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VALUE CHAIN ANALYSIS FOR DEVELOPMENT

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Fisheries value chain analysis in The Gambia

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Acronyms and abbreviations

AoP	Area of Protection
BaNafaa	Gambia-Senegal Sustainable Fisheries Project
CECAF	Fishery Committee for the Eastern Central Atlantic
CIRAD	French agricultural research and international cooperation organisation
CFCs	Community Fisheries Centres
DoF	Department of Fisheries
DRCR	Domestic Resource Cost Ratio
ECOWAS	Economic Community of West African States
EU	European Union
FAO	United Nations Food and Agriculture Organisation
FCR	Feed Conversion Ratio
FSQA	Food Safety and Quality Authority
FUI	Fuel use intensity
GAMFIDA	Gambia Artisanal Fisheries Development Association
GER	Gross Enrolment Ratio
GRT	Gross Registered Tonnage
ICCAT	International Commission for the Conservation of Atlantic Tunas
IGS	Intermediate goods and services
ILO	United Nations International Labour Organisation
IUU	Illegal, unreported and unregulated fishing
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
MCS	Monitoring control and surveillance
NAAFO	National Association of Artisanal Fisheries Operators
NASCOM	National Sole Co-Management Committee
NGO	Non-Governmental Organisation
nm	Nautical mile (1852 km)
NPC	Nominal Protection Coefficient
SFPA	EU-Gambia Sustainable Fishing Partnership Agreement
SNEEG	National Strategy for Equity and Gender Equality
SRFC	Sub-Regional Fisheries Commission
t	Tonne (1000 kg)
TAGFC	The Association of Gambian Fishing Companies
tkm	Tonne-kilometre, a unit of transportation measurement (payload-distance)
TWNP	Tanbi Wetlands National Park
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
VCA	Value Chain Analysis
VCA4D	Value Chain Analysis for Development
VGGT	Voluntary Guidelines on Responsible Governance of Tenure of Land, Fisheries and Forests
VHS	Village Health Services

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Executive summary

Context

This report provides an analysis of the fisheries value chain in The Gambia, under the "Value Chain Analysis for Development" (VCA4D) project. The assessment consisted of four analyses: functional, economic, social and environmental. All components of the analyses draw on multiple information sources, including primary and secondary data.

The Gambia's fishing sector employs 200 000 people, 76% of which are Gambian nationals. This study estimated that the average wage of Gambians working in the fishing segment was GMD 42 760 per month ranging from GMD 13 200 for fishers on board a purse seine up to GMD 87 560 for fishers on board a bottom gillnet. The Gambian fishing sector represents 6.5% of the country's GDP, with artisanal activities (fishing and processing) contributing up to 4.6%.

The Euro to Dalasi conversion rate used throughout the analyses was EUR 1 = GMD 55.

Functional analysis

Gambian fishing activities can be classified in several ways, but they are essentially either "artisanal" (i.e. small-scale) or industrial. Fishing activities and subsequent links in the value chain are closely related with landing sites. Landing sites feature a minimum infrastructure and host numerous artisanal processing facilities (i.e. smokehouses and drying racks). Hygienic conditions are appalling in landing sites and artisanal processing facilities, in addition to the current decrepit conditions of cold storage, ice production, and sewage infrastructure.

A typology of actors across the value chain was produced (Figure A), excluding aquaculture systems, as they remain to date marginal in the country, despite aquaculture development being contemplated as a priority in the national Fisheries and Aquaculture Sector Strategy 2017 – 2021.

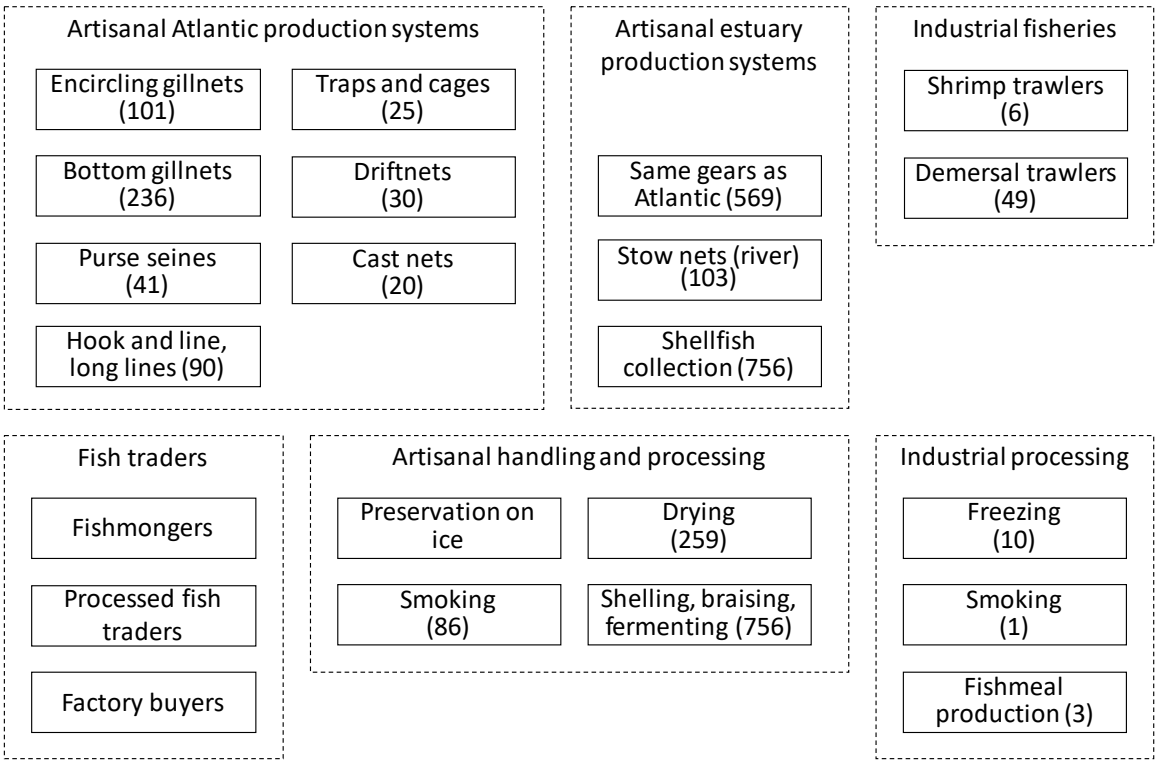


FIGURE A. TYPOLOGY OF ACTORS OF THE GAMBIAN FISHERIES VALUE CHAIN (NUMBERS IN PARENTHESIS REPRESENT THE NUMBER OF UNITS)

The bulk of landings consists of small pelagic (bonga and sardinella), caught by encircling gillnets and purse seines (27% and 19% of captures, respectively), and supplying both Gambian consumers and the fishmeal industry (Table A). Among the variety of demersal-targeting production systems, bottom gillnets dominate in terms of captures (22%) (Table A). Shellfish remains a marginal, yet interesting activity from a sustainable development perspective. Fish processing activities are dominated by artisanal smoking and drying (Table B). Export-oriented activities (fishmeal, fish processing for export, off-Gambia landings by industrial vessels) represent roughly 19 300 t per year, generating GMD 3 350 million, while domestic-oriented activities represent 32 300 t/y equivalent to GMD 2 750 million.

TABLE A. ARTISANAL AND INDUSTRIAL CATCHES IN GAMBIAN WATERS, PER TYPE OF PRODUCTION UNIT (2014-2018)

			Average annual production		
Type	Fishery	Number of units	Per unit (t)	Total (t)	Contribution (%)
Artisanal	Bottom gillnet	417	34	14 118	22%
Artisanal	Encircling gillnet	149	120	17 919	27%
Artisanal	Purse seine	41	305	12 489	19%
Artisanal	Hook and line + long-lines	125	16	1 955	3%
Artisanal	Traps and cages	35	56	1 955	3%
Artisanal	Driftnets	298	10	2 932	4%
Artisanal	Cast nets	47	21	977	1%
Artisanal	Stow nets	103	19	1 955	3%
Artisanal	Oysters and cockles	756	0.36	273	<1%
Artisanal	Aquaculture (oysters, tilapia, mullets)	20	1.7	33	<1%
Industrial	Shrimp trawlers (SN)	6	113	677	1%
Industrial	Demersal trawlers (CN)	44	231	10 174	16%
All	Total production			65 456	100%
Artisanal	Inland captures	672	15	10 357	16%
Artisanal	Post-harvest losses (20%)	1 743	5	8 362	-20%
Artisanal	Estimated subsistence catches (2010)			6 500	+10%
All	Estimated IUU (2010): 10% for artisanal and 12% for industrial fisheries			6 732	+10%
All	Estimated discards (2010)			4 000	-6%
Industrial	Estimated landed by-catch from shrimp trawlers, consisting of sole, other demersal fish, and cuttlefish			1 354	+2%

Notes: Industrial landings are landed abroad.

TABLE B. ARTISANAL AND INDUSTRIAL FISH PROCESSING IN THE GAMBIA, PER TYPE OF PRODUCTION UNIT (2014-2018)

Type	Process	Number of units	Per unit (t)	Total (t)	Contribution (%)
Artisanal	Smoking	86	41	3 532	28%
Artisanal	Drying	259	12	3 110	25%
Industrial	Smoking	1	26	26	0.2%
Industrial	Freezing	10	224	2 237	18%
Industrial	Fishmeal production (CN)	3	1 233	3 698	29%
	Total production			12 603	100%
Industrial	Small pelagic processed by FM plants			16 642	31%
Artisanal	Fresh fish processed by artisanal smoking			5 212	10%
Artisanal	Fresh fish processed by artisanal drying			4 614	8%

Notes: Industrially processed fish is exported.

From a technical point of view, the Gambian fisheries value chains are inefficient (for instance, regarding fuel consumption per landed fish). The enabling environment for these activities is deemed insufficient, as infrastructure and financing are insufficient and certain policies lack thorough implementation and enforcing.

Economic findings

Value added and contribution to the economy

The financial analysis involves assessing the profitability of the operations of the key actors identified in the functional analysis. For fishers, the four most important artisanal fishing actors are considered in this analysis (encircling gillnet fisher, purse seine fisher, bottom gillnet fisher, and stow net fisher) as well as oyster collectors.

Purse seine fishers register a negative average income and a net value added of GMD 305 000. The revenue generated is insufficient to cover the operating of the fishing unit. The net operating profit for the encircling gillnet fisher is GMD 19 700 for a value added of GMD 515 000. The operating profit of the bottom gillnet amounts to GMD 795 500 and a value added of GMD 1.788 million. Stow nets feature better financial ratios with an operating profit and a net value added of GMD 1.593 million. Except for the purse seine units, the incomes of the Gambian artisanal crew members are much higher than the guaranteed minimum professional wage of GMD 15 000 per month (EUR 273).

Fish processing is mainly limited to drying and smoking. For the drying processor, the net operating profit is GMD 16 000. Smoking processors record a negative net operating profit. Processing of oysters is performed vertically, integrated by the same women who harvest them from the wild. Each female collector handles during the three-month period around 300 kg of fresh oyster leading to 4.5 kg of proceed products sold at a market price of GMD 600 per kg generating a net cash flow of around GMD 2 700 (EUR 49).

The distribution of fish is the result of a large number of economic agents. Three agents are being considered: retailer, medium fishmonger and large fishmonger. All fish distributors register a positive net operation profit and value added. The net annual operating profit is GMD 1.947 million for the retailer, GMD 681 000 for the medium fishmonger and GMD 7.528 million for the large fishmonger. The lowest value added is registered by the medium fishmonger (GMD 739 000) and the highest by the large fishmonger (GMD 7.754 million). Retailers generate a value added of GMD 1 952 000 (EUR 35 500).

Globally, 14 processing plants are in operation in The Gambia including one industrial smoking plant, 10 industrial freezers, and three fishmeal plants. All these processing operations are found to be financially viable. The net operating profit is GMD 77 542 000 for a freezing plant and the net value added amounts to GMD 87.898 million. For the industrial smoking plant, the financial ratios are respectively GMD 62.963 million and GMD 64.643 million. The estimated value added resulting from the fishmeal plant is GMD 22.703 million and the net operating profit is GMD 12.153 million (EUR 221 000).

In assessing the overall effects on the national economy, **the average annual direct value added generated by the Gambian fisheries is estimated at GMD 2.5 billion (EUR 45.384 million),** of which GMD 1.7 billion is derived from the production segment and GMD 723 million from the industrial processing segment. The contribution of fish trade is very low, oyster collection insignificant and artisanal smoking none. In the production segment, artisanal fishing activities supply the international market (bottom gillnet and stow net), though the land-based industrial fish plants generate 93.3% of the value added. Even though industrial processing accounts for 45.8% of value added from fisheries, this segment would contribute more to the economic wealth of the country if it produced more refined and elaborate products (bulk unprocessed products account for 68.7% of total exports).

The value added by fisheries represents 6.5% of the Gambia's GDP. The production segment of the fisheries contributes to 20.1% of the wealth generated by the agricultural sector. The National Accounts of the Gambia reports the contribution of fisheries to GDP at only 1.9% as only the production segment is considered. The fisheries sector also generates indirect effects on other sectors of the national economy (i.e. transportation, energy, small and medium industry) estimated at GMD 358.850 million (EUR 6.5 million).

The balance of trade in fisheries provides information on the profile and importance of foreign trade in fisheries products. For exports of fisheries products estimated at GMD 2.883 billion, and direct imported intermediate goods of GMD 0.299 billion, fisheries register a trade surplus of around GMD 2.583 billion (EUR 46.963 million).

The Government of The Gambia does not provide direct or indirect subsidies to fisheries value chain actors. The open access prevailing in small-scale fisheries in The Gambia means in practice that small-scale fishers

pay no licences or permits. The Department of Fisheries (DoF) has conceded the management of fish landing docks, smoking sheds, boxes and fuel stations to the Community Fisheries Centres. Fish processing plants are subject to direct taxes (corporate taxes up to 27% of net profit) and indirect taxes (mainly value added tax of 15%). Globally, contribution of the fisheries sector to the national budget (State and government collectivities) is estimated at GMD 100.726 million (EUR 1.8 million). In addition to taxes and subsidies related to activities of the value chain, fishing agreements signed by The Gambia provide revenues to the Public Treasure. The "Sustainable Fishing Partnership Agreement signed in 2018 with The European Union provides to The Gambia a direct financial compensation of EUR 550 000 (GMD 30 800 000) per year and EUR 1 450 000 (GMD 81 200 000) yearly from the licensing fee from European vessels, observers and support vessels fees.

