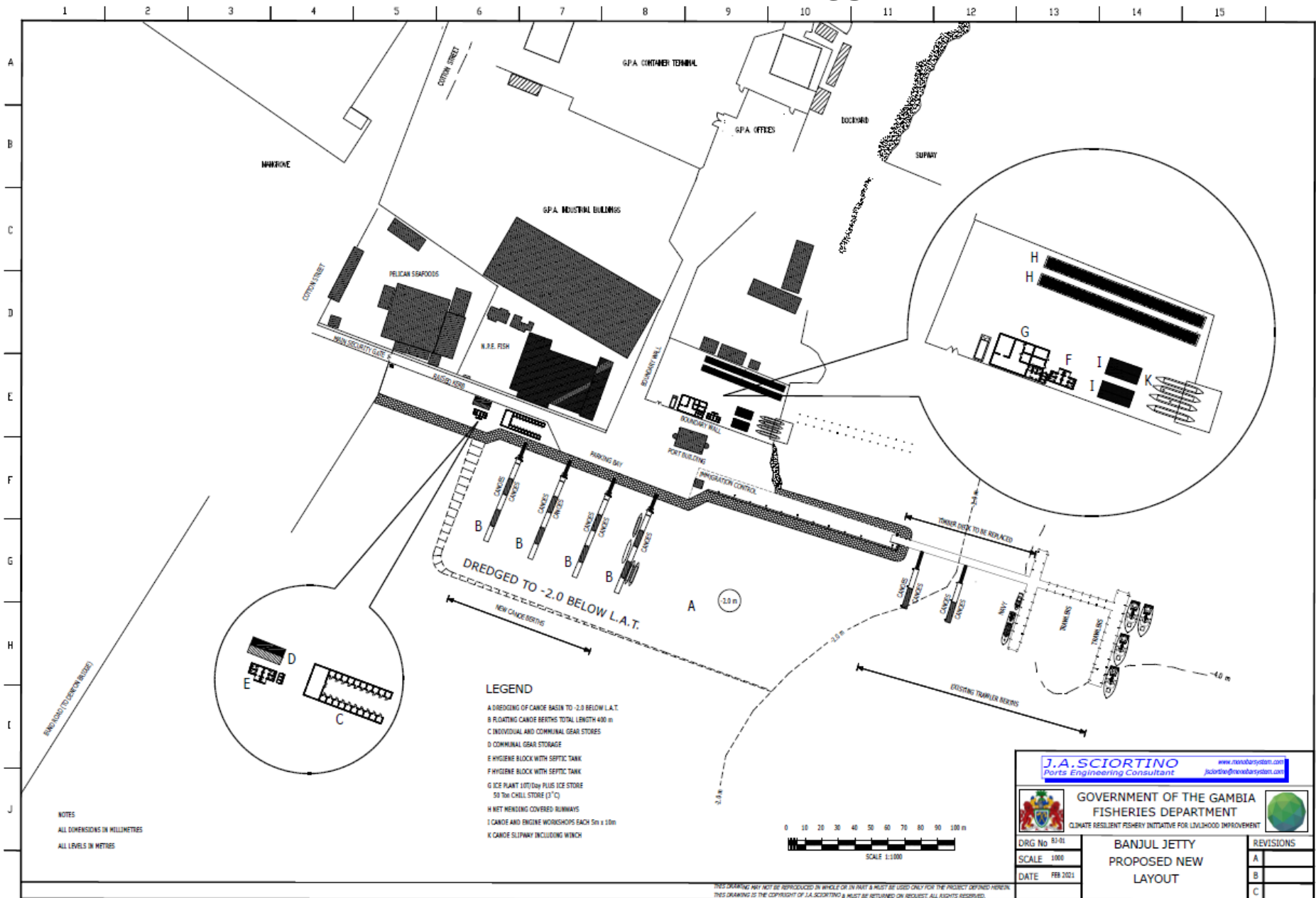
Rehabilitation of existing gear stores.

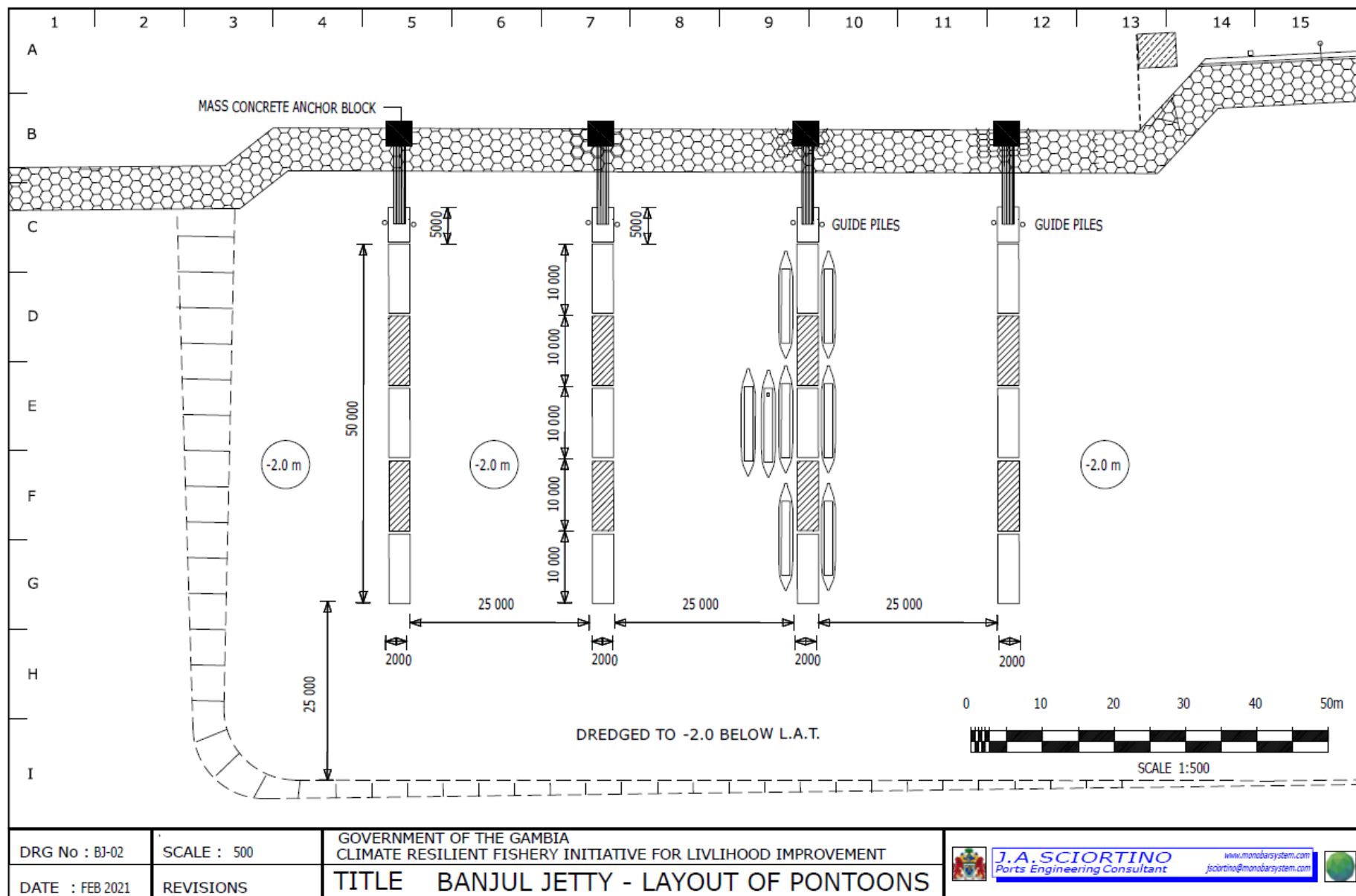


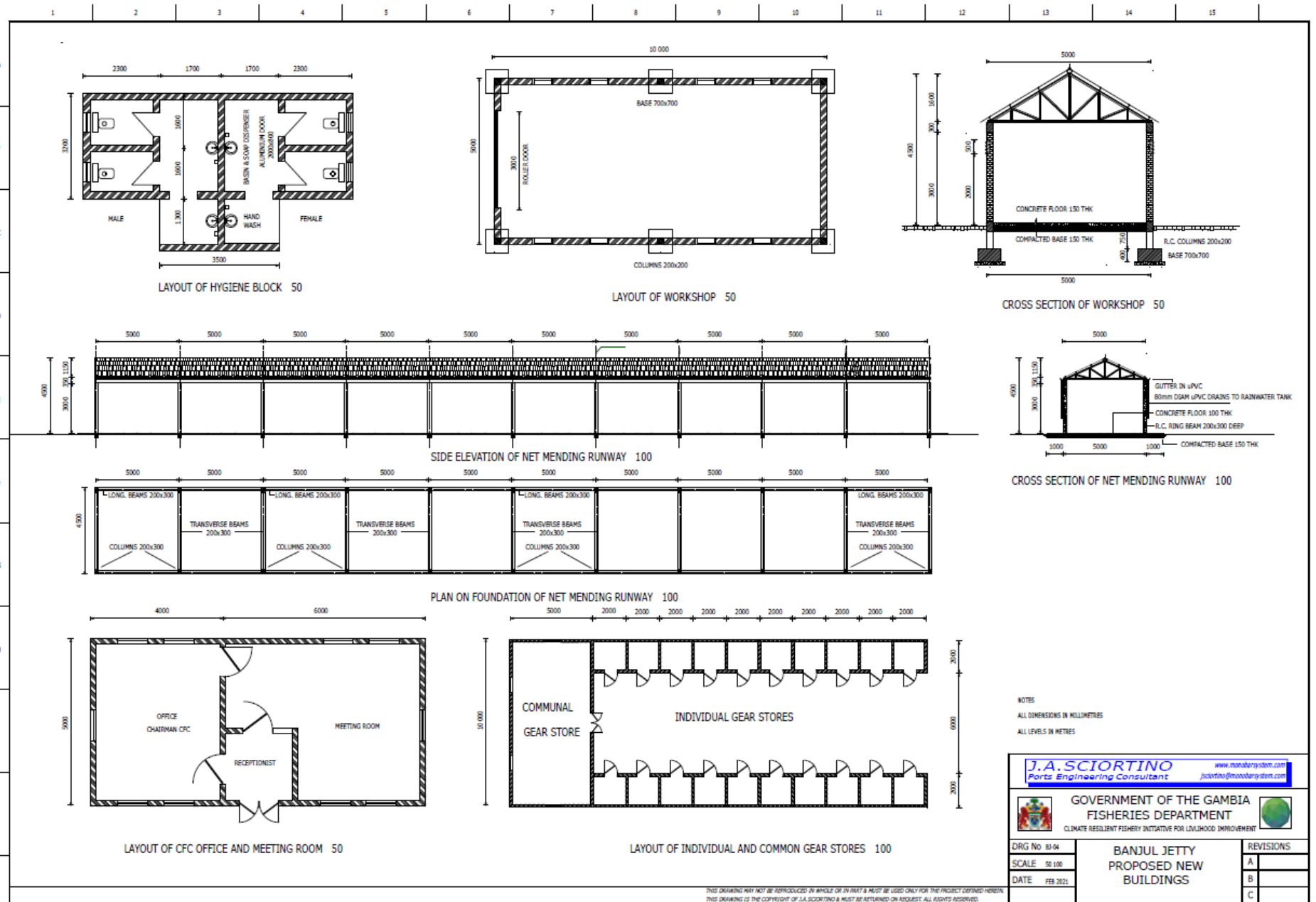
Figure 21–View of level of river bank (*left*) – Existing jetty piles removed (*right*) and replaced with floating pontoon