Economic sustainability and growth inclusiveness

For the analysis of the sustainability and the viability of the value chain within the global economy, two standard coefficients, namely the Nominal Protection Coefficient and the Domestic Resource Cost, were computed. The Nominal Protection Coefficient of 0.898 indicates that the value chain is viable in the international economy and leads to an economic gain for the national economy since the value added is higher than the cost of using the non-tradable factors of production. A Domestic Resource Cost of 0.073 confirms the strong contribution of the value chain to the national economy and an efficiency use of domestic resources in the process.

For growth inclusiveness, **the value chain can be considered inclusive from the perspective of the actors of the production segment** as fishers contribute to direct value added as much as their share of net operating surplus. Retailers, medium and large fishmongers have a relatively small share of net operating profit compared to their contribution to direct value added. The contribution of retailer and large fishmongers to wages is limited. As far the distribution segment is concerned, the value chain can be considered inclusive. The share of total income is greater for all exporting fish plant, particularly for the industrial freezers as it surpasses their combined net operating profit and value added. However, many jobs in the production and the processing sub-sectors are either precarious or informal. Children on-board of small-scale fishing units are exposed to accident risks and women involved in rough work (processing mainly) have low income and are more vulnerable to poverty.

Relative to employment creation and distribution, 4 234 fishers and 756 shellfish collectors are active along the Gambian coastline. In the segments of distribution and processing of fish, a total of 10 330 fishmongers and 25 420 fish processors were counted respectively by the DoF. With five people employed by each processor, around 127 100 people are involved in support activities for processing fish. For the distribution of fish, an average of three employees assist each fishmonger, making a total of 30 399 people. Overall, 193 249 actors derive their livelihoods from artisanal processing and the distribution of fisheries products. Fourteen fish processing and export companies are operational in The Gambia, employing around 1 500 workers. Outboard motor mechanics and carpenters, and people employed in these two activities, are around 500. With an average of 11 members in the fish worker's household, the sector contributes to the livelihood of thousands of people across the country.

Regarding governance and innovation, specific support in the form of an attractive framework (tax and customs reductions) will motivate investors to establish small and medium packaging enterprises for the need of the local fish processing plants and for exports in the sub-region. The analysis indicates that fish exports would contribute more to the economic wealth of The Gambia by putting in the international market more elaborate products as bulk products account for up to 68% of total fish exports. Support from public authorities in the form of subsidies, tax refunds and facilitation to access financing for the fishing industry would allow processors to renew and direct their infrastructure towards the development of elaborate products bringing more value added and jobs. The DoF and all concerned institutions should work in a holistic approach to make the jetty and the dockyard more functional in order to attract fishing vessels to land their catches in the country.

The unsanitary conditions at processing places, the use of archaic smoking technologies (e.g. very energy-consuming and prone to yield poor quality products), and the lack of knowledge of good practices regarding quality and safety are evident. In terms of recommendations, combined actions from State authorities in charge of fisheries, NGOs and professionals are expected to improve 1) the sanitation of fish landing, processing, storage and marketing spaces, 2) the handling and transportation of fish, and 3) transformation

processes. Beyond upgrading the existing facilities, it will also involve creating new industrial ice production and storage units at the main landing points, fitting cold rooms at the main storage and marketing locations, and enabling the use of refrigerated containers throughout the supply chain of the fresh fish sector.

Social findings

The social profile (Figure B) of the value chain appears low and reflects all the difficulties of the vast majority of stakeholders, particularly Gambian nationals. Apart from gender equality, which has a moderate score of 3 and demonstrates the importance of women in the value chain in terms of their massive presence in almost every link, other social indicators are weak. The overall social profile reflects the shortcomings of the fisheries governance system in The Gambia. In fact, despite the many opportunities in the value chain in terms of job creation, provision of animal protein and income, its contribution to the creation of sustainable social conditions is still too low. The consequences of this poor governance is a loss of foreign exchange for the Gambian government and a decrease of the income of national actors leading to difficult living conditions and food and nutritional insecurity of the population.

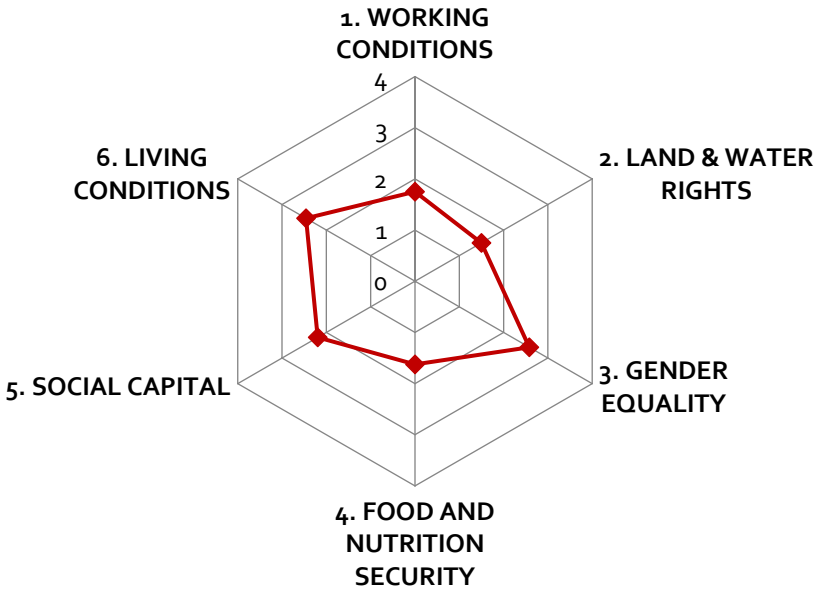


FIGURE B. SOCIAL PROFILE OF THE GAMBIA'S FISHERIES VALUE CHAIN

Working conditions

In general, working conditions throughout the value chain are perceived as difficult. International regulations are not well enforced in employment contracts. The majority of workers in the industries are day labourers, while employment in artisanal fisheries is informal. Thus, the vast majority of workers in the value chain do not benefit from social security coverage, which has an impact on the income level and the working and living conditions of these actors. Children are present in the fisheries units and processing workshops. In the fishing units, most of the children have not been to school while in the processing workshops, children who are in primary school are solicited in the afternoons during the school year while those who are in high school are solicited during the holidays. In general, the incomes of actors in the value chain are higher than those of public sector workers. Due to several constraints, the fishing sector is not attractive, especially for young Gambians who have neither the maritime culture, i.e. a fishing tradition, nor adequate training.

Land and water rights

It seems that the shortcomings of the system of control over access to the Gambian EEZ and the facilities granted to processing industries represent a loss factor for the Gambia. The government's option to attract investment in the industrial sector has overly favoured the latter, while not sufficiently addressing the

concerns and impacts on the local population. Although the country's fisheries policy documents are in line with the FAO Voluntary Guidelines on Responsible Governance of Tenure of Land, Fisheries and Forests, in practice, investors and institutions do not seem to adhere to it. Some investments such as fishmeal are perceived as harmful to local populations. Difficulties of access to information, the consultative nature of professional organisations and the lack of prior and informed consent of the communities concerned by the investments make most decisions unpopular.

Gender equality

Women are present at all stages of the chain where they play an important role. Although in production they are directly involved only in oyster harvesting and shellfish harvesting, some have their own fishing unit and/or provide funding and equipment to other fishers. 80% of processors and 50% of fish retailers are women, while 65% of the processing plant workforce is female. As economic operators, women are involved in various income-generating activities and in the acquisition of material goods, yet their contribution to the economic growth is weak compared with that of men. Financial constraints are a discriminatory factor for them because very few women have access to credit. The perception of a highly gendered division of labour means that women are most often only invited to decision-making as transformers or traders. Women are affiliated with organisations in which they hold important positions of responsibility. Housewives first, then processors or traders, performing arduous and sometimes dangerous tasks, women have low incomes and are more vulnerable to poverty.

Food and nutrition security

Due to shocks such as floods, drought and economic stagnation, food production in The Gambia has declined in recent years. Nevertheless, the evolution of food supply in the Gambian market is relatively stable thanks to the government’s measures. The decline in actors' incomes means that they have fewer resources to spend on daily expenses, while the prices of most food products are now considered higher. Food is perceived as being of lower quality and is now the cause of common diseases. There is no improvement in nutritional practices, except for those benefiting from food fortification projects, and 99 per cent of households consume cereals every day. Over the past five years, the proportion of people considered food insecure has increased from 5 to 8 percent, partly due to the fluctuating Bonga fish populations. The establishment of three fishmeal factories in the country is cited as one of the main causes of the lack of fish in Gambian households.

Social capital

Some umbrella organisations such as TAGFC, GAMFIDA, NAAFO, NASCOM, TRY are often cited as being most involved in the value chain. These organisations are more inclusive than associations of professionals from the same link. The negotiation capacities of organisations on the market are rather weak. Access to information by actors in the chain is generally perceived as low. Professionals and communities are not involved in decisions that impact their livelihoods, such as fisheries agreements and the establishment of fish meal factories. Through participatory management, local knowledge is taken into account. There is participation in the rehabilitation or construction of roads, schools, health centres, and the awarding of scholarships for the benefit of communities by some actors in the value chain.

Living conditions

Most professional households only have access to primary and secondary health facilities. There has been an improvement in the type of housing, but most households have only basic toilets with latrines and no access to drinking water. School enrolment in The Gambia is high because the law makes the first six years of primary school free and compulsory. Nevertheless, the rate of access to secondary education is low. There are very few training schools and no training structures in the fisheries and aquaculture sector. Occupational mobility within the chain is rather low, so job security is precarious. However, geographical mobility is very high. Actors in the fish value chain in The Gambia suffer from poor road infrastructure and lack of facilities at landing and processing sites.

Environmental findings

The relative environmental impacts of the Gambian fisheries (see Figure A) are variable among types of production units, with those not consuming fuel (cast nets and stow nets) having the lowest impacts. The impacts of demersal fishing activities are considerably higher than those of pelagic fishing, which is in line with previous findings in the literature, mainly due to the associated fuel use intensity. Moreover, impacts of the industrial fleets are higher than those of the demersal artisanal fleets, which is counterintuitive because industrial vessels usually benefit from economies of scale. The reasons of this specific dynamic in Gambian fisheries are multiple: the unusual shape of the Gambian Exclusive Economic Zone (EEZ) and the respective fishing zones for the artisanal and industrial fleets, the status of targeted stocks limiting economies of scale, and even the skipper effect limiting the performance of industrial vessels. Moreover, the proxy Senegalese and Mauritanian data used to model industrial fisheries may not be fully representative of the Gambian conditions.

The impacts of fish processing are higher for artisanal processing (except for the shellfish sub-value chain) than for industrial processing. This is due to the important weight losses (residues, water evaporation) associated with artisanal processing, which moreover processes fish from high-impact fisheries (mainly demersal); while industrial freezing produces a minimal amount of residues and fishmeal production benefits from economies of scale and processes fish from low-impact fisheries (small pelagic).

The environmental impacts of the whole value chain are determined by the fuel use intensity of the various sub-fleets. For most fishing activities, fuel consumption contributes to >90% of impacts. The impacts of fish processing are determined mainly by the impacts of the supplying fisheries, except for shellfish processing, for which the main driver for impacts is the combustion of wood as fuel. The environmental performance of fishmeal production is not driven by fuel consumption, but by the Fuel use intensity (FUI) of the supplying fisheries. This can be explained by the important differences in FUI providing the fishmeal industry around the world: Peruvian purse seiners consume <20 L fuel per t fish, while Gambian purse seiners consume 104 L /t and encircling gillnets 163 L/t. Mean African encircling gillnets feature a FUI of 31 L/t, and the global mean FUI for pelagic fish has been estimated at 42 L/t. The fuel consumption of shrimp-targeting vessels, both industrial and artisanal, resemble those of the respective Senegalese fleets.

Transport of fish products has a relatively minor contribution to overall impacts, even including the production of ice used in transport of fresh fish. Actual impacts are probable higher, due to the condition of Gambian roads and vehicles, many of which probably do not fulfil the European emission standards “Euro 3” specification, as is common in Africa.

The impacts of Gambian fisheries and processing activities, including transport of fish products, affect predominantly the area of protection human health. These impacts are driven by inefficient fuel (liquid fossil fuels, wood, other biomass) consumption. Industrial fisheries in particular are very inefficient, FUI-wise, with a large normalised impact on human health (ecosystems and resources feature, in contrast, much lower environmental impacts, also dominated by FUI).

Conclusions and recommendations

The economic analysis has demonstrated that the Gambian fishery value chain **is sustainable from an economic point of view**, given that actors of all segments are gaining revenues and creating value added. The fishery sector shows some impacts at macro-economic level as far as economic growth, employment creation, public finances are concerned.

The social analysis has shown that, due to a poorly controlled EEZ, uncontrolled fishing authorisations, unsupported national stakeholders, wishful thinking aquaculture and numerous benefits granted to investors without taking into account the concerns of the local population, the seafood value chain in The Gambia **does not yet appear to be socially viable to meet the expectations of the local population**. Moreover, fishing in The Gambia **is far from being an inclusive sector**. Without corrective measures, Gambian nationals, especially women, will be increasingly marginalised in their own country by foreign investors and economic operators and their living conditions will be even more difficult.

The environmental analysis showed that pelagic and demersal, artisanal and industrial fisheries, as well as both artisanal and industrial processing, are rather inefficient. It thus can be said that the value chains **are**

not environmentally sustainable, especially if the lack of proper stock management, as well as poor Monitoring control and surveillance (MCS), are weighted into the assessment. Measures aimed to improve fuel use intensity and waste management of both the fisheries and the processing activities should lower their environmental impacts.

The overall sustainability of the Gambian fisheries value chain actors is detailed in Table C. A synthesis of recommendations, together with their expected positive effect, is presented in Table D.