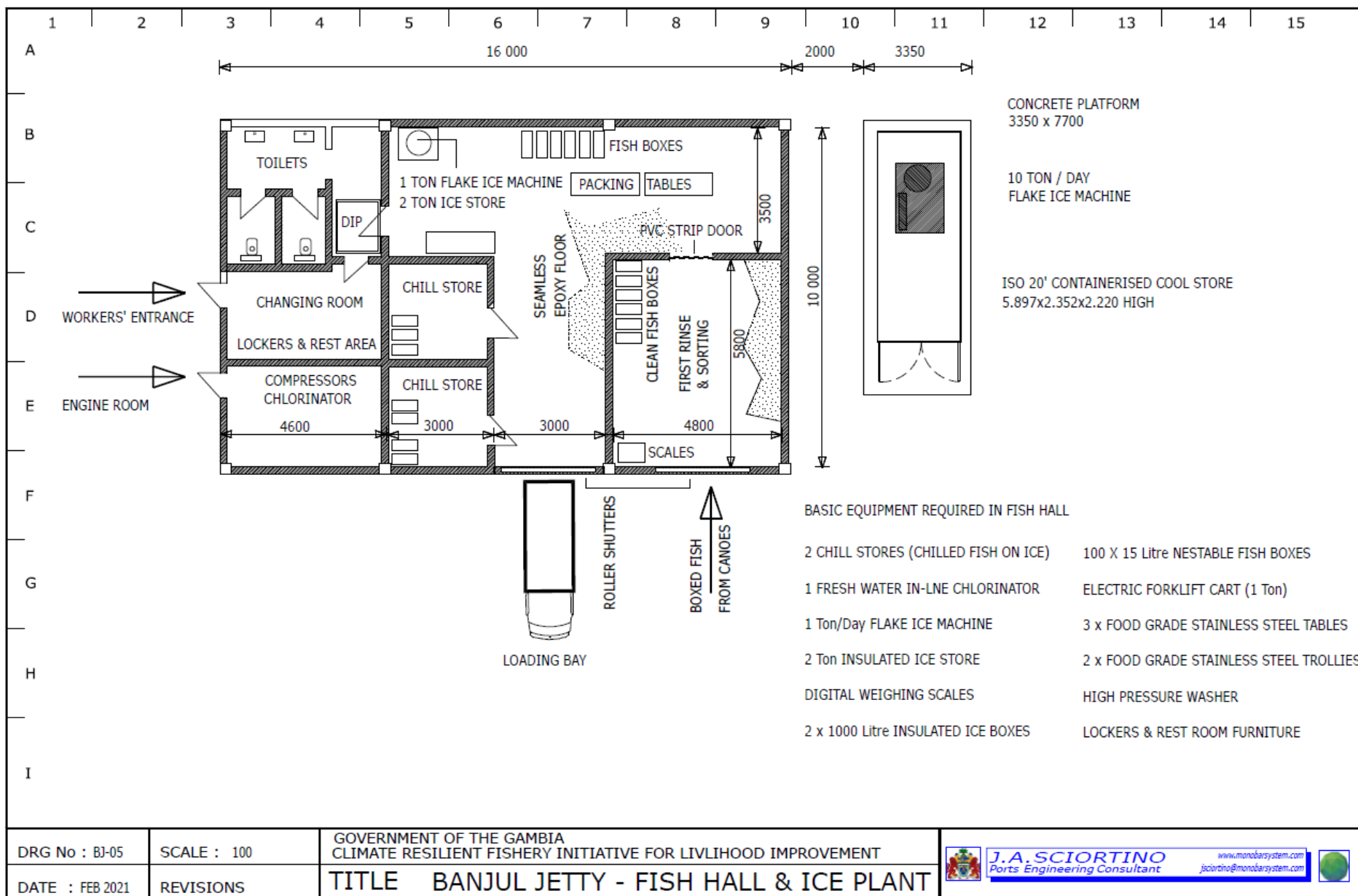


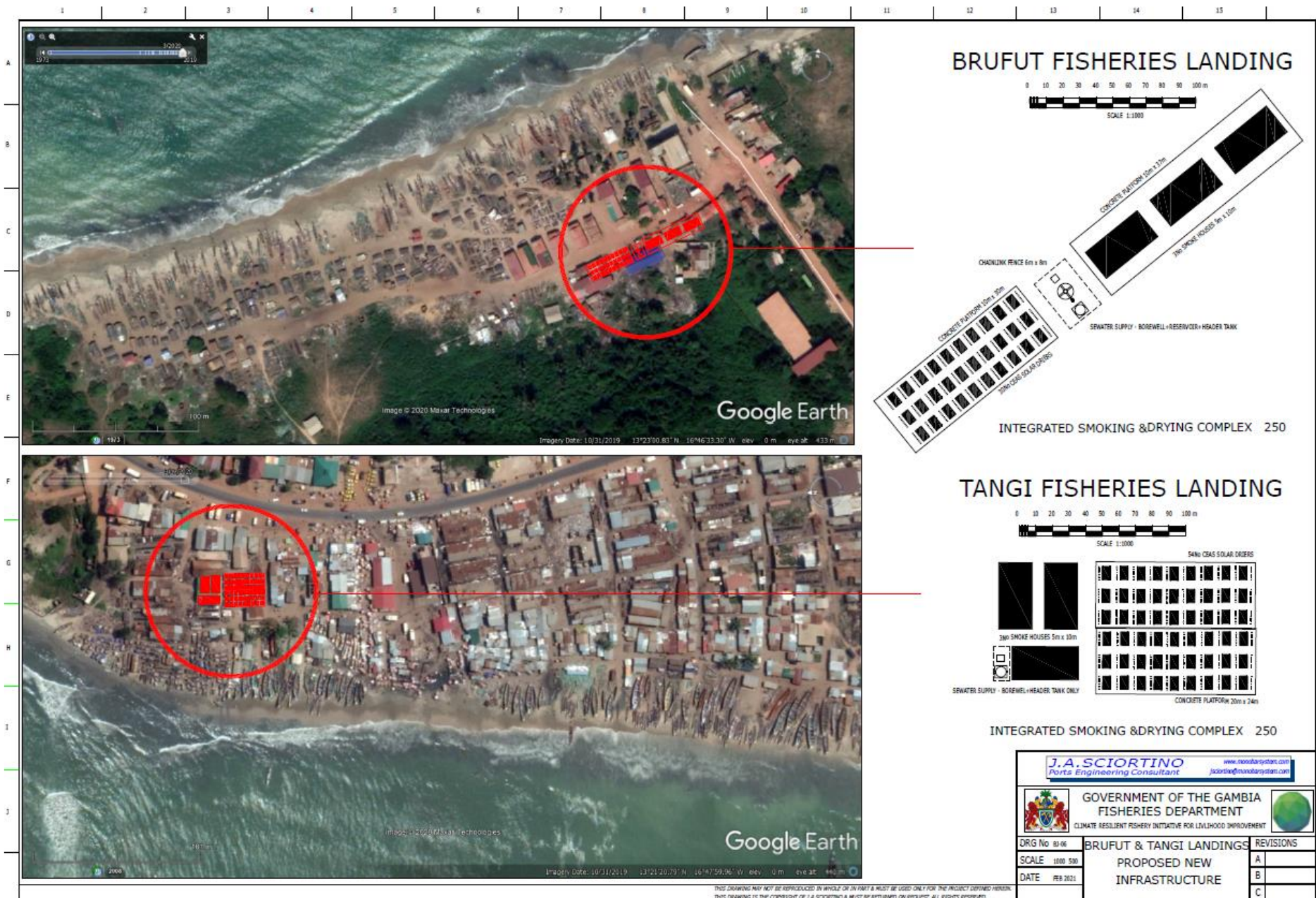
ANNEX 2 – DRAWINGS