TABLE C. SUSTAINABILITY COMPARISON OF GAMBIAN SEAFOOD SYSTEMS

Actors		Resilience	Economic performance	Social performance	Environmental performance *
Artisanal fishers, pelagic	Encircling gillnets	★★★ Abundant resource, high fish demand	★★ Net operating profit very low, target low fish prices oriented to local consumption, fishmeal plant	★★ Ensures the supply of fish to households and is dominated by the Senegalese	★★ Slightly high FUI
	Purse seiners	★★★ Abundant resource, high fish demand	★★ Net operating profit negative, , target low fish prices oriented to local consumption, fishmeal plant	★★ Ensures the supply of fish to households and factories and exclusively used by Senegalese	★★ Slightly high FUI
	Cast nets	★★ Less abundant resource, lower fish demand	★★★ Target valuable fish oriented to export, high net operating profit	★★★ Traditional fishing technique of the natives	★★★ Passive gear
	Subsistence catches	★★★ Abundant resource, high fish demand	N/A	★★★ Traditional fishing technique of the natives	★★★ Passive gear
Artisanal fishers, demersal	Bottom gillnets	★★ Less abundant resource, lower fish demand	★★★ Target valuable fish oriented to export, high net operating profit	★★★ Easier to use gear through which the Gambia learns to fish at sea.	★ High FUI
	Hook and line + long lines	★★ Less abundant resource, lower fish demand	N/A	★★ High-tech fishing gear used mainly by Senegalese	★ High FUI
	Traps and cages	★★ Less abundant resource, lower fish demand	N/A	★★★ Traditional fishing technique of the natives	★★ Slightly high FUI
	Drift nets	★★ Less abundant resource, lower fish demand	N/A	★★★ Traditional fishing technique of the natives	★ High FUI
Artisanal fishers, estuarine	Drift nets (shrimp)	★★ Less abundant resource, lower fish demand	N/A	★★ Traditional system of local fishers struggling to meet the demand for fish	★★★ Passive gear
	Stow nets	★★	N/A	★★★	★★★

		Less abundant resource, lower fish demand		Traditional system of local fishers struggling to meet the demand for fish	Passive gear
	Shellfish	★★ Less abundant resource, threat by other fisheries and estuary degradation	N/A	★★★ Traditional system of local fishers struggling to meet the demand for fish	★★★ Passive gear, active mangrove preservation
Industrial fishers, demersal	Shrimp trawlers	★★ Less abundant resource	N/A	★ A system that does not benefit Gambians either in product or in use	★ Very high FUI, higher than world mean for trawling
	Demersal trawlers	★★ Less abundant resource, high fuel consumption	N/A	★ A system that does not benefit Gambians either in product or in use	★ Very high FUI, higher than world mean for trawling
Traders	Fishmongers, large	★ High fish demand, risk of low offer during fisheries pauses	★★★ Net operating profit positive, contribute to the value added as much as it generate net operating profit	★★ Essentially Senegalese controlling the market	★ Low transport impact and waste generation
	Fishmongers, medium	★ High fish demand, risk of low offer during fisheries pauses	★★★ Net operating profit positive, contribute to the value added as much as it generate net operating profit	★★ Dominated by men who control the long haul	★ Low transport impact and waste generation
	Fishmongers, retailers	★ High fish demand, risk of low offer during fisheries pauses	★★★ Net operating profit positive, contribute to the value added as much as it generate net operating profit	★★★ Mainly low capital Gambian women	★ Low transport impact and waste generation
	Factory buyers	★★ Medium fish demand, risk of low supply during fisheries resting periods	N/A	★★ Essentially Senegalese controlling the market	★ Low transport impact and waste generation
	Processed fish wholesalers	★	N/A	★★★ Feeding rural areas and cities in the hinterland	★ Low transport impact and waste generation

		High fish demand, risk of low offer during fisheries pauses			
	Processed fish retailers	★ High fish demand, risk of low offer during fisheries pauses	N/A	★★★ Women supplying the urban market	★ Low transport impact and waste generation
Artisanal processors	Smokers	★ High fish demand, risk of low offer during fisheries pauses	★ Negative net operating profit	★ Dominated by women working in difficult conditions	★★★ Medium waste generation
	Driers	★ High fish demand, risk of low offer during fisheries pauses	★★★ Net operating profit positive	★ Dominated by women working in difficult conditions	★★★ Medium waste generation
Industrial processors	Freezers	★★ Medium fish demand, risk of low supply during fisheries resting periods	★★★ Net operating profit positive	★★ Employing a predominantly female and temporary workforce	★★ Low waste generation, medium energy consumption
	Smokers	★★ Medium fish demand, risk of low supply during fisheries resting periods	★★★ Net operating profit positive	★★★ A local initiative in the fishery products industry	★★ Low waste generation, medium energy consumption
	Fishmeal producers	★ High fish demand, risk of low offer during fisheries pauses, conflict with local population	★★★ Net operating profit positive	★ Threat to household food security in the Gambia	★★ Standard West African eco-efficiency, low-FUI fish provision

* Performance is here understood as the inverse of environmental impacts intensity. FUI: fuel use intensity (t fish/kg fuel). FUI is lower for passive gear than for active gear (Parker et al., 2018).
The lowest score per category is represented by one star, while the highest is three.

TABLE D. SYNTHESIS OF RECOMMENDATIONS

	Positive impacts		
Recommendation	**Economic**	**Social**	**Environmental**
Engage in combined actions such as institutional of mutual credit services and training in fishing technics to attract Gambian fishers to the most valuable fishery activities (sole, cuttlefish)	X	X	
Engage in actions to boost small-scale processing	X	X	X
Improve the oyster value chain	X	X	X
Train in improved techniques and improve facilities for artisanal fish driers and smokers	X	X	X
Rehabilitate existing and build new fish landing sites infrastructures	X	X	X
Facilitate the purchase of cold trucks by fishmongers	X	X	X
Encourage development banks to support low-interest credit to enable fish processing companies to pay on receipt (as done in neighbouring countries) and thus stimulate fish processing in The Gambia	X	X	
Enable a local packaging and ancillary materials light industry in The Gambia, to reduce imports	X	X	
Restrict all landings of fish products in Banjul to the official jetty (many fish plants are building private jetties) and provide all facilities for landing, conditioning and storage of fish	X		
Improve governance of the fisheries sector	X		X
Improve the living conditions of the value chain actors	X	X	X
Improve fuel use intensity (e.g. by facilitating the use of enhanced engines)	X		X
Improve grid energy provision to reduce liquid fuels consumption by processing plants			X
Implement and enforce the existing management plans (sole, oysters), and reinforce MCS activities for enhanced stock protection	X	X	X

Major issues/risks

Among the most pressing issues affecting the Gambian fisheries value chains, the current conditions of landing, storing, processing, and transport infrastructure pose a significant challenge to further development of these value chains. A combination of adequate funding for infrastructure, its maintenance and management, combined with proper technical and management training at all levels, would be required to improve the performance of these value chains.

Fishmeal plants rely exclusively on small-scale fishery for their supply of raw materials (fish). These factories are in competition with the other national actors and threaten, strongly, food security in The Gambia. They contribute to only 2.9% of the national growth and the community's expectations in terms of job creation for young people, and better road connection needs are not yet met, while people are facing environmental deterioration and harming of the tourism sector. Priority must be given to meeting the nutritional needs of the Gambian people, sustainability of the tourism sector, and the environmental health.

The system of governance that focuses on foreign investors risks undermining the activities of Gambian actors. The latter, through their organisations, should be supported and involved in decision-making. The dependence of the Gambian fishing economy on Senegalese actors does not guarantee food security and sustainable jobs in the country. A licensing system granted to fishers who only supply the local market could be envisaged.

Relevant issues requiring further in-depth analysis

Fisheries management should be more adequately funded, including MCS activities (surveillance, vessel tracking systems, on-board observer programmes, etc.), stock assessments and management plans.

The idea of introducing licences for fishers willing to supply the local market should be analysed in depth in order to identify the modalities of its application.

1 Introduction

This report provides an analysis of the fisheries value chains in The Gambia. The assessment is part of a larger project, funded by the European Commission's Directorate-General for International Cooperation and Development (DG DEVCO), entitled "Value Chain Analysis for Development" (VCA4D). The VCA4D project is part of the European Union's "Inclusive and Sustainable Value Chains and Food Fortification" Programme. The objective of this study is the description and analysis of the fisheries value chain in The Gambia, using the evidence-based, largely quantitative, toolkit developed/ compiled by DG DEVCO (methodological support for analysis and development of inclusive and sustainable value chains). This diagnosis of the fisheries value chain is intended to support the European Commission and the Government of The Gambia in structuring their policy dialogue around the strategic issues that presently hinder the sustainable development and growth of the fisheries value chain in the country. It also highlights relevant issues and risks for the value chain, and areas for more in-depth analysis.

This assessment was implemented over a period of six months, between July and December 2019, and included two missions by the team (17-31/07 and 30/08-07/09). The team who implemented this study consisted of the following members:

- Angel Avadí, CIRAD, France, environmental expert and team leader
- Moustapha Dème, ISRA/CRODT, Senegal, economics expert
- Adama Mbaye, ISRA/CRODT, Senegal, social expert
- Joseph Ndenn, Individual consultant, The Gambia, national expert

2 Methodology

2.1 DG DEVCO VCA methodology

The methodology used in the assessment aims at generating evidence, supported by a list of indicators measured quantitatively or based on expert assessments that together provide an answer to four framing questions:

1. What is the contribution of the value chain to economic growth?
2. Is this economic growth inclusive?
3. Is the value chain socially sustainable?
4. Is the value chain environmentally sustainable?

The analytical process comprised four components:

Functional analysis: provides a general mapping and description of the main actors, activities, and operations in the value chain, an overview of the products and product flows, the major production systems, a description of the main governance mechanisms in the chain, and a short description of (known) constraints. The functional analysis formed the basis for the analyses in the other three components. The analysis was mainly based on key informant interviews and structured questionnaires with both value chain actors and key experts, complemented with secondary data.

Economic analysis: firstly, consists of a financial analysis of each actor type (financial accounts, return on investment), as well as an assessment of the consolidated value chain (total value of production, global operating accounts). Secondly, it assesses the economic performance (contribution to economic growth in terms of direct and indirect value added generated, and the sustainability/viability for the national economy within the international economy (Domestic Resource Cost Ratio). Finally, it addresses inclusiveness of growth by examining income distribution (business income, wages), and employment creation and distribution. Data were derived from secondary data sources (articles, reports and statistics), key informant interviews, and structured questionnaires. The analysis was (partially) conducted with the support of the Agri-Food Chain Analysis (AFA) software, developed by CIRAD.

Social analysis: explores whether the fisheries value chain is socially sustainable. It also contributes to discussion on whether economic growth in the value chain is socially inclusive. The social analysis drew on multiple information sources, including secondary data and field data from aquaculture producers at different scales, hatchery owners, processors, input suppliers, traders, and other government and non-government stakeholders. The social analysis followed the six domains and associated questions specified in the methodology and social analysis software: working conditions, land and water rights, gender equality, food and nutrition security, social capital and living conditions.

Environmental analysis: evaluates the environmental sustainability of the value chain. The analysis was conducted using Life Cycle Assessment (LCA). LCA consists of 4 phases, after which the environmental analysis was organised, namely Goal and scope, Life Cycle Inventory (LCI), Life Cycle Impact Assessment (LCIA) and Interpretation (EC-JRC, 2010; ISO, 2006). The scope of LCA focused on three areas of protection: Human health, Resources and Ecosystem quality, to which a set of environmental impact categories and corresponding indicators are associated. The calculation of relevant environmental impacts in LCA was based on an exhaustive and quantitative inventory of all input and output fluxes over the entire life cycle of the studied system, based mainly on field-collected primary data and complemented with secondary data (scientific and grey literature).

2.2 Scope of the Gambian fisheries value chain analysis

The original mandate of the study intended to analyse all value chains associated with fisheries and aquaculture. Those include all production, processing and distribution activities. Regarding aquaculture, it was found at an early stage that there are barely any aquaculture activities in the country. There exist a few subsistence pond systems, and no supporting systems (hatcheries, aquafeed plants, etc.), except for an underfinanced and underequipped government-run hatchery.

Therefore, this study focuses on a) production activities centred on fishing, including shellfish collection, b) fish processing activities, and c) fish commercialisation activities. The unit of analysis is the **unit of production (UP)**, which for fisheries means each homogenous type of vessel + fishing gear + crew + targeted species. This approach assumes mono-gear vessels, which is the case in The Gambia, and has been previously applied in environmental studies of fisheries (Avadí and Vázquez-Rowe, 2019a; Cloâtre, 2018). For processing, the UP is the processing facility (i.e. smokehouse, drying rack, fish processing plant). For commercialisation, the UP is the type of trader, by targeted product and size of the operation.

2.3 Data collection

2.3.1 Primary data

Primary data were collected during two missions by the team in The Gambia, and through follow up with key respondents after the second mission. The first mission took place from 17th to the 31th of July 2019 and the second from the 1st to 7th of September 2019. Detailed work plans for the first and second missions are provided in Annex A. Both missions focused on field visits, mainly on the Atlantic coast, and interviews with key stakeholders, both on activity sites and at Banjul. Both missions took place in and around the Greater Banjul Area, from Kartung to Mandinari in the coastline, from Serrekunda to Brikama inland, and as far as Bintang up-river.

Over a hundred people were interviewed, both in the context of focus groups and individually, covering a range of actors (whose characteristics are listed in Table 1). During some of the stakeholders' interviews, and later via email, a representative dataset of primary socio-economic and environmental data was obtained from actors of all types.

TABLE 1. ESTIMATION OF THE PROPORTIONS OF ACTORS ACCORDING TO GENDER AND NATIONALITY

Actors	Categories	Relevance for development	% by gender		% by nationality	
			Men	Women	Gambians	Foreigners
Producers	Fishers	Large, key actors	100%		10%	90%
	Shellfish collectors	Medium	1%	99%	70%	0%
	Aquaculturists	Low	70%	30%	100%	0%
	Industrial plant/vessel owners	Low	100%	0%	0%	100%
Fish traders	Large wholesalers	Medium	99%	1%	1%	99%
	Industrial (factory buyers)	Low	100%	0%	5%	95%
	Medium	Large	70%	30%	30%	70%
	Retailers	Large	5%	95%	70%	30%
Processors	Artisanal dryers	Large	5%	95%	60%	40%
	Artisanal smokers	Large	20%	80%	70%	30%
	Industrial smokers	Low	0%	100%	100%	0%
	Industrial freezers	Medium	100%	0%	50%	50%
	Industrial fish meal	Low	100%	0%	0%	100%
Employees	Employed in the processing industry	Medium	10%	90%	30%	70%
	Employed in the fresh industries	Quite weak	30%	70%	90%	10%
	Employees in fishmeal plants	Rather weak	99%	1%	90%?	10%?
Service providers	Carpenters	Rather weak	100%	0%	1%	99%
	Mechanics	Rather weak	100%	0%	1%	99%
	Carriers	Rather weak	40%	60%	99%	1%

The construction of economic, social and environmental profiles for each type of actor was always based on multiple respondents, thus they are representative at the national level.

2.3.2 Secondary data

Secondary data was compiled from the literature (scientific and grey) to complement primary data, including:

- Stock assessment data for Gambian species was sourced from the Fisheries and Resources Monitoring System (FIRMS) data system of the FAO, specifically from the Fishery Committee for the Central Eastern Atlantic (CECAF) Stock Status Reports data collection (http://firms.fao.org/firms/en), and from the most recent CECAF reports (http://www.fao.org/fi/static-media/MeetingDocuments/CECAF/CECAF-SSC8/default.htm).