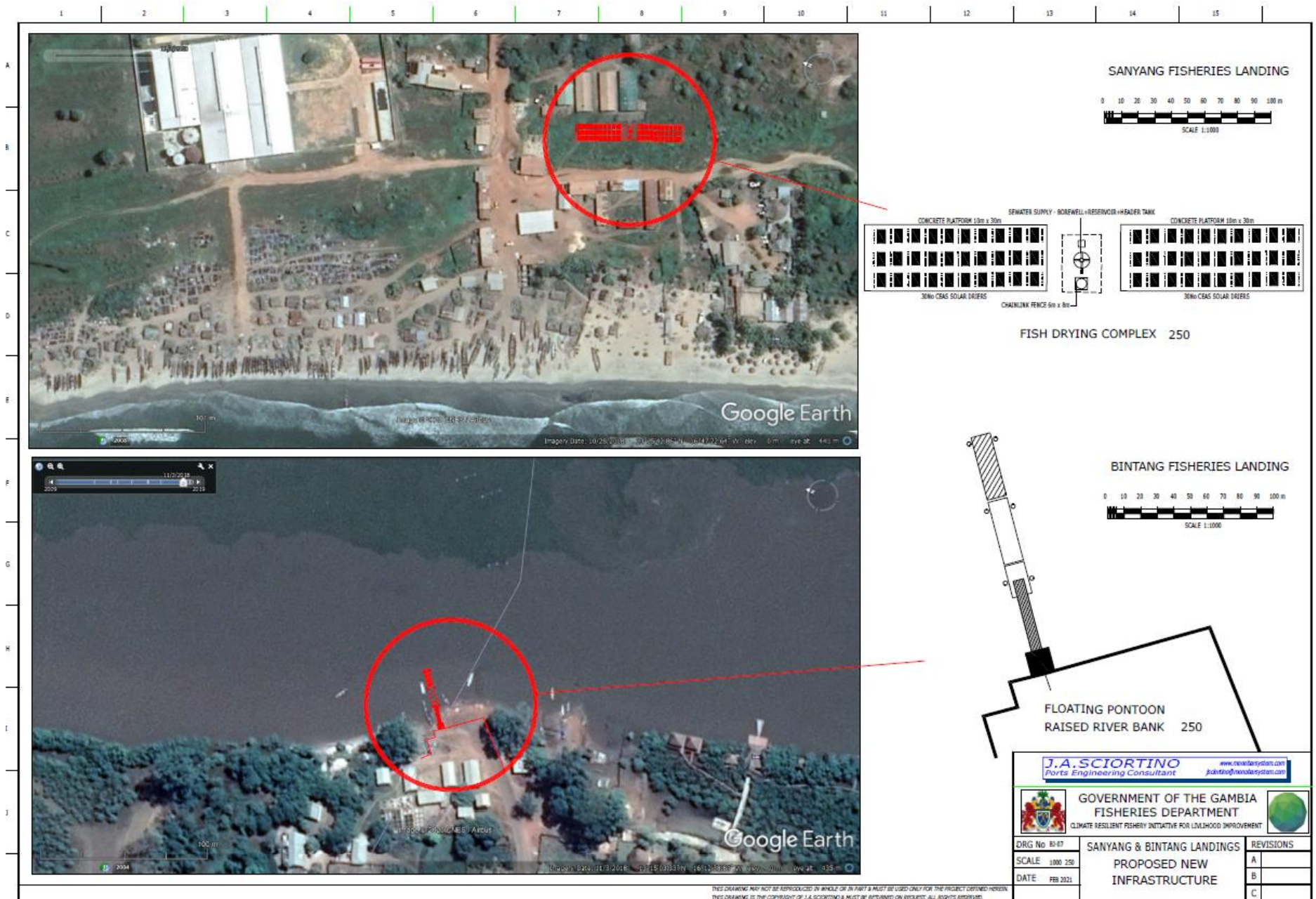






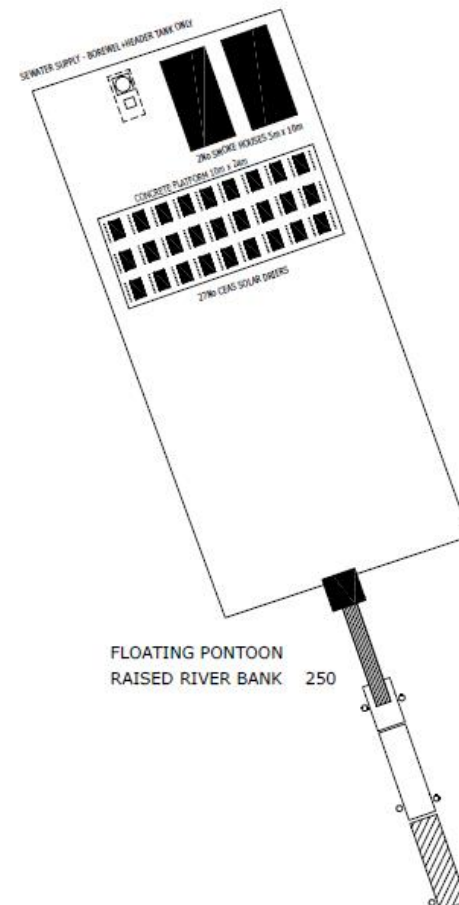
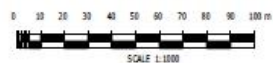








KARTONG FISHERIES LANDING



J.A.SCIORTINO
Ports Engineering Consultant

www.mackdesign.com
jasciortino@mackdesign.com



GOVERNMENT OF THE GAMBIA
FISHERIES DEPARTMENT
CLIMATE RESILIENT FISHERY INITIATIVE FOR LIVELIHOOD IMPROVEMENT

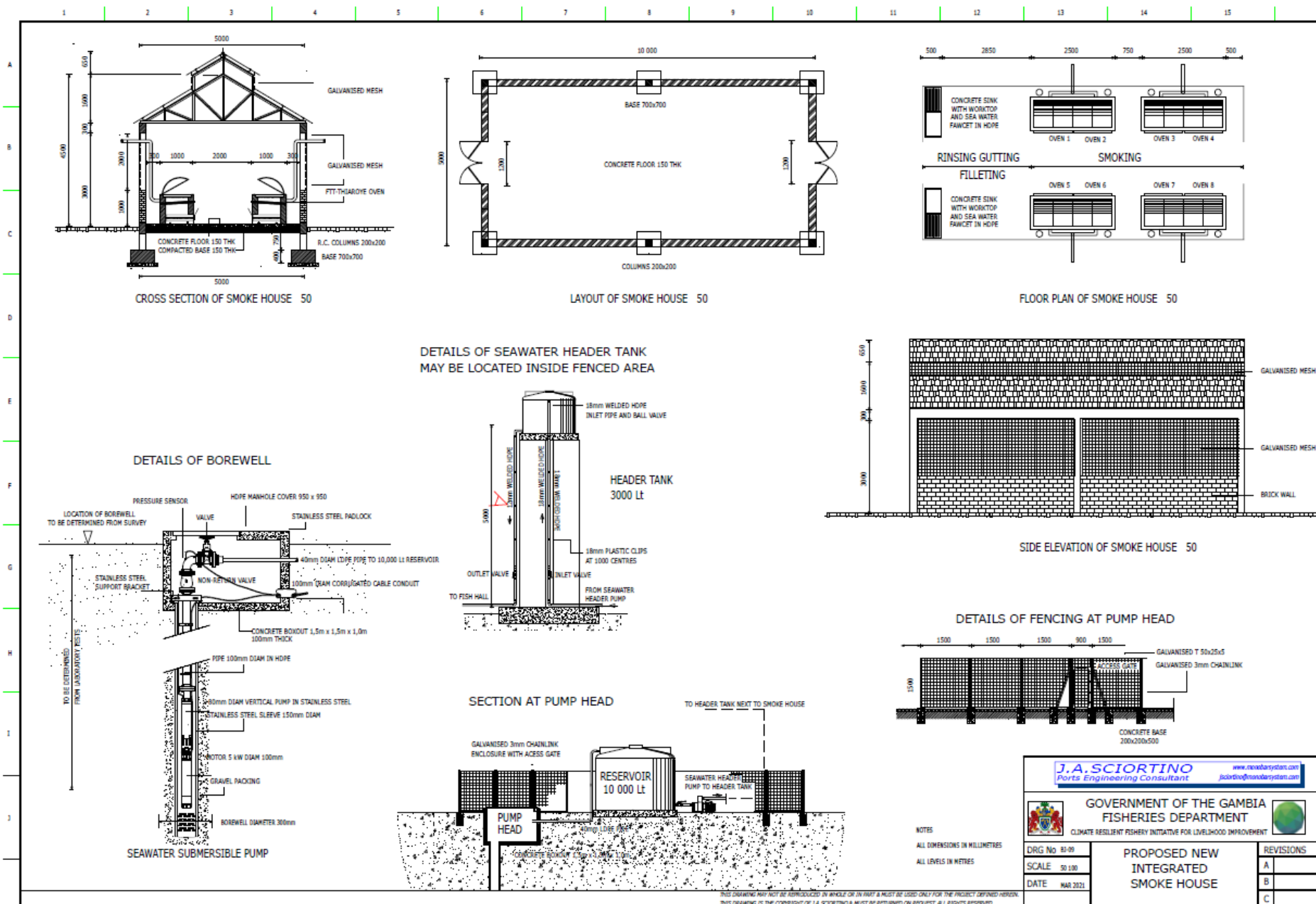


DRG No: RI-08
SCALE: 1:1000 250
DATE: MAR 2021

KARTONG LANDING
PROPOSED NEW
INFRASTRUCTURE

REVISIONS	
A	
B	
C	

THIS DRAWING MAY NOT BE REPRODUCED IN WHOLE OR IN PART & MUST BE USED ONLY FOR THE PROJECT DETAILING HEREIN.
THIS DRAWING IS THE COPYRIGHT OF J.A.SCIORTINO & MUST BE RETURNED ON REQUEST. ALL RIGHTS RESERVED.



ANNEX 3 – PRELIMINARY BILLS OF QUANTITY

SUMMARY OF COSTS

	AMOUNT U\$
1 BANJUL JETTIES	3,054,100
2 BRUFUT	672,500
3 TANJI	672,500
4 SANYANG	526,020
5 GUNGUR	50,000
6 KARTONG	1,286,900
7 BINTANG	777,560
TRAINING	90,000
TOTAL	7,129,580

**SEE SEPARATE
EXCEL FILES**

Climate change and aquaculture in The Gambia – Options for investment

Introduction

At the request of the Gambian Government, FAO implemented the project entitled: *Support to enhancing the capacity of youth and women for employment in aquaculture*, under its Technical Cooperation Programme (TCP/GAM/3603) from 2016 to 2018. The project contributed to Africa's Blue Growth Initiative, whose main goal was to improve fish supply for food and nutrition through more efficient and sustainable use of aquaculture resources by training farmers, including young men and women, and encouraging them to implement innovative aquaculture production technologies.

Various attempts had been undertaken until then to develop the aquaculture sector in the country, but absorption by fish farmers or private sector was hampered by the lack of fingerlings and fish feed and the lack of technical and technological proficiency not only of potential farmers but also Government officers. The TCP project's objective was to establish a solid and functioning foundation for sustainable provision of and access to good quality fingerlings and feed, transfer of technical and technological expertise, and managerial and other skills to farmers and officers for aquaculture to effectively and sustainably develop the sector.

With the basic requirements in place, the time has come to start up production of fingerlings and fish feed to assist fish farmers producing valuable food fish for food and nutrition security. However, installations and existing fish farms may be affected by changes in climatic conditions, which may have an effect on the flow rate of the River Gambia, the salinity of the water, salt intrusion into the groundwater, fish species diversity in the river, mangrove species diversity along the river and in the estuaries, etc. In order to increase the resilience of fish farmers and aquaculture associations a number of activities have been proposed to continue producing fish and bivalves, particularly in the light of possible reductions in capture fisheries in the river, estuary and ocean. The proposed activities have been listed below, which concentrate on fish and shellfish, excluding shrimp and lobster. The experiences with shrimp culture have been negative, not only because of escapement of introduced species from the Indian Ocean, but also because of the destruction of stretches of mangrove forest for the shrimp farms. The changes in soil composition after shrimp culture are often irreversible.