- Fishmeal industry data was obtained from West African and global literature (Avadí and Vázquez-Rowe, 2019a; Corten et al., 2017; Fréon et al., 2017; Gorez, 2018; Greenpeace, 2019; IFFO, 2018; Seafish, 2018; Tarbiya and Mouhamédou, 2011), as Gambia-based Chinese fishmeal plants failed to provide data, despite insistent demands by the project team. Specific assumptions included:
    - Technical features and efficiencies of plants were considered at a level between Peruvian fair average quality and residual plants, with a fish-to-fishmeal conversion ratio of 4.5 (Table 5), and featuring direct drying fuelled by R500 residual fuel.
    - The total amounts of processed fish were computed based on the fish-to-fishmeal conversion ratio and export data, as all fishmeal is exported and all exports are authorised by the Gambian Food Safety and Quality Authority (FSQA), which provided disaggregated data. FSQA does also not have direct access to fishmeal plants data, but they enforce data provision on the international trading firms that handle Gambian exports.
    - Fish provision to fishmeal plants was assumed, following several interviews with fishers and Department of Fisheries (DoF) officers, to be dominated by contractual arrangements between plants and purse seines, complemented by surplus —i.e. the proportion of landings not purchased by fish traders— landings by encircling gillnets (estimated flows in Figure 8).
    - Economic performance data was obtained from Mauritanian fishmeal plants, and deemed representative of the Gambian industry, while social data was obtained by means of interviews to fishmeal plant workers and other related stakeholders.

- Certain vessel and fishing gear construction data was obtained from West African sources (e.g. Gulbrandsen 1991).

- Illegal, unreported and unregulated (IUU) captures in the country were estimated from literature data (Belhabib et al., 2016, 2013; MRAG, 2010).

- Fish prices were obtained mainly from the DoF, representatives of industrial fish processors, and literature.

- Artisanal catches of small pelagics landed in Senegal were computed from Sea Around Us data (http://www.seaaroundus.org/data/#/eez/270), associated with other University of British Columbia reports (Belhabib et al., 2016, 2013).

3 Functional analysis

3.1 Value chain mapping

3.1.1 Landing sites

Figure 1 provides an overview of the geographical distribution of the different fishing areas, landing and processing sites, as well as the areas were subsistence and project-related aquaculture systems are known to exist.

Around 132 landing sites were identified during the 2016 survey conducted by the DoF. Landing sites are distributed unevenly across the country. They are spread as following: 17 in the Atlantic Coast Stratum, 21 in the Lower River North Bank Stratum, 42 in the Lower River South Bank Stratum, 22 in the Upper River North Bank Stratum, and 30 in the Upper River South Bank Stratum (DoF, 2016). The majority of the landing sites are permanently used by fishers.

The most important artisanal fishing sites, regarding the operating fleet and the landed volumes, are located along the productive Atlantic coast in Kartong, Gunjur, Sanyang, Tanji, Brufut, Jeshwang, Bakau and Banjul. The major fishing sites along the River Gambia are Barra, Albreda, Bintang, Tendaba and Jarreng. Fishing sites along the coast are somewhat specialised in certain fisheries operations. For example, Gunjur, Tanji, Old Jeshwang and Bakau are more into bonga (Bonga shad, Ethmalosa fimbriata) fishery than other sites.

Landing sites feature a minimum infrastructure and host numerous artisanal processing facilities (i.e. smokehouses and drying racks). Hygiene conditions are appalling in landings sites, and artisanal processing facilities, at least partially due to the current decrepit conditions of cold storage, ice production, and sewage infrastructure. It is noticed in all landing sites a chaotic mix of people buying and selling innumerable products, some which have nothing to do with fishing at all.

The Banjul Fisheries Jetty, intended for industrial vessels, does not feature the right infrastructure conditions to attract them. At least one industrial processing plant in Banjul has been observed to have its own jetty. Consequently, an important percentage of captures in Gambian waters are landed in neighbouring countries, due to (at least for the industrial fleets) infrastructure limitations.

FIGURE 1. MAP OF DISTRIBUTION OF FISHERIES VALUE CHAIN ACTIVITIES (MAIN SITES ONLY)

3.1.2 Value chain actors

An overview of the fisheries value chains in The Gambia is presented in Figure 2. The vast majority of fish reaching the Gambian consumers is landed by artisanal vessels and distributed via fishmongers and processed fish traders, via markets, as fresh fish (preserved in ice) or as artisanal smoked or dried fish.

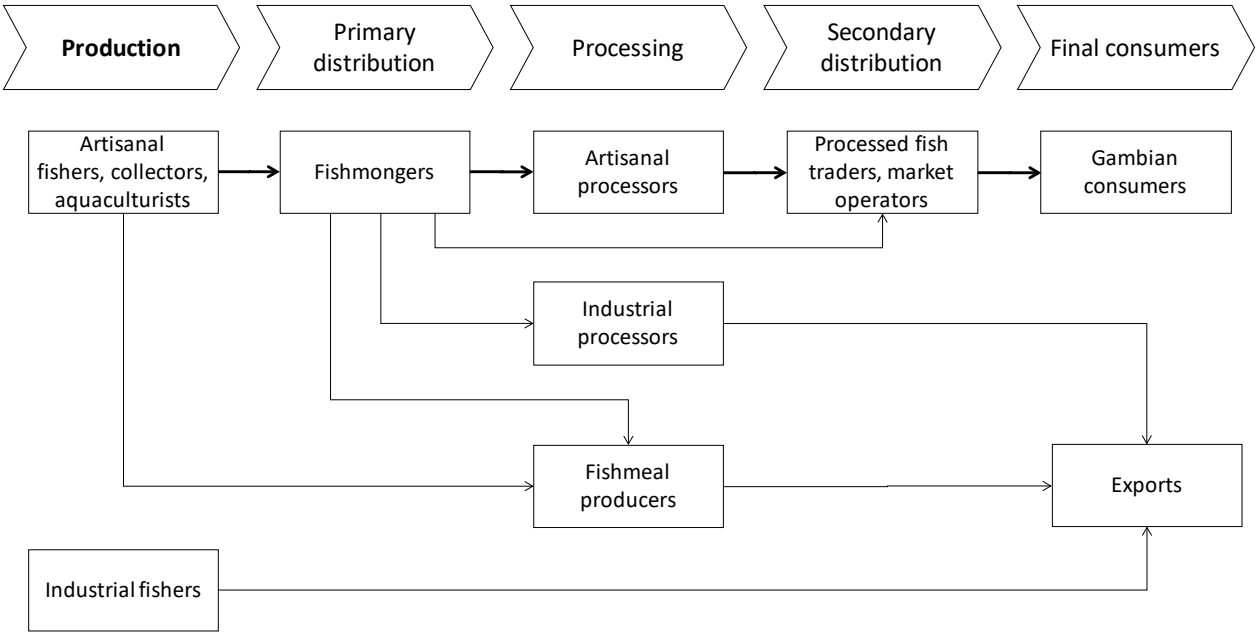


FIGURE 2. VALUE CHAIN MAP (SIMPLIFIED)

We developed coherent typologies for all actors in the value chain, as shown in Figure 3. The classification of actors engaged in fishing activities was based on the distinctive type of vessel, manned by a set crew, using specific gear and targeting specific species. It was possible because Gambian fisheries production units tend to be homogenous regarding these parameters. In other words, as the fishing vessels are mono-gear, it can be safely assumed that one vessel is equivalent to one production unit. The classification of other activities was based on the types of processing activities (processors) and handled products (processors, fish traders).

Aquaculture systems remain very marginal in the country (Rice et al., 2012; Saidyleigh, 2016), despite aquaculture development being contemplated as a priority in the national Fisheries and Aquaculture Sector Strategy 2017 – 2021 (DoF, 2017). **Aquaculture systems have thus been excluded from this study.**

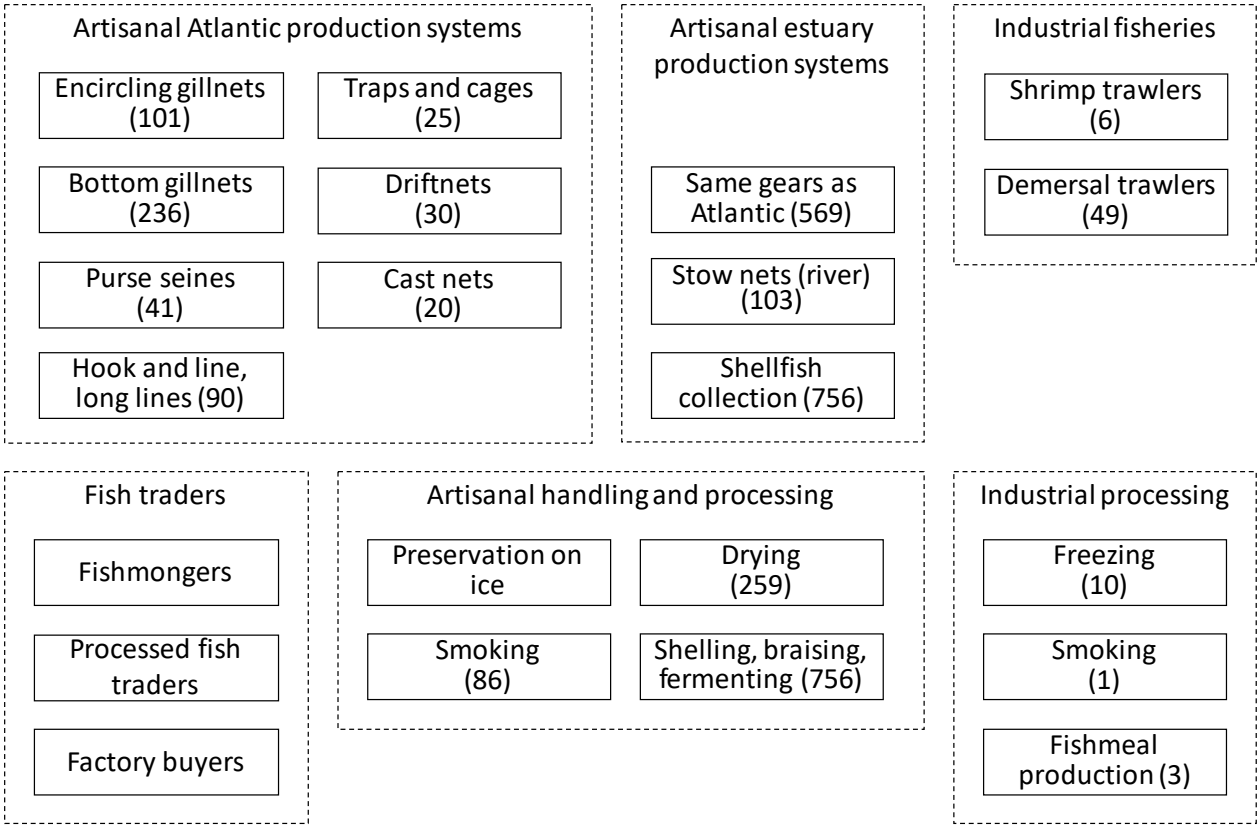


FIGURE 3. TYPOLOGY OF ACTORS OF THE GAMBIAN FISHERIES VALUE CHAIN (NUMBERS IN PARENTHESIS REPRESENT THE NUMBER OF UNITS)

3.1.3 Primary producers

Gambian fishing activities can be classified in several ways, but they are essentially either "artisanal" (i.e. small-scale) or industrial. There are no official definitions of artisanal and industrial vessels, beyond the following: "The industrial fishery sector is characterised by high capital investment and limited to the marine area while the artisanal fishery is dispersed and characterized by low capital investment and labour intensive activities" (DoF, 2017). Another official document states that "The fisheries of The Gambia are zoned by use. The artisanal fishery has exclusive fishing rights to waters out to 9 nautical miles (nm). Vessels up to 250 Gross Registered Tonnage (GRT) are allowed to fish between 9-12 nm while beyond 12 nm is open to all licensed vessels." (MoFWR, 2012).

1.1.1.1 Artisanal fishers

Artisanal fishers fall into two categories, according to their activity environment: those operating at sea and those operating in continental or estuarine environments. The 2016 Frame Survey estimated the number of units operating at sea as 565 (2 812 fishers), while the number of those operating in the continental environment was estimated at 658 units (1420 fishers). These figures clearly seem to be on the rise. The VCA4D team had recorded in Tanji alone more than 600 units operating at sea. Admittedly, Tanji is the largest fishing centre in The Gambia in terms of the number of units and quantities landed, but other centres such as Gunjur, Kartong, Sanyang and Brufut each, host a minimum of 100 units.

The great peculiarity of sea fishing in The Gambia is that it is dominated mainly by foreigners, and more particularly by Senegalese. The 2016 Frame Survey identified 300 Senegalese units out of 502 motorised units. The mainland fishery, in the other hand, remains dominated by nationals, with only 63 Senegalese 31 Malians out of 728 units (DoF, 2016). The majority of fishers are sedentary (they do not migrate seasonally) (DoF, 2016).

The artisanal fleet is sub-divided into sub-fleets, characterised by specific combinations of production means (fishing vessels, engines, fishing gears) and targeted species. The artisanal fleet differentiates slightly in size, but in its wooden structure it is very similar.

Catching gear and methods, however, are varied. As depicted in Figure 3, the following typology was produced:

- Encircling gillnets (149): These gears are used mainly in shallow waters. They consist of encircling the fish and, by producing noise, fish being scared are forced to entangle themselves in the net. The gear is used in fishing operations all year round. Surround gillnet target small pelagic fish, particularly bonga shad.
- Bottom gillnets (417): These gears are set out at sea to be hauled the next day. Bottom gillnet target a wide range of demersal, mainly the sole fish. The gear is operational all year round.
- Purse seiners (41): These gears are employed in pelagic fisheries and target mainly sardinella. It is deployed from a boat around an entire school of fish. The seine has floaters along the top line with a lead line threaded through rings along the bottom. Once the school is encircled with the net, the lead line is then pulled in by preventing fish from escaping by swimming downward. The catch is harvested by the crew using large landing nets. The fishery is operated and dominated by the Senegalese, using large fishing canoes of about 20-22 metres of length all motorised with 60 HP engines and a crew of around 20.
- Traps and cages (35): These gears are used to capture cephalopods (cuttlefish, octopus). The fishery is dominated by Senegalese migrant fishers, as Gambians are confronted with the high cost of fishing materials, the huge size of fishing canoes and a weak know-how to operate the fishery.
- Driftnets (298): These units operate both in the ocean, targeting rays and sharks, and in the estuary, targeting shrimp. The fishery is dominated by the Ghanaians using huge fishing motorised canoes (40 HP) of about 15-20 metres in length and operate nets of about 800-900 metres in length with a crew of 14-16. In most cases, a second engine is taken on-board as standby. As the fishing trip last a week, fishers process partly their catches on-board by sun drying the sharks. The shrimp driftnets (***félé-féle***) fishing technique is simpler. The fishing gear is generally maneuvered by two fishers from a small canoe (up to 7 m long), propelled by paddling. The net, firmly attached to the canoe via the main rope, is simply drifting with the current.
- Cast nets (47): This fishing activity is operated by fishers from shore, without the use of a vessel.
- Stow nets (103): These units operate only in the estuary, targeting shrimps by means of pairs of stationary stow nets (*mujas*). The type of fishing units used are planked canoes without engines, which are towed to their fishing ground in groups from seven to twelve by a motorised canoe. The gear is set daily out in the sea for hours and then hauled and set again at sea unless the net has to be repaired. Some operate with two or four units of nets and each net is supported by an anchor. A middleman with a bigger motorised canoe can tow the smaller canoes to their fishing grounds and being paid of the daily catch.
- Hook and line (90): This fishing technique is inexpensive in terms of capital investment and low in fuel consumption. It is selective and efficient as directed at species of high market value such as snappers and sea bream as well as tilapia and catfish in lakes and rivers. This type of exploitation is implemented from anchored canoes. The hook is usually baited with sardinella. The size and resistance of the hooks and the type of line used depend on the species targeted.