Proposed project interventions:

Catfish culture in fiberglass or concrete fish tanks in vegetable gardens

Fish culture in existing rice fields

Fish culture in earthen ponds

Oyster culture in mangrove forests on artificial substrate and Clam and cockle culture on mud flats

Operationalize fish feed manufacturing units

Fish smoking using latest technology

Extension of the Jahally hatchery

Catfish culture in fiberglass or concrete fish tanks in vegetable gardens

The proposed project will integrate fish tanks in new and existing vegetable gardens as well as in gardens that will be rehabilitated. The vegetable gardens' water supply will be from boreholes that is used by farmers to water their crops. Part of the water will be used to fill circular open water

tanks of approximately 4000 liters volume, which will be filled with 3000 liters of water. A total of 500 catfish (*Clarias gariepinus*) fingerlings of 9 to 10 grams each will be stocked in the tanks. After a brief period of acclimatization, the feeding will start, three times per day and once per night. Each garden will be provided with ten tanks, 5000 fingerlings and an adequate quantity of fish feed. During the rearing period, the fish will grow in size and consume more feed, which results in increase in excrements. In order to avoid pollution of the fish tanks, the water with the natural fertilizer will be used to water and fertilize the crops. This will reduce the use of (artificial) fertilizer to be purchased by the gardens considerably. Depending on the ambient temperature, the fish will grow to 600-800 grams in six months' time, after which they can be harvested and processed. Per year two production cycles are feasible, yielding 10 (tanks) times 2 (cycles) times 700 (average weight) times 500 (fingerlings) which amounts to 7000 kg per year per garden. Based on average feed consumption in the West-African region, a quantity of 8400 kg of feed will be required in the first year of operation, which will gradually reduce with practice and experience to 7000 kg per year. The Government-owned fish hatchery in Jahally will provide the fingerlings (see below). The fish tanks will be (partly) sheltered to reduce the amount of sunlight entering the ponds as the fish in nature are bottom dwellers and shy away from sunlit areas. The majority of the Gambian citizens have smoked fish on the menu and the African catfish is an ideal fish to be smoked (see below). The proposed project aims at installing fish tanks at 30 vegetable gardens, at 15 existing ones and at 15 new ones.

Fish culture in existing rice fields

The area near and around the Jahally fish hatchery is rich in irrigated paddy fields, ideal for a combination with fish. As dykes surround the existing fields, it will be impossible to bring in excavators for the ground works. This will thus require manual labor to dig the so-called refuge canals and the small-sized fish pond where the fish may stay when water levels drop for any possible reason. The rice plants will be planted in the fields and (partly) submerged. The fish, either tilapia (*Oreochromis niloticus*) or catfish, or a combination of the two will forage among the plants and eat the insects and other possible vermin that attack the rice plants. The excrements will fertilize the paddy fields, benefiting the plants considerably. With time, the farmers will find a balance between the number of fish and the amount of fertilizers and pesticides. Experience from other parts in the world indicates that considerable savings can be made by the combination of rice and fish. Eventually the fish and rice culture will not require any chemical inputs any longer. In case the water level fluctuates and drops to very low levels, the fish will withdraw into the refuge canals and pond. The pond will be dug deeper than the refuge canals to allow for easy fish collection, when the rice is harvested. Depending on the size of the paddy fields and the fish density it will be decided to supply fish feed to accelerate fish growth. In other countries where FAO implemented rice-and-fish culture projects, it appeared that the quality of the rice was of such quality that the rice-eating birds had to be kept out of the paddies using net coverage. The nets simultaneously kept away the fish-eating birds. The selected paddy fields in the project area will be provided with nets when required. The proposed project aims at introducing integrated fish rearing in 300 ha newly developed paddy fields, benefiting 600 rice farmers, who will contribute to the reduction of the use of chemicals (fertilizers and pesticides).

Box 1 Options for livelihood support for fishermen in northeast Nigeria and unemployed youth in Ghana

Considerable efforts are currently being undertaken to support refugees and internally displaced persons (IDPs) in the Lake Chad Basin. Lake Chad is a lake severely affected by ever reducing rainfall due to climate change and its surface area is on the decrease for a considerable period. The rehabilitation of the agriculture and livestock sectors, which play an important role in the livelihoods of many households, receives much attention. Less consideration, however, appears to be given to the displaced fishermen and their families. Before the crisis there were approximately 100 000 Nigerian fishermen operating on Lake Chad. Together with their families they may number about 700 000 and thus represent nearly one-third of the total number of IDPs. These families need support through cash and food transfers, but also through livelihood support.

Many fishing families left their villages along Lake Chad during the crisis and sought shelter in Maiduguri. The displaced fishermen have few options to make a living and many engage in whatever possibilities they get. Project interventions to ameliorate this dire situation include breeding of catfish, which already are part of many people's diets, especially in smoked form. Catfish aquaculture can provide a source of income for displaced fishermen, reduce pressure on existing fish stocks and help improve the quality of fish sold. FAO and the Ministry responsible for fisheries have already successfully established a backyard fish culture activity in fibreglass fish tanks elsewhere in the country. Moreover, Nigeria has a well-developed fish breeding and fish-feed manufacturing industry, able to provide essential inputs. Experience with previous projects indicates that it would be relatively straightforward to implement a fish breeding project that provides tanks, fish fingerlings and feed to displaced fishermen in the northeast. Fibreglass tanks can be produced fairly quickly and on the spot, once a mould has been manufactured. A borehole may provide the necessary water resources until regular water supply is restored. Such a project would not only provide fishers with fish-related activities, but the products would also contribute to food and nutrition security, not least by improving the quality of fish. In the longer term, promoting fish breeding among the displaced fishermen would help establish this activity also when they have returned to their homes. This would reduce pressure on existing fisheries resources in the lake and provide additional household income, thus contributing to food security and resilience of households. The IDPs, through the fish farming activities, have been completely integrated into the host communities by the aquaculture-agriculture approach, growing fish and providing their hosts with the wastewater for irrigation of their crops, by which they strongly reduced their use of fertilizers.

The fish tank approach has been successfully introduced in rural Ghana where youth groups received fish tanks and starter kits which led to increased self-confidence of the youth who formed four production cooperatives, which eventually formed a fish processing union. That union produces high-quality smoked and branded catfish, vacuum packed with at least 11 months' shelf life.

Fish culture in earthen ponds

Many efforts have been made by different projects as well as private farmers to dig fishponds for fish culture. Due to the lack of quality fingerlings, juvenile fish from the river were caught and kept in the ponds. Also the absence of local quality feed did not contribute to worthwhile fish production. Many fish ponds have been abandoned or were dug at inappropriate sites where saline groundwater entered the ponds and negatively affected fish growth. The Jahally hatchery provides access to a series of well designed grow-out ponds, which serve as examples of how to manufacture fish ponds. The design will be shared with fish farmers after site selection. Depending on the landscape, soil quality and access to water farmers will be assisted to dig their ponds. If the soil will not allow for water to be retained, then so-called pond liners will be provided. Site selection is paramount in the light of possible (future) salt intrusion and thus the freshwater supply will be of importance for culture of tilapia species and catfish. Sinking boreholes may be required depending on the distance of the ponds to the main river. In total ten existing earthen ponds will be rehabilitated and 50 fishponds to be newly constructed. Fishponds will be organized in clusters of five ponds each for joint water access and economies of scale in production and marketing.

Oyster culture in mangrove forests on artificial substrate and Clam and cockle culture on mudflats

The Gambia has a strong reputation with respect to managing oyster resources. Hundreds of women oyster collectors are organized in a large group adhering to strict regulations regarding the close season for oyster collection and their sizes. However, the oyster collection has a large potential as they are not exploited everywhere. Oysters usually occur on the root systems of mangroves in the estuary and along the river. The oysters tolerate fluctuations in water level as well as in salinity level of the water. As a possible effect of climate change on the flow of the river (either more discharge into the ocean due to increased rainfall or reduced outflow because of drought) the salinity profile of the river may change, which could affect the natural distribution of oysters. In order to remain flexible the proposed project will introduce artificial substrates near the mangrove forests to collect spat fall (the gonadal products of oysters after mass spawning) and to manipulate the density of oyster larvae to achieve an optimal oyster harvest. The advantage will be that in case the environmental conditions change the substrates can be placed in other areas, where the conditions are more conducive for oyster growth. This form of non-fed aquaculture (no feed required) is obviously an interesting form of secondary production for food and nutrition security. The activities that will be undertaken will be in close collaboration with another FAO intervention to strengthen the value chain of oysters.

Women collect clams and cockles under dangerous circumstances in deep waters, without any safety gear like life jackets. The proposed project will undertake juvenile clam collection in shallow waters for "sowing" on mudflats in special clam or cockle beds. The beds will be submerged following tidal movements during which the cockles and clams feed and grow to a certain harvestable size. Women collecting these organisms will be able to continue their activities under safer conditions, while harvesting only the adult animals. The activity leads to predictable harvests as the densities of the bivalves will be controlled. As the women's group(s) have positive experiences with managing bivalve resources (oysters), the clam and cockle resources will likewise be managed rationally. The proposed project will target 40 communities in total, of which 30 in clam and cockle production and ten in oyster production.

Box 2 Oyster management by Gambian women's groups

In 2013, the Fisheries Department entered into co-management agreements with National Sole fish Committee (NASCOM) and TRY Oyster Women's Association (community-based fisheries management umbrella organizations) for the management of sole fishing within nine nautical miles from the Atlantic shoreline and oyster and cockle fishing in Tanbi Wetlands National Park respectively. These management arrangements empowered the two organizations to support the Fisheries Department in sustainable management of these resources.

With regard to the participation of women and youth in fisheries, the current Fisheries and Aquaculture Strategic Plan has recognized the role of women. It seeks to empower them in line with Gender and Women Empowerment Policy and National Youth Policy to resolve gender-based poverty by enhancing their participation in fishing, fish farming, processing and marketing. The number of women engaged in fisheries and aquaculture related activities as reported in 2016 Frame Survey report was estimated at 370 (Processors) and 397 (Shellfish actors). The participation of women in decision-making and co-management of resources in TRY are in line with the National Policy for Advancement of Gambian Women: The Gender and Women Empowerment Policy (2011-2020).

TRY is in charge of implementing the oyster and cockle co-management plan in the Tanbi Wetlands National Park. TRY is responsible for ensuring sustainable exploitation of the bivalve resources. The TRY Oyster Women's Association of The Gambia won the prestigious Equator Prize in 2013 for their implementation of the oyster management plan, which allows members to harvest oysters in a certain period of the year, without damaging their natural substrate, which is formed by the roots of the mangroves. There is much room for expansion of this environmentally friendly and socially acceptable activity.

Operationalization of fish feed manufacturing units

The above-mentioned TCP project installed two fish feed manufacturing units, which have been fully established, connected to the electricity grid and provided with water supply. The propose project will benefit from these installations by further generating youth employment in the communities to develop a fish feed value chain. Necessary ingredients are fishmeal, fish oil, rice bran, wheat bran, brewery offal, slaughterhouse offal, processed soybeans and other protein-rich components. Imported feed is costly and in order to contribute to resilience, the proposed interventions should be sustainable and therefore the production of local feed will be encouraged to reduce dependency on imported feed at high costs (including transport costs).

Fish smoking using latest technology

FAO, in close collaboration with an institute in Senegal, developed new fish-smoking technologies. During the cooking process, the fish to be smoked release body fluids and grease, which normally fall onto the hot combustibles (like charcoal). The smoke that is then produced contains toxic and carcinogenic compounds that may cause respiratory problems to the women processors (who are often looking after their children at the same time; these children are also exposed to the smoke and the harmful compounds). The improved technology prevents the liquids and fats from dripping on the charcoal or firewood. These fats and body liquids are then collected for possible other uses. The charcoal or firewood is mixed with heat-retention stones to make more efficient use of the heat source. The smoked products are of extremely high quality, look appetizing and have a longer shelf life than traditionally smoked products. The ovens are very much fuel efficient, reducing the fuelwood consumption to a large extent.

Extension of the Jahally hatchery

The assistance from FAO's TCP project resulted in an operational hatchery for the production of fingerlings commensurate with the current demand. In the light of the proposed activities in vegetable gardens and rice fields there will be an additional demand for fingerlings of tilapia and catfish. The proposed project will strengthen the hatchery further to meet the demand that will increase during the operational phase of the project. The hatchery produces fingerlings from local wild brood stock, however, to produce reared fish more efficiently, selected brood stock should be obtained for high quality offspring. In neighboring countries quality brood stock is available and contact will be made to build up a strong genetic pool for further selection and genetic improvement by cross breeding (NOT genetic modification) through selection of fast growing fingerlings. The proposed project will organize demonstration events to train fish farmers through Fish Farmer Field Schools (or Aquaculture Field Schools). FAO has prepared manuals in other African countries on how to set up such Field Schools. The technologies presented in these manuals may easily be replicated in existing and future Gambian fish farms.