In summary, some gear specialisation was found. The Senegalese fishers are mainly engaged in sardinella, shrimp, and demersal fisheries while Guineans operate in sardinella and sole fisheries. Ghanaians fishers are mainly involved in shark fishery and Malians in *Clarias* spp. fishery. Gambian fishers are more present in the bottom gillnets and the cast nets fisheries.

1.1.1.2 Industrial fleet

The industrial fleet consists of foreign and foreign-beneficed vessels, predominantly trawlers targeting shrimps or demersal fish and cephalopods, as depicted in Figure 3:

- Shrimp trawlers: Shrimp vessels target pink shrimps but make significant bycatch of important commercially species. Six shrimp trawlers are being active in the Gambian waters in 2019. Among them, five are registered under the Gambian flag and one under the Senegalese one.

- Demersal trawlers: 49 demersal trawlers operate in the Gambian waters in 2019, 34 registered under the Gambian flag, 10 under the Ivory Coast flag, 4 under the Chinese flag, and one under the Egyptian flag.
- Purse seiners and pelagic trawlers: only one purse and one pelagic trawler, both from Guinea Bissau, are being active in the Gambian waters and target big pelagic fish such as tuna.

The vessel owners usually make contractual arrangements with Gambian fishing companies in order to satisfy national licensing conditions. Some Senegalese trawlers operate in the Gambian waters under the Reciprocal Maritime Fishing Agreement between The Gambia and Senegal. Being in existence since 1982, Gambians have not been able to fully benefit from this fishing agreement because of the paucity of locally based fishing vessels. Some vessels also operate under bilateral agreements with China, Ivory Coast, and Guinea Bissau. The captures by these sub-fleets and their relative contribution to total captures in Gambian waters are listed in Table 2.

TABLE 2. ARTISANAL AND INDUSTRIAL CATCHES IN GAMBIAN WATERS, PER TYPE OF PRODUCTION UNIT (2014-2018)

			Average annual production		
Type	Fishery	Number of units	Per unit (t)	Total (t)	Contribution (%)
Artisanal	Bottom gillnet	417	34	14 118	22%
Artisanal	Encircling gillnet	149	120	17 919	27%
Artisanal	Purse seine	41	305	12 489	19%
Artisanal	Hook and line + long-lines	125	16	1 955	3%
Artisanal	Traps and cages	35	56	1 955	3%
Artisanal	Driftnets	298	10	2 932	4%
Artisanal	Cast nets	47	21	977	1%
Artisanal	Stow nets	103	19	1 955	3%
Artisanal	Oysters and cockles	756	0.36	273	<1%
Artisanal	Aquaculture (oysters, tilapia, mullets)	20	1.7	33	<1%
Industrial	Shrimp trawlers (SN)	6	113	677	1%
Industrial	Demersal trawlers (CN)	44	231	10 174	16%
All	Total production			65 456	100%
Artisanal	Inland captures	672	15	10 357	16%
Artisanal	Post-harvest losses (20%)	1 743	5	8 362	-20%
Artisanal	Estimated subsistence catches (2010)			6 500	+10%
All	Estimated IUU (2010): 10% for artisanal and 12% for industrial fisheries			6 732	+10%
All	Estimated discards (2010)			4 000	-6%
Industrial	Estimated landed by-catch from shrimp trawlers, consisting of sole, other demersal fish, and cuttlefish			1 354	+2%

Notes: Industrial landings are landed abroad.
Sources: Primary data, DoF landing statistics, DoF (2016), MacFadyen et al. (2018), (FAO, 2017), Mendy (2005), Belhabib et al. (2013), Belhabib et al. (2015) and Mbye (2005).

According to DoF data, the average captures in The Gambia between 2014 and 2018 were in the order of 65 000 t/y (66% of it corresponding to artisanal Atlantic captures, 22% to industrial Atlantic captures, and 13% to artisanal inland captures). From total landings (87% of captures), 26% corresponded to bonga shad (*Ethmalosa fimbriata*), 21% to sardinellas (*Sardinella* spp.), and 8% to demersal fish such as catfishes, rays and sharks (mainly destined for artisanal processing).

The average annual aquaculture output (molluscs and freshwater fish) in the same period was 33 t, most of it consisting of oysters (20 t). Aquaculture activities are currently negligible in terms of production volumes and professionalism of the few existing systems, which are, at best, subsistence ones. The emerging model of shellfish (oysters, cockles) collection (see 3.1.13), occasionally combined with oyster cultivation in

mangrove areas, seems very interesting from a social and environmental perspective, as it enables many women to earn a livelihood while protecting the estuarine mangrove ecosystem.

In the 2014-2018 period, capture data by the DoF indicates the top 20 species represented >80% of landings by artisanal fleets (Table 3).

TABLE 3. TOP 20 SPECIES LANDED BY ARTISANAL VESSELS (AVERAGE 2014-2018)

Scientific name	English name	Landings (t)	Contribution	Mean price (GMD/kg)
Ethmalosa fimbriata	Bonga shad	14 209	26.3%	25
Sardinella maderensis	Flat sardinella	6 823	12.6%	20
Sardinella aurita	Round sardinella	4 725	8.8%	20
Arius spp.	Sea catfishes	2 408	4.5%	110
Pentanemus quinquarius	Royal threadfin	1 748	3.2%	90
Arius latiscutatus	Rough-head sea catfish	1 444	2.7%	135
Elops lacerta	West African ladyfish	1 380	2.6%	135
Cynoglossidae	Tonguefish	1 232	2.3%	75
Pseudotolithus elongatus	Bobo croaker	1 153	2.1%	120
Pomadasys jubelini	Sompat grunt	1 019	1.9%	100
Pseudotolithus senegalensis	Cassava croaker	979	1.8%	100
Polydactylus quadrifilis	Giant African threadfin	954	1.8%	180
Brachydeuterus auritus	Bigeye grunt	861	1.6%	65
Decapterus spp.	Scads	828	1.5%	N/A
Lutjanus spp.	Snappers	750	1.4%	230
Sphyraena spp.	Barracudas	629	1.2%	180
Gymnura micrura	Smooth butterfly ray	618	1.1%	N/A
Trachurus trecae	Cunene horse mackerel	545	1.0%	N/A
Chrysichthys nigrodigitatus	Bagrid catfish	525	1.0%	85
Sepia officinalis	Cuttlefish	496	0.9%	190
Others		10 971	19.8%	

Source : DoF landing statistics, DoF officers, freezing plants managers

Industrial vessels predominantly land abroad, while industrial fish processors (freezing, smoking, and fishmeal production) are also export-oriented. Ten species represent 80% of captures by industrial vessels (Table 4).

TABLE 4. TOP 10 SPECIES CAPTURED BY INDUSTRIAL VESSELS (AVERAGE 2014-2018)

Scientific name	English name	Landings (t)	Contribution	Mean price (GMD/kg)
Octupus vulgaris	Common octopus	1 407	13.0%	195
Cynoglosidae	Solefish	1 239	11.4%	110
Sepia spp.	Cuttlefish	1 165	10.7%	190
Sardinella maderensis	Flat sardinella	1 153	10.6%	20
Mugil spp.	Mullets	826	7.6%	N/A
Sardinella aurita	Round sardinella	772	7.1%	20
Pagellus spp.	Seabreams	722	6.7%	100
Penaeus notailis	Pink shrimp	677	6.2%	180
Dentex spp.	Dentex	349	3.2%	60
Arius spp.	Sea catfishes	347	3.2%	85

Others		2 194	20.2%	

Source: DoF landing statistics, DoF officers, freezing plants managers

3.1.4 Primary distributors

The fisheries sector is the main provider of animal protein in the diets of many Gambian households because of the relative availability and affordability of fish compared to meat. The bulk of the catch is marketed fresh, while some are smoked and sundried before being sold. Industrial fish exports plants are mainly supplied by small-scale fisheries. Large fishmongers, medium fishmongers, retailers, and factory fishmongers mostly handle these fish products**:**

- Large fishmongers buy 5 to 10 t of fish per day from fishers at the landings beaches. They deliver their fish to central points in townships and inland markets. They use insulated trucks for distribution of fresh fish and open trucks for processed products. Fish products are sold mainly to private traders dealing primarily in fresh, smoked and dried small pelagic fish species.
- Medium fishmongers buy around 3 t of fish per day from fishers at the landing beaches and distributed to inland or neighbouring markets within the urban areas. They either personally hire a land rover or jointly hire a truck. Fish is kept under ice. Medium fishmongers can sell their fish directly to consumers or resell to retail buyers. They display their fish on cement tables provided by markets authorities.
- Retailers, called *Bana-banas*, buy smaller quantities of fish (3 to 4 baskets of 50 kg each per day carried in with ice) from fishers at the landing beaches and transport it to market for direct sales. The scope of operation is usually a few miles radius as they supply fish to the immediate environment and nearby villages and towns. Public transportation is usually used; some of them however transport their products on bicycles or motorcycles to the markets.
- Factory buyers: As the individual landings by small-scale fishers are too small for the processors or traders, most of the products landed are bought by the fish traders in charge of consolidating and selling their aggregated collected product on to industrial companies (octopus, grouper, shrimps, sole). Most of the factory buyers are independent and self-financed. However, fishery plants provided ice and collect products using their own refrigerator truck.

The bulk of small pelagic fish volumes handled, are landed in poor sanitary conditions at landing sites and poorly conditioned. Being sorted on large tarpaulins (Figure 4), fish products are insufficiently protected from contact with the soaked soil. In many cases, the fish is loaded directly into trucks and layers of ice are scattered over the product. This type of conditioning fish products and the lack of attention to the handling operations are at the origin of a degradation of the fish. There is also a lack of appropriate fish handling and storage facilities along the Gambian coastline. The weak fish distribution and marketing system coupled with the inadequate fish handling lead to post-production and post-harvest losses also. Respondents during the field trips estimate up to 20-30% post-harvest losses. It is clear from the analysis that the lack of ice production, fish storage (Figure 5), and poor sanitary conditions at landing sites are a major impediment to the development of fish distribution. Large fishmongers have old trucks (Figure 6) that are not adapted to fish transportation. During the field trips, it has been reported to the mission frequent failure of fishmonger's vehicle resulting in the loss of important quantities of fish.

FIGURE 4. INADEQUATE OF FISH HANDLING (M. DEME, JULY 2019)

FIGURE 5. POOR FISH STORAGE (M. DEME, JULY 2019)

FIGURE 6. TRUCK NOT ADAPTED TO FISH TRANSPORTATION (M. DEME, JULY 2019)

3.1.5 Processors

Fish processing in The Gambia consists of artisanal and industrial operations. There are hundreds of artisanal fish processors (>350), concentrated at the landing sites. They process mainly small pelagic, but also some demersal fish, including elasmobranchs[1] (e.g. rays and sharks, mainly processed for export to neighbouring countries in Brufut/Ghanatown (Moore et al., 2019)). Artisanal processing consists of sun drying in racks and hot-smoking in open ovens, the latter fuelled by local biomass (wood from local species Kolloh (*Terminalia macroptera*) and Keno (*Pterocarpus erinaceus*), and palm tree branches (Njai, 2000)). Industrial fish processors, concentrated mostly around Banjul (due to better access to water, electricity, and services), mainly freeze high value demersal fish for export. The emerging fishmeal production industry, represented in the country by three Chinese-owned fishmeal plants of medium capacity, are spread over the Atlantic coast.

As depicted in Figure 3, the following typology of fish processors was produced:

- Artisanal smokers (86): can be classified into two main groups. The first group is specialised exclusively on bonga processing and is composed of both male and female actors. Smoked bonga is the economic mainstay of the artisanal fisheries sector. The second group process a variety of species like catfish, skate and ray. This group mainly consists of female smokers. Due to relatively high cost of improved smoking facilities and affinity for cultural practices, pit and barrel ovens with low capacity and poor hygienic conditions are operated by many female fish processors along the Gambian coastline. However, some community-owned ovens are operational in some major landing sites.
- Artisanal driers (259): are mainly female and are active in all major landing sites. The raw material that artisanal driers use is predominantly spoiled fish as sharks, skates and rays. Actors go through a long process to handle the fish: fermentation, cleaning, gutting, dripping, salting, and drying. Artisanal fish driers often use racks made locally from materials taken in the forest to dry the fish. Besides pest infestation of the products, artisanal driers are affected by rain. They are subject of spoilage and products loss.
- The actors involved in oyster picking and shellfish harvesting are mainly women from the Jola/Diola ethnic group (10.5% of the population). Women from other communities, particularly from the Mandinka/Socé people, who dominate in The Gambia (34.4% of the population), have little interest in this activity. Even in their own villages, it is the Diola women who pick oysters in exchange for the shells they use in the construction of their houses. Some women from Senegal, particularly from the southern region of Casamance, are also involved in the activity. Fresh harvested shellfish are braised and air dried prior to commercialisation.
- Industrial smokers (1): Among the 14 locally registered fishing companies operating in The Gambia, only one factory (Rosamond Trade) is smoking industrially fish. A variety of species like catfish, shrimp, bonga, sardinella, and barracuda are processed according to the demand. The United Kingdom market is their main market.
- Industrial freezers (10): Nine of the 14 fish plants operating in The Gambia export exclusively whole and frozen fish (crustaceans, cephalopods). Such products have undergone any local processing.
- Fishmeal production (3): Three Chinese-owned fishmeal plants are operating in The Gambia. For their supply in fish, they contract with Senegalese purse seine fishers. Fishmeal plants also benefit from Gambian artisanal fishers landings, mainly from encircling gillnets.

Globally, improved techniques and shelters are strongly required for artisanal fish driers and smokers. The amounts of fresh fish consumed and resulting products of processors are listed in Table 5.

TABLE 5. ARTISANAL AND INDUSTRIAL FISH PROCESSING IN THE GAMBIA, PER TYPE OF PRODUCTION UNIT (2014-2018)

[1] The following elasmobranch taxons have been reported to be landed and processed in The Gambia (Moore et al., 2019): sharks (Squalidae, Squatinidae, Scyliorhinidae, Leptochariidae, Triakidae, Carcharhinidae, Sphyrnidae) and rays (Rhinobatidae, Glaucostegidae, Zanobatidae, Torpedinidae, Rajidae, Gymnuridae, Dasyatidae, Myliobatidae, Rhinopteridae); at least one third of which are listed as endangered or critically endangered.

Type	Process	Number of units	Per unit (t)	Total (t)	Contribution (%)
Artisanal	Smoking	86	41	3 532	28%
Artisanal	Drying	259	12	3 110	25%
Industrial	Smoking	1	26	26	0.2%
Industrial	Freezing	10	224	2 237	18%
Industrial	Fishmeal production (CN)	3	1 233	3 698	29%
	Total production			12 603	100%
Industrial	Small pelagics processed by FM plants			16 642	31%
Artisanal	Fresh fish processed by artisanal smoking			5 212	10%
Artisanal	Fresh fish processed by artisanal drying			4 614	8%

Notes: Industrially processed fish is exported.
Sources: species proportions from Mendy (2009). A fish-to-fishmeal yield of 4.5 assumed based on FAO estimations, Fréon et al. (2017) and Oceana (2018).

The 14 fish processing plants established in The Gambia depend on 90% of the small-scale fishery for their supply of fish. They are subject to periodic shortage of raw materials, largely related to the seasonality of the fisheries but also to the prolonged return of artisanal fishers to their countries of origin (mainly Senegal) on religious holidays or family ceremonies.

The three Chinese-owned fishmeal plants currently operating in The Gambia, all of them established over the last few years, face negative perception by the population, as well as bad press (Table 6).

TABLE 6. EXAMPLES OF FISHMEAL PLANT-BASHING PRESS

Press piece title	Year	Source
Gambians Fight Chinese Fishmeal Factory as Fish Prices Soar, Stocks Fall	2018	https://pulitzercenter.org/reporting/gambians-fight-chinese-fishmeal-factory-fish-prices-soar-stocks-fall
Gambia's Environmental Campaigners Are Calling Time on Fishmeal	2018	https://pulitzercenter.org/reporting/gambias-environmental-campaigners-are-calling-time-fishmeal
Sanyang community mourns reopening of fishmeal factory	2018	http://thepoint.gm/africa/gambia/article/sanyang-community-mourns-reopening-of-fishmeal-factory
Gambia: Short and Long Term Effect of Dumping Fish meal Waste into Open Water Bodies- the honourable minister of information; D.A. Jawo was wrong	2018	https://www.freedomnewspaper.com/2018/04/30/gambia-short-and-long-term-effect-of-dumping-fishmeal-waste-into-open-water-bodies-the-honourable-minister-of-information-d-a-jawo-was-wrong/
Nassim Fish-Meal Factory Pipes Set Ablaze	2018	https://foroyaa.gm/nassim-fish-meal-factory-pipes-set-ablaze/
Ocean Shock: Fishmeal Factories Plunder Africa	2018	https://www.voanews.com/africa/ocean-shock-fishmeal-factories-plunder-africa
African fishmeal factories under fire	2018	https://thefishsite.com/articles/african-fishmeal-factories-under-fire
Chinese pollution on Gambian coast	2018	https://newint.org/agenda/2018/05/01/chinese-pollution-in-gambia
GAMBIA: Tourists Leave Beach Restaurants When Fishmeal Factories Start Operating	2019	https://greenworldwarriors.com/2019/02/25/gambia-tourists-leave-beach-restaurants-when-fishmeal-factories-start-operating/

Beyond these perceptions, Gambia-based fishmeal plants are notoriously secretive, as they do not release or grant allow access to data, not even to the DoF. Objectively, despite perhaps questionable waste management and commercial practices and technical efficiencies of these fishmeal plants probably mirror

the general situation of the industry in West Africa. Therefore, and facing the lack of primary data, Gambian fishmeal plants were modelled based on assumptions (see 2.3.2).

3.1.6 Secondary distributors

The following distinctive types were found:

- Processed fish wholesalers market large quantities of products and have substantial financial resources that give them the ability to meet transportation and storage costs. They sell their products to the semi-wholesalers at the primary and secondary markets, which in turn supply local market retailers. Wholesalers also export to sub-regional markets.
- Processed fish retailers (Bana-bana) have low financial capacity and generally do not have any personal mean of transportation. They use public transport. Retailers buy their products directly from processors or at the level of semi-wholesalers or wholesalers and sell them to the consumer on stalls.
- Markets: there are 28 regular fish markets in the country, most of them run by the local town hall. The existent infrastructures are inadequate and not very operational, featuring deplorable hygiene and sanitation conditions. In addition to fish (fresh, smoked, dried), these markets also receive various other food products such as vegetables, cereals, and meat. None of these markets specialises exclusively in fish.

3.1.7 Consumers

Gambian consumers fulfil between 50 and 60% of their animal protein intake by fish (Béné et al., 2015; FAO, 2018a; Tacon and Metian, 2018). Annual *per capita* fish intake reaches 18-20 kg (computed from FAO data (FAO, 2018a), yet is has been suggested that such consumption may reach up to 25 kg (http://thepoint.gm/africa/gambia/article/gambians-consumption-of-fish-highest-in-wafrica). Over 60% of the population is urban, and at least 48% of the population lives under the poverty line (poverty being more prevalent in the rural areas), with most households devoting over 50% of their income on food (The Gambia CO, 2018). No differentiation in fish purchasing behaviour has been documented, but in national terms, consumers prefer fresh small pelagic when available, complemented with dried and smoked fish (small pelagic and low quality demersal) when fresh fish is not available.

3.1.8 Input providers

As artisanal fisheries are the dominant activity, the main input providers of interest include wood providers, artisanal vessel builders, engine and fishing gear providers, and maintenance providers. Wood for building boats is chiefly sourced from the Casamance region of Senegal, and imported mainly as rough planks (as dugout canoes are increasingly being displaced by planked ones in The Gambia). The legality of such wood trade is unclear.

Commercial operators peddle in engines, paint, fuels and lubricants, and fishing gear materials. Fishing gear is mostly locally produced from imported materials. Maintenance services are performed by the fishers themselves, as well as by boat-yards and mechanical workshop professionals.

3.1.9 Importers of Gambian fish

Importers of Gambian fish are quite diversified according to the nature of traded products. Few importers are concerned with fresh fish (mainly Israel and USA). In 2017, fresh fish counted only for 1.3% of fish imported from The Gambia. Regarding frozen fish products (68.6%), the first importer is Korea followed far away by Vietnam, Spain and the Netherlands. The United Kingdom is nearly the only smoked fish importer. Importers fishmeal and fish oil from the Gambia are Vietnam (68.5% of volumes) and Tunisia (31.5%). South Korea and the United Kingdom are the only counties interested in dried fish.

Table 7 summarises fish importers from The Gambia in 2017. Imports of fish into The Gambia are negligible.

TABLE 7. GAMBIAN FISH PRODUCTS EXPORTS IN 2017 (T)

Destinations/Product nature	Dried	Fish Meal	Fresh	Frozen	Total	%
Mali				24 100	24 100	0.6
Canada				22	22	<0.1
Ghana				50 250	50 250	1.3
Guinea Conakry				29 742	29 742	0.8
Israel			35 504	13 210	48 714	1.4
Italy				162 532	162 532	4.3
Korea				874 985	874 985	22.6
Netherlands			544	275 128	275 672	7.1
Nigeria			2 100	9 600	11 700	0.3
Portugal				91 461	91 461	2.4
South Africa				25 697	25 697	0.7
South Korea	1575			23 166	24 741	0.6
Spain			49	316 583	316 632	8.2
Taiwan				34 738	34 738	0.9
Tunisia		361 050			361 050	9.3
United Kingdom	11 525			20 065	31 590	0.6
USA			1 2890	81 262	94 152	2.4
Vietnam		785 750		620 592	1 406 342	36.4
TOTAL	**13 100**	**1 146 800**	**51 087**	**2 653 133**	**3 864 120**	**100.0**

Source: FSQA

3.1.10 Ecosystems and biodiversity

The Gambian ecosystems supporting and affected by fisheries and other activities in the value chain can be roughly classified, based on the dominant salinity levels, as coastal, estuarine (up to 200 km upriver during the dry season, with high salinity) and riverine proper (upstream, with low salinity). The seasonal water exchange among these ecosystems enables the existence of the same target species in all three ecosystems (Laë et al., 2004). The estuarine shores are covered in mangrove forests (mainly *Rhizophora mangle, R. racemosa*), and serve a key role in various species reproductive cycles. Yet another ecosystem affected by Gambian fisheries is the tropical rainforest biome of Casamance in Senegal, the dominant source of wood for boat-building. The main wood species exploited for that purpose is African Mahogany (*Khaya* spp.). Wood is also used as fuel for artisanal processing activities, but it consists of lesser quality local wood and palm tree branches.

3.1.11 Status of fish stocks

Gambian fish stocks are assessed, in the context of regular Northwest African regional assessments, by the CECAF. CECAF ultimately publish data and advice documents in the FIRMS repository (http://firms.fao.org/firms/en). The latest data available in FIRMS for West Africa dates from 2016. The most recent assessments for small pelagics and demersal fish, as well as on the performance of artisanal fisheries in the sub-region, were published by CECAF in 2018 (http://www.fao.org/fi/static-media/MeetingDocuments/CECAF/CECAF-SSC8/default.htm). FAO devotes both a sub-committee (CECAF) and working groups to the study of West African stocks, to inform national fisheries management authorities. For instance, the latest assessment of small pelagics was published in 2019, based on 2017 data (e.g. surveys by the R/V Dr Fridtjof Nansen), by the FAO Working Group on the Assessment of Small Pelagic Fish off Northwest Africa (FAO, 2019).

The main body of findings and recommendations by CECAF and the working groups is summarised in Table 8. Recommendations for artisanal fisheries were also provided by CECAF (FAO, 2018b):

- Improve and harmonise data collection methods, approaches and analyses pertaining the artisanal fisheries.
- Systematically involve artisanal fisheries stakeholders in the collection, analysis and validation of socio-economic information.

- Deploy a series of environmental conservation measures, including legal frameworks and measures to avoid over-exploitation, reduce fish habitat destruction, understand sources of pollution, mitigate IUU, etc.

TABLE 8. SUMMARY OF FAO STOCK ASSESSMENTS AND RECOMMENDATIONS FOR WEST AFRICAN FISHERIES (ONLY STOCKS RELEVANT FOR THE GAMBIA)

Stock	Assessment	Management recommendations
Bonga shad (*Ethmalosa Fimbriata*)	Overexploited	Despite the 2017 recommendation to reduce the effort, a very strong increase in catches and fishing effort took place in 2017 compared with 2016. It is recommended that effort and catch be **reduced** relative to current levels, for bonga to regain a catch level that can ensure sustainability.
Sardinellas (*Sardinella* spp.)	Overexploited	Based on the different indicators available, it was found *S. aurita* to be overexploited. The status of *S. maderensis* remains unknown. Given the multi-specific nature of these fisheries, and as a precaution, it is recommended **reducing** both the effort and catches for the two species for all zones and fleets.
Catfishes (*Arius* spp.)	Fully exploited	The available data would not allow assessments of this stock, for this purpose, as a precautionary measure, it is recommended **not to exceed** the level of fishing mortality that would allow the recent annual mean catches of 7 600 t (Gambia and Senegal).
West African croakers (*Pseudotolithus* spp.)	Inconclusive	As the assessment is not conclusive, it is recommended, as a precaution, **not to exceed** the fishing mortality level of 2016 (Gambia and Senegal).
White grouper (*Epinephelus aeneus*)	Overexploited	Taking into account the results of the assessments, it is recommended **reducing** the current fishing mortality (Mauritania, Senegal and Gambia).
Pink shrimp (*Penaeus notialis*)	Overexploited	Given that the last assessment (2013) shows overexploitation, it is recommended **not to increase** the 2016 level of fishing mortality (Gambia and Senegal).
Octopus (*Octopus vulgaris*)	No assessment	Given the reduction in fishing effort in Morocco and Mauritania in recent years and the improvement in the abundance of both stocks (Dakhla and Cap Blanc), it is recommended for Senegal and Gambia, as a precaution, **not to exceed** the current fishing mortality.
Cuttlefish (*Sepia* spp.)	No assessment	It is recommended for Senegal and Gambia, as a precaution, not to exceed the 2016 fishing mortality.

Notes: no assessment of sole (*Cynoglossus* spp.) is available among recent reports for Northwest Africa (e.g. Subgroup North of the FAO/CECAF Working Group on the Assessment of Demersal Resources.
Source: CECAF Eight Session, Abidjan, Côte d'Ivoire, 23 - 26 October 2018, http://www.fao.org/fi/static-media/MeetingDocuments/CECAF/CECAF-SSC8/default.htm

Management recommendations generally suggest not to exceed 2016 catch levels, except for bonga shad, sardinellas and White groupers, for which the recommendation is to reduce landings. As shown in Figure 7, in 2018 these recommendations were respected for bonga shad, sardinellas (despite a peak of overfishing in 2017), catfishes, West African croakers and octopus, but not for White groupers, cuttlefish and shrimps. In the case of cuttlefish and shrimps, the contribution of industrial fleets to these excessive catches is non-negligible.