TRAINING NEEDS

The proposed project will apply the latest available technologies for the implementation of the project and as such, dedicated training activities are foreseen for:

Fish tank catfish culture

- Manufacturing of fiberglass fish tanks and the necessary plumbing
- Handling of catfish fingerlings
- Rearing of catfish and determining feed quantities during production cycle
- Monitoring of fish growth and health
- Draining water for irrigation purposes
- Harvesting fish for processing

Rice-and-fish culture

- Training for mechanical and manual preparation of paddy fields
- Monitoring water level in paddy fields
- Monitoring fish growth performance and health
- Harvesting fish for marketing

Fish culture in earthen ponds

- Selecting proper sites (with respect to water supply, sloping landscape, draining, etc.)
- Compacting of soil, preparing dykes and water inlet and outlet, predator prevention
- Stocking of fish in proper densities
- Handling fingerlings and feeding
- Monitoring fish growth performance and fish sampling to determine feed quantities
- Monitoring algal growth and oxygen contents of water
- Collecting data on feed consumption, growth, mortality, temperature, etc.
- Harvesting of fish plus marketing

Oyster culture, Clam and cockle production

- Selection of areas in mangrove forest for wild oyster collection
- Selection of sites for placing artificial substrates to collect spat from oysters
- Monitoring growth performance
- Harvesting of oysters of legal size
- Handling of live oysters
- Processing of oysters in traditional way, using fuel efficient stoves

- Adding value to harvested oysters
- Marketing of oyster products
- Selecting mudflats and beaches for clam collection and rearing
- Installing the beds
- Monitoring clam growth
- Harvesting and sorting clams for marketing

Fish feed manufacturing units

- Formulating feed for tilapia and catfish culture
- Procuring ingredients for fish feed
- Operating manufacturing units
- Maintaining the units
- Producing fish feed and marketing

Fish smoking ovens

- Harvesting and cleaning fish
- Eviscerating fish
- Handling cleaned fish preparing for smoking procedures
- Smoking fish while monitoring moisture content, using fuel efficient ovens
- Handling, (vacuum) packaging and storing fish products
- Practicing smoking of other (aquatic) organisms for high-quality consumption products
- Marketing smoked products
- Forming cooperative structures
- Preparing business plans

TRAINING FACILITIES

The proposed project is envisaging the creation of resilience of fishing communities against the impact(s) of climate change. The reduction in availability (and catchability) of fisheries resources may affect large numbers of community members. The proposed project will expand the hatchery to be able to cater for the large numbers of fingerlings for the envisaged activities. The large numbers of beneficiaries to be trained require field training in the majority of the aspects of aquaculture and therefore the proposed project will expand the hatchery with a dormitory and class rooms to create a demonstration fish farm where fish farmers can upgrade their knowledge of fish culture or start to become apprentice fish farmers. The demonstration farm will contain also other facilities to make longer stays at this farm possible.

INPUTS

Fish tanks for one vegetable garden:

- Ten fish tanks @ USD 500
- Shelter for ten tanks USD 1000
- Fingerlings for ten tanks for two production cycles 10,000 @ USD 0.15
- Feed for two production cycles (700 grams fish, feed conversion ratio 1.2) 8,400 kg @ USD 1.20
- Assumption: vegetable gardens have water storage facilities

Rice-fish culture:

- Manual labor to dig refuge canals and pond USD 200 per ha
- Fish stocking: 3000 tilapia fingerlings per ha @ USD 0.15 per production cycle
- Fish stocking: 6000 catfish fingerlings per ha @ USD 0.15 per production cycle

- Fish feed for tilapia (330 grams, feed conversion ratio 1.5) 1,500 kg @ USD 1.20 per cycle
- Fish feed for catfish (500 grams, feed conversion ratio 1.2) 3,600 kg @ USD 1.20 per cycle

Oyster culture, Clam and cockle production:

- 50 units of artificial substrate for oysters (roof tiles, poles, ropes) @ USD 200
- One motorized canoe per 10 units of oyster collectors @ USD 7,500
- Harvesting materials, cutlasses, knives, containers, cooking pots, stoves, etc.
- Ten units of cockle collectors, one canoe per unit @ USD 3,000
- Cockle bed requirements, ten beds per units @ USD 100
- Spades, knives, sieves, netting material, metallic bars, containers, etc
- Safety equipment for canoes @ USD 1000

Fish culture in earthen ponds:

- Pond digging for pond of 400 m², compacting bottom and dykes @ USD 2.00
- Draining and filling pipes per pond @ USD 1,500
- Fish stocking: 3 tilapia fingerlings per m², 1200 fingerlings @ USD 0.15 per cycle
- Fish feed for tilapia (500 grams, FCR 1.5) 900 kg @ USD 1.20 per cycle

OR

- Fish stocking: 20 catfish fingerlings per m², 8000 fingerlings @ USD 0.15 per cycle
- Fish feed for catfish (700 grams, FCR 1.2) 6,720 kg @ USD 1.20 per cycle

Operationalization fish feed manufacturing units:

- Raw materials for fish feed @ USD 0.75 per kg
- Per vegetable garden per year 8,400 kg
- Rice-fish production cycle 4,500 kg
- Catfish pond per production cycle 9,600 kg
- Tilapia pond per production cycle 1,800 kg
- Electricity and water consumption @ USD 100 per month
- Two additional fish manufacturing units with extruder @ USD 60,000
- Two additional extruders for existing units at Jahally and Koloro

Improved fish smoking technology:

- Two smoking units per vegetable garden @ USD 1500
- Shelter for two units @ 2000
- Fuelwood @ USD 20 per month

Extension Jahally hatchery:

- Upscaling to cater for increased fingerling demand: USD 100,000
- Including start-up feed for fingerlings of tilapia and catfish
- Including hormones for sex conversion (female into male)
- Including *Artemia* production as live feed for fingerlings
- Constructing a dormitory and ancillary spaces for one to two weeks' training sessions
- Constructing class rooms and an office dedicated to training activities

EXIT STRATEGY

The proposed project intends to deliver institution building of Government officers, including extensionists to accompany newly trained fish farmers, feed producers, oyster and clam collectors, fish processors, as well as other aquaculture professionals. These extensionists will assist groups of man, women and youth to form small-scale and medium enterprises, fish processing unions and fish production cooperatives, not only for business plans but also for food and nutrition security and safety. These activities will be attracting private sector initiatives to take fish production further in

a sustainable way, with the possibility of exporting high quality fish products, free of toxic substances, to niche markets in Africa, Europe and North America. The aquaculture component of the project will contribute to increased resilience of fishing communities against the possible effects of climate change, as well as to sustainable use of the available resources to keep up with the same level of annual fish consumption per capita.

The proposed project will concentrate on a certain number of value chains, varying from fresh to smoked freshwater catfish, from fresh tilapia from fishponds to tilapia from rice-and-fish culture, oysters as well as fish feed and fingerlings. Fish culture from floating cages in freshwater or brackish water has not been selected as the river conditions are unpredictable at the present stage. Also, shrimp culture has been omitted for reasons of mangrove conservation and risk of escapement as has been observed in the Gambian waters at an earlier stage when exotic shrimp species ended up in a new environment, where it adjusted itself very well. That introduction was an infringement on the unique Gambian aquatic biodiversity. Recycling systems have been left out as well, as that would require stringent monitoring and a continuous supply of water and electrical energy.