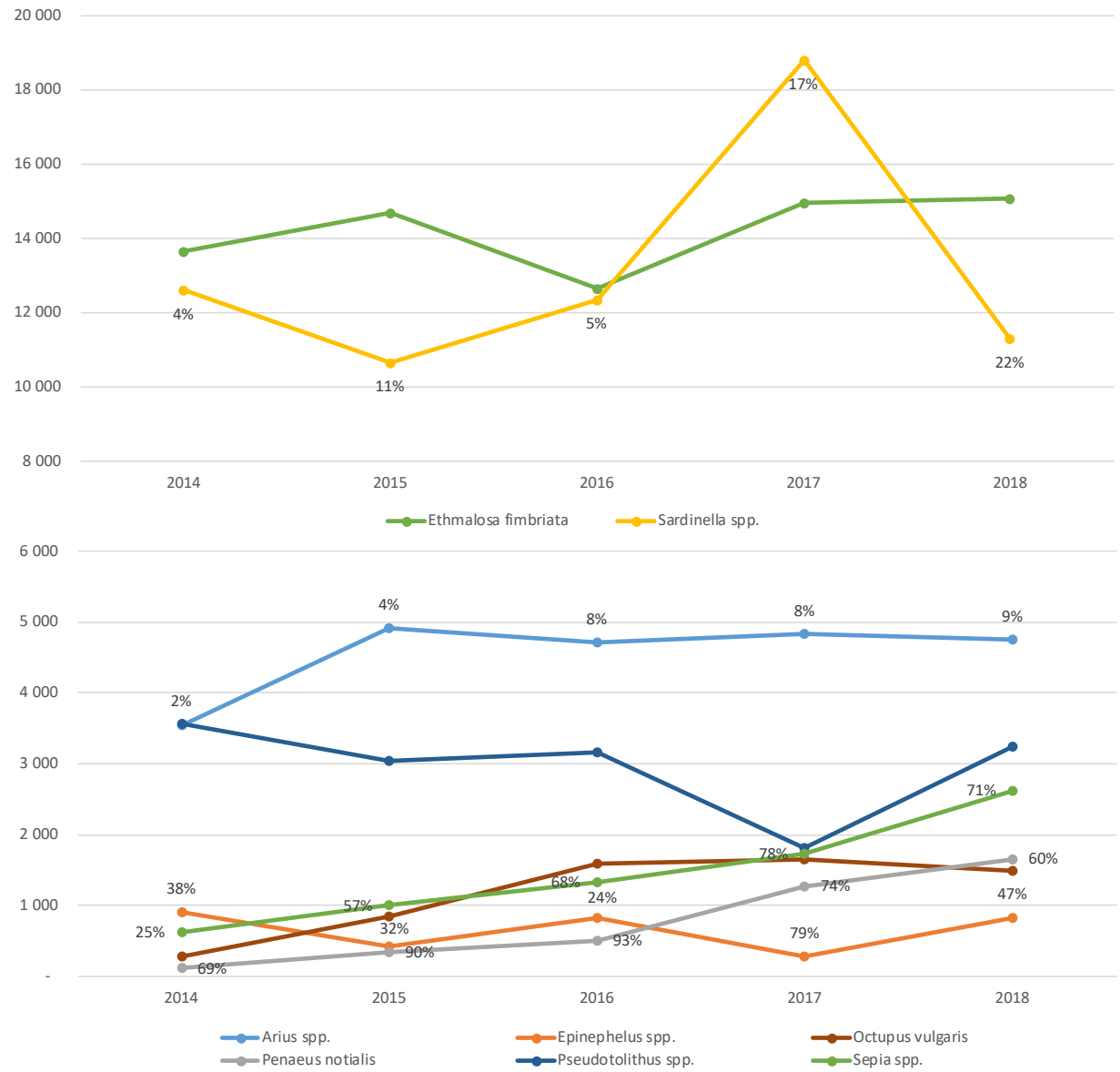


FIGURE 7. HISTORICAL GAMBIAN CATCHES (2014-2018) OF THE SPECIES FOR WHICH CECAF MANAGEMENT RECOMMENDATIONS EXIST. PERCENTAGES REPRESENT THE CONTRIBUTION OF INDUSTRIAL FISHERIES. SOURCE: DOF DATA

3.1.12 Material and economic flows

Figure 8 presents a mapping of mass (product) and economic flows within the Gambian fisheries value chains. A less detailed version of this mapping is provided in Annex B.

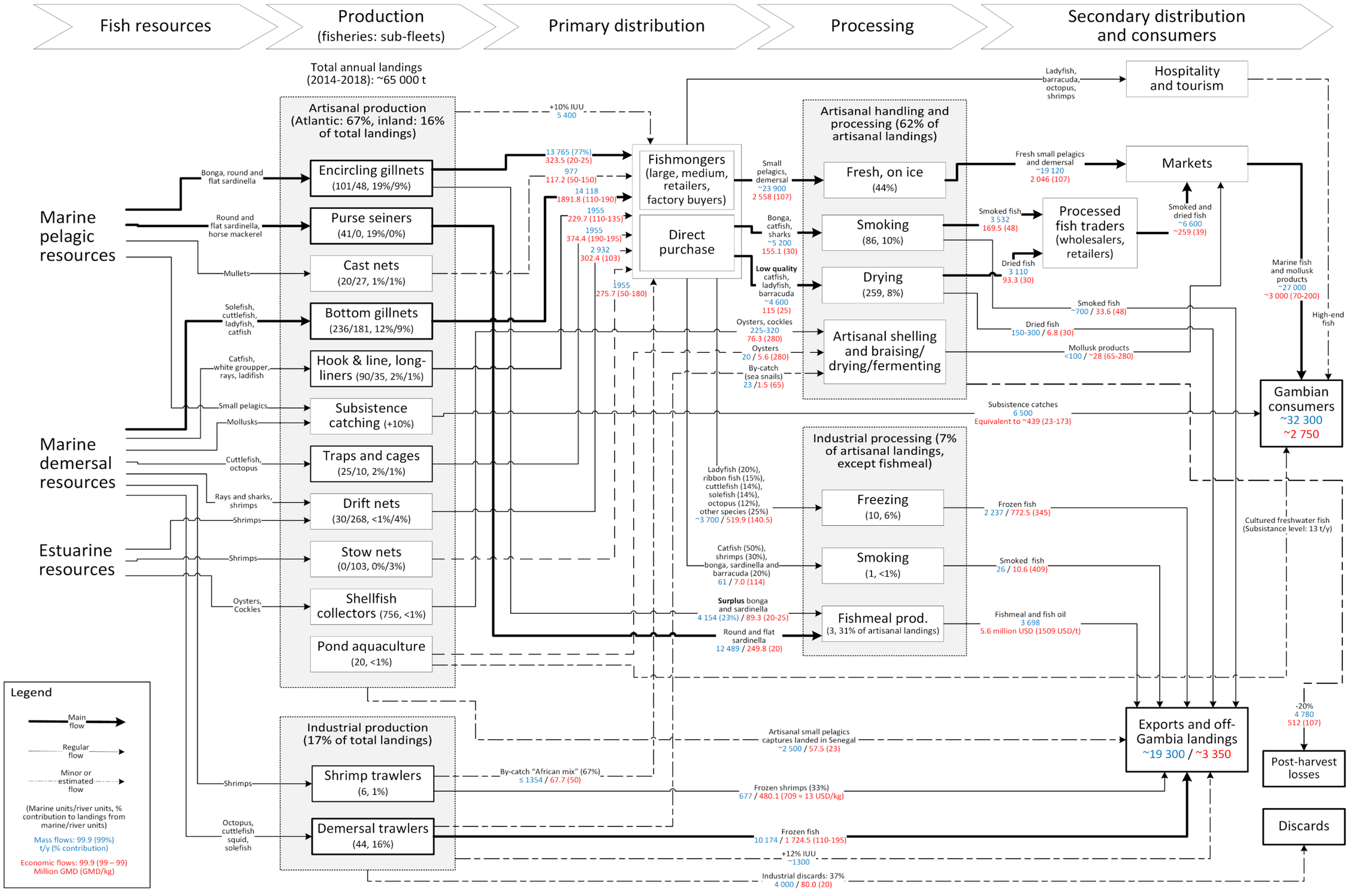


FIGURE 8. MAPPING OF THE MAIN ACTORS AND MAJOR MATERIAL AND ECONOMIC FLOWS IN THE VALUE CHAIN (DETAILED)

Gambian fisheries are dominated by artisanal activities (83% of landings, 67% of which are Atlantic). Industrial fish captures, landed abroad, represent 17% of captures.

The bulk of artisanal landings reaching Gambian consumers are dominated by small pelagic and demersal fish caught by encircling gillnets and bottom gillnets, respectively. These landings are consumed in fresh (44%) and artisanal processed (~18%) forms, and distributed mainly through markets. Other small pelagic landings (31%), mainly by purse seiners but also 23% of encircling gillnets landings, are processed by the exports-oriented fishmeal industry. Other demersal landings (7%) are processed (i.e. frozen) by the industrial fish processing industry, whose production is also exported. Overall, some 32 000 t of fish and fish products reach Gambian consumers each year, while around 19 000 t are exported (including an estimated 2 500 t of artisanal captures landed abroad, according with See Around Us data, mainly consisting of small pelagic). Overall, around 2 750 million GMD in fish products are consumed in Gambia, while at least 3 350 million GMD worth of products are exported or otherwise landed abroad.

3.1.13 Emerging and developing fisheries and aquaculture models

An emerging production model, for which there is increasing interest by various national and international stakeholders, is the combined collection/aquaculture of shellfish.

The shellfish collection exploits primarily the West African mangrove oyster (*Crassostrea gasar/tulipa*) and the blood ark cockle (*Senilia senilis*), in tributary water bodies (bolong) at the Tanbi Wetlands National Park (TWNP) and other mangrove areas in the country. This activity is dominated by women, but many men also take place in it. The 2016 Frame Survey identified 397 women and 359 men practicing oyster collection, but the TRY women's association alone lists in excess of 600 female members. The TRY association (TRYOYSTERS, https://www.facebook.com/TRYoysters/) has been granted exclusive rights to manage shellfish resources in the TWNP since 2007, as enacted in that year's Fishery Act and Regulations (MoFWR, 2011; USAID, 2014). The association has engaged since, in collaboration with the DoF, in sustainable practices such as enforcement of seasonal closures, designation of community exclusive use zones, mangrove reforestation, conservation harvesting (i.e. non mangrove-destructive), etc. The association is a key stakeholder in the 2012 co-management plan for the Cockle and Oyster Fishery of The Gambia, developed under the auspices of the 2009-2014 USAID funded Gambia-Senegal Sustainable Fisheries Project (BaNafaa[2]).

Shellfish (oysters and cockles) harvest areas are reached by small (3-4 m) non-motorised dugout canoes or by walking at low tide. Once collected, shellfish are braised and sundried, while the shells are gathered in heaps to be ultimately sold to lime, brick, animal feed and fertiliser industries. Hygienic conditions at processing sites are sub-optimal, as shellfish processing sites lack adequate infrastructure. Oyster harvesting takes place over four months (March to June), while cockles are collected (at a lesser extent than oysters) from July to November. During the eight months off the oyster season, women engage in other economic activities (house servicing, farming, fish trading). Efforts have been made to engage in oyster aquaculture (by means of rafts and string systems), but no generalised practice is widespread yet (MoFWR, 2011).

Two other marine species, marginal in terms of landings, have also been identified as subjects of growing interest by stakeholders:

- *Trichiuridae* fish (hairtails and cutlassfishes, locally known as ribbonfish) are captured by both artisanal and industrial vessels. In 2014-2018 landings averaged <200 t/y, representing <1% of total landings. Nonetheless, anecdotic data suggests it is increasingly becoming a species of interest, yet no targeted fishing activities seem to currently exist. Several factors favoured the emergence and the rapid development of the ribbonfish fishery in The Gambia. The existence of a solvent and highly remunerative export market concomitant with the presence of an easily accessible resource were the first factors of this emergence. To this, it will be necessary to add the rapid adaptability of artisanal fishers especially Senegalese ones to the conditions of exploitation of the new resource. Existing know-how has allowed a rapid redeployment of fishing effort on this species.

[2] https://www.crc.uri.edu/projects_page/gambia-senegal-sustainable-fisheries-project-usaidba-nafaa/

- Sea snails (*Cymbium* spp.) is mainly a by-catch of industrial trawling. DoF statistics indicate, in 2014-2018, ~23 t/y from industrial vessels, but older sources suggest that in 1994-1999, landings were in the order of 55 – 230 t/y (Njie and Tall, 2001). Sea snails are fermented and dried, and consumed both in Gambia and in neighbouring countries.

3.2 Technical diagnosis

3.2.1 Performance of artisanal and industrial production systems

Artisanal fishing units in The Gambia have mean fuel use intensities (FUI) of 401 and 150 L fuel/t landings for demersal and pelagic sub-fleets, respectively. In contrast, the mean FUI of all artisanal Senegalese fisheries has been estimated at 103 L/t (FAO and World Fish Center, 2008).

Industrial fisheries in The Gambia have a mean FUI of 1553 L/t for shrimp trawlers and 1423 L/t for demersal trawlers. In contrast, the mean African FUI has been estimated to lie between 385 and 690 L/t (Greer et al., 2019; Parker et al., 2018), while the global FUI for demersal fisheries (cephalopods and fish) has been estimated to be between 539 and 613 L/t (Parker et al., 2018).

The apparent lower technical performance of Gambia fisheries, as expressed through their FUI, may be due to various reasons, including:

- Limited fishing expertise, as suggested by the large proportion of foreign fishers occupying the artisanal fisheries niche in The Gambia.
- A recent generalised increase in fishing effort and presumably in fuel consumption in the sub-region (Ba et al., 2017).
- The shape of the Gambian EEZ, which is very narrow (~80 km) and very long (200 NM) (Figure 9); and ultimately to inaccurate data, given that fuel consumption data was reconstructed from fishers' recalls and estimations of fishing days/year by sub-fleets from (Greer et al., 2019).

The performance of the artisanal fishery lies on its capacity to adapt permanently to the modifications of the context of the activity (qualitative and quantitative availability of the resource, economic conditions, market remuneration). This strong reactivity of artisanal fishers is linked, among other things, to their good knowledge of the behaviour of fisheries resources but also to their great organisational capacities in the face of a changing environment and the appropriation of new techniques to exploit new resources. These dynamics have resulted in the adoption of fishing strategies and tactics that are based on several elements: migration, fishing effort report, economic risk management, decapitalization, vertical integration of the fishing sector. The share system prevailing in artisanal fisheries is a response to the economic risks associated with the exit. The principle of rewarding the result of the work and not the effort as such remains the most effective and appropriate response to allow the fishery to adapt to all contexts. In terms of technical performance, the purse seine fishers have increased their fishing capacity: larger canoes (18 to 22 m), more powerful engines (40 to 60 hp) and longer fishing nets (500 to 1000 m).

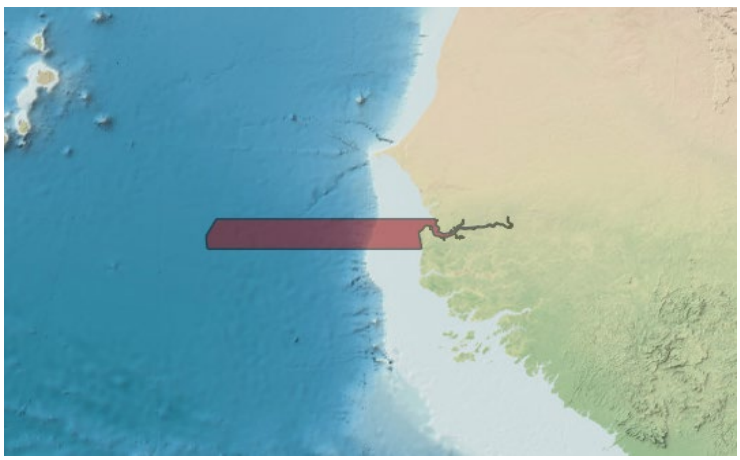


FIGURE 9. THE GAMBIAN EEZ. SOURCE: HTTPS://DOI.ORG/10.14284/312

3.2.2 Performance of artisanal and industrial processing

Artisanal fish processing consists of smoking and sun drying. Fish handling and processing takes place under appalling hygienic conditions, as commonly happens all over West Africa, where between 20 and 40% of landed fish is lost though spoilage (Adeyeye and Oyewole, 2016; ICSF, 2002). It has been moreover noted that "traditionally smoked fish products from Africa may pose high level of potential risk due to the presence of high amount of carcinogenic PAHs, microbial contamination and the presence of aflatoxins; highly toxic compounds in the traditionally smoked fish products." (Adeyeye and Oyewole, 2016).

Industrial fish processing mainly consists of freezing gutted and to a lesser extent filleted fish and cephalopods. According with FAO, freezing is the main processing method for fish, worldwide, accounting for 56% of total processed fish in 2016 (FAO, 2018a). The mean energy consumption per tonne of fish processed in The Gambia is 751 kWh, perhaps influenced by the lack of reliability of the national electric supply, which forces processing plants to consume fuels for on-site energy generation. For instance, one of the largest fish freezing plants generates up to 47% of their annual energy demand by means of gensets (consuming 50 000 L diesel/y). In contrast, the Peruvian fish freezing industry consumes >1000 kWh/t. FAO suggests a minimum of 200 kWh/t fish for freezing (Avadí, 2014).

3.2.3 Distribution and trade

Landings from artisanal fisheries and artisanal processed products are mainly marketed in the country, particularly in cities and rural areas. A large part of processed products such as sharks and rays are exported to neighbouring West African countries where demand for fish is very high, particularly Ghana, whose nationals in Gambia ensure the supply.

Part of the artisanal catches of high-value fish (shrimp, soles, sea bream, lobster) are purchased by industrial fishing companies for processing and export abroad. They are appointed fish merchants who supply the factories. In the fresh fish trade, women tend to be small traders. They mainly buy a few fish trays (usually bonga, but also white fish) from the large mongers and transport them to the various urban markets where the fish is retailed.

Fish traders sometimes collectively rent a commercial vehicle to transport fish to urban markets, or use local vehicles. Large-scale traders are mainly men, usually Senegalese: they often buy large quantities and export fish to Senegal or Ghana, Guinea Conakry, Nigeria, etc., in smoked or dried form. Local hotels and restaurants are also supplied mainly by this category of distributors (MacFadyen et al., 2018).

However, within this group of suppliers, some women are often very active, as they also enter into contracts with hotels and restaurants, especially during the tourist season (October-April). This trade offers women who participate in it a large number of employment opportunities. Higher returns than those available to the small processing company that puts its products on the market every morning. This category of women traders generally need a little more working capital and better cash flow. This is because hotels and restaurants generally do not pay upon receipt of products: women are paid every two weeks, or monthly. Thus, granting a line of credit to this category of women traders will help them to develop their business and increase their income, which could lift them out of poverty. In addition, these women will need training in various aspects of the fish value chain, small business management and other important and relevant skills (UNCTAD, 2014).

In the marketing of processed products, men and women tend to operate in different market segments. A distinction is made between smoked-dry and hot-smoked fish products. Men tend to trade long distances in smoked and dried products with a longer shelf life. Their activities are more capital intensive and their products are marketed in domestic and sub-regional markets, where profit margins are higher. Women are mainly involved in the domestic marketing of hot fish, which has a relatively short shelf life and is intended for urban and domestic markets. Their activities are often labour-intensive and are characterised by small-scale direct marketing (on a daily basis) and low profit margins. Urban markets absorb the bulk of smoked products (Table 9).

TABLE 9. DISTRIBUTION OF SMOKED PRODUCTS IN THE GAMBIA (2000)

Products	Urban markets	Rural markets	Regional markets	Exports
Hot-smoked bonga shad	90%	7%		3%
Smoked-dry bonga shad	2-5%	35%	60%	
Smoked rays/sharks	35%	2-5%	60%	
Hot-smoked catfish	90%			10%
Other smoked products	10%		2%	88%

Source: (Njai, 2000)

3.3 Enabling environment

The enabling environment of the value chain consists of the set of policies, rules, and regulations, including informal rules and cultural norms, infrastructure and services that support (or hinder) the fisheries and aquaculture value chains, specifically:

- Policies: fisheries policy, trade policy, land tenure and access, property rights, research and development, standards and regulations, taxes and tax management, labour policies, and SME policies
- Physical and business infrastructure: landing sites, roads, market infrastructure, food safety infrastructure (e.g. cold chain), and finance (availability, access and conditions)
- Services and coordination: extension, education, training and knowledge, business linkages and chain coordination, business development services, risk management options.

The sections below describe some of our findings related to the enabling environment.

3.3.1 Governmental initiatives

Under an Act of Parliament, the DoF was given responsibility for planning, developing and managing fisheries resources under Gambia's jurisdiction. The Department is guided by three instruments, the Fisheries Act of 2007 and sections 11 to 16, to provide adequate justification for the preparation of management plans to protect fisheries from future threats, such as increased fishing effort, changes in environmental conditions or changes in industrial efforts.

These management tools are discussed collectively with all relevant stakeholders in one or more meetings and the decisions to be implemented are bottom-up approaches, discussed and agreed collectively.

Section 14 of the Act empowers the Minister of Fisheries to establish "special management areas" for the conservation and management of community fisheries. Section 15 of the Act also empowers the Minister to establish Community Fisheries Centres (CFCs) for the conservation of community fisheries and the management of special management areas or parts thereof. The Minister of Fisheries may establish special management areas and may also give authority to the CFCs to manage fisheries resources within the special management areas for community-based fisheries management. The Minister of Fisheries may grant such powers to fishing communities and bring them into force after publication in the Government Gazette.

3.3.2 Regional and international initiatives

The Gambia is affiliated with various regional and international institutions involved in fisheries policies: the Fishery Committee for the Eastern Central Atlantic (CECAF), the Sub-Regional Fisheries Commission (SRFC) which has a Surveillance Operations Coordinating Unit (SOCU) in The Gambia, the Conférence Ministérielle sur la Coopération Halieutique entre les États Africains Riverains de l'Océan Atlantique (COMHAFAT), the Comité des Pêches pour l'Atlantique du Centre-Est (COPACE), and the Partenariat Régional pour la Conservation de la Zone Côtière et Marine d'Afrique de l'Ouest (PRCM).

Nevertheless, the country remains cautious with regard to certain institutions of which it is not yet a member. The Gambia ratified the United Nations Convention on the Law of the Sea (UNCLOS) on 22 May 1984, and the UN Port States Measures Agreement (PSMA) in 2016, being the 25th country to do so and helping the PSMA

enter into force. The Gambia has not ratified either the UN Fish Stocks Agreement or the FAO Compliance Agreement. The Gambia has ratified the following sub-regional and international conventions:

- The Convention on Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central Africa Region (WACAF) aiming to protect the marine environment, coastal zones and related internal waters falling within the jurisdiction of the West and Central African region.
- Convention establishing the Sub-Regional Fisheries Commission for strengthening co-operation and co-ordination of Member States in mainly harmonising policies on preservation, conservation and exploitation of marine resources in the sub-region.
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to regulate trade and to prevent depletion of wildlife resources.
- United Nations Convention on the Law of the Sea (UNCLOS) defining the rights and responsibilities of nations with respect to their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources.
- Convention on Biological Diversity (CBD) whose objective is to develop national strategies for the conservation and sustainable use of biological diversity.
- FAO Code of Conduct for Responsible Fishing (CCRF) which is to set international standards of behaviour for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and biodiversity.

3.3.3 Policy structure

The Gambia's fisheries policy is set out in the 2006 Fisheries Policy, which has a general objective of "promoting a flourishing fisheries sector, encouraging responsible fishing and sustainable fisheries development for food security and poverty reduction in The Gambia" (Baio, 2019).

The guiding principles outlined in the policy document are conservation and sustainable use of resources, overall responsibility, responsible management of the fishery, and collective decision-making. The policy includes strategies for 15 areas considered essential for the development of the sector: marine artisanal fisheries, monitoring, control and surveillance, access to financial resources, fisheries research human resource development, inland fisheries and aquaculture, intersectoral links; gender, youth and development of the fisheries sector; institutional reforms, extension of fishing, industrial fishing, control of harvest and quality, marketing of fish, sub-regional and international cooperation, and sport fishing.

The Gambian Government plans to implement these different fisheries policies through the FAO-supported Fisheries and Aquaculture Sector Strategy (DoF, 2017), which runs from 2017 to 2020. This strategy lists the following five strategic pillars: 1) institutional restructuring, redevelopment and capacity building; 2) legal and political; 3) capacity of key stakeholders and awareness; 4) intersectoral and optimisation of the global value chain; 5) collaboration and partnership.

In this policy, the government makes co-management a priority in its new approach to management.

3.3.4 Fishing agreements

The presence of fishing fleets under fishing agreements in Gambian waters has led to a competition for demersal species (cephalopods, shrimps, and sole) with the national fleets. There is asymmetry of operation between foreign vessels and national fleets: foreign fleets operating in The Gambia enjoy enormous comparative advantages to local ones. In terms of carrying capacity, fishing power, energy autonomy and stewardship on-board, foreign units have a significant advantage over national fleets. These favourable comparative advantages induce lower production costs, higher yields and a better product quality. Consequently, foreign industrial units are much more competitive than Gambian national fleet.

In terms of national fish supply, fishing access agreement fleets do not contribute to the Gambian food security despite the requirement to land 10% of fish caught. Foreign ship-owners said to be constrained by the lack of an operational fishing ports in The Gambia. The catches of the foreign industrial fishing fleet are then intended for the international markets and therefore do not contribute to the Gambian fish processing

plants supply. No activity related to fishing agreements is domiciled in The Gambia along the entire fish value chain.

A major constraint for The Gambia in negotiating fishing access agreements is a lack of sufficient scientific information on the fish stocks for their sustainable management. Comprehensive and scientific assessment of the state of the fish stocks are not conducted on a regular basis (see section 3.1.11). This could then mean that targeted resources are not related to excess resources but as a simple way to generate national budget revenue. Some Non-Governmental Organisations (NGOs) are also questioning the equity of the financial compensation of the concession of fishing rights to foreign fleets[3]. Another argument developed by NGOs is that financial compensation does not benefit enough to the development of the national fishery sector.

The Gambia has always been in a delicate and vulnerable position when negotiating fishing access agreements. This is due to the little size of the country and the fact that fish stocks in The Gambia migrate within nearby countries, but there is a lack of cooperation among countries in the region when it comes to negotiating fishing agreements. Moreover, negotiation capacities with large and powerful entities like the European Union, China, and Japan are uneven.

The **Gambia-Senegal Reciprocal Maritime Fishing Agreement**, including both small scale and industrial fisheries, was first signed in 1982. It had been reviewed every two years since then until 2010, the date of the last review. The bilateral fisheries access agreement is reciprocal and does not envisage a financial contribution for access to fishing opportunities. The Agreement stipulates "The Government of each State shall allow artisanal fishers of the other State to fish in the waters under their jurisdiction under the same conditions as those applicable to its nationals. Artisanal fishers from either state, operating in The Gambia or Senegal are required to land their catches in the country where they are based." (USAID, 2014). The protocols governing the Agreement are basically only two: 1) the conditions of access to resources are the same for fishers operating in each country, and 2) nationals of both countries are required to conduct their fishing operations in accordance with the laws and regulations in force in each country.

This agreement thus prevents Gambia from charging a tax on Senegalese fishing units, which are more numerous than those in Senegal. Although the agreement stipulates that all catches in the respective waters of The Gambia and Senegal *must be landed and sold in the country where they operate*, Senegalese fishers do not comply with this provision and very often land their catches in Senegal, particularly when the price is better than that offered in The Gambia. This situation poses a problem for the supply of Gambian fish factories and even households. Thus, this agreement as it is presently being operated is clearly in Senegal's favour. However as there is a prevalent Gambian culture for Gambians not be actively involved in fishing at sea, it is important for Gambia to improve operation of the existing agreement to Gambia's advantage by ensuring a higher percentage of quality catch landings in Gambia for consumption and onward processing (packaging, smoking, retail, export etc.). Senegalese fishers in The Gambia are engaged in a variety of fishing activities targeting sardinella, shrimp, cuttlefish, sole fish, ladyfish and cassava croaker. They operate throughout the year.

Some Senegalese industrial trawlers operate in the Gambian waters under this Fishing Agreement. The feeling of most Gambians is that they have not been able to fully benefit from this fishing agreement because of the paucity of locally based fishing vessels.

The European Union and the Republic of The Gambia signed a new agreement setting out the fishing opportunities and financial contribution on 19 October 2018. The new agreement covers a period of six years from the date of its provisional application, tacitly renewable. The objective of the **EU-Gambia** Sustainable Fisheries Partnership Agreement (SFPA) and associated protocol is to set out the fishing opportunities for EU vessels in Gambian waters, the financial compensation to be paid by the Union and the modalities of sectoral support to the fishing sector of the Gambia. The Protocol provides for fishing opportunities in the following categories: 28 tuna seiners, 10 bait boats, 3 trawlers (targeting black hake, a deep-sea demersal species). The agreement concerns the fishing of tuna with a limited demersal component.

[3] See for instance the journalistic piece "How Gambia Is Selling Its Tuna For 136 Euro Per Ton To The EU", https://greenworldwarriors.com/2018/12/11/how-gambia-is-selling-its-tuna-for-136-euro-per-ton-to-the-eu/

The negotiation of the new Sustainable Fisheries Partnership Agreement with the Gambia is part of the EU fisheries policy (negotiations are led by DG MARE), but, in line with the principle of policy coherence for development, fisheries policies are to take into account the objectives of development cooperation in its external policies, and to contribute to achieving the 2030 Agenda and the Sustainable Development Goals (SDGs). A previous protocol had expired in 1996 and its application was inactive.

The annual financial contribution amounts to EUR 550 000, based on: a) an annual amount for access to fisheries resources in the Gambian fishing zone of EUR 275 000 equivalent to a reference tonnage, for highly migratory species, of 3 300 t per year, and b) support for the development of Gambia's sectoral fisheries policy, amounting to EUR 275 000 per year. According to the European Commission, this support is in line with the objectives of Gambia's national policy for the sustainable management of continental and marine fisheries resources.

Moreover, the annual financial contribution paid by the EU vessel owners is set at EUR 315 000, corresponding to the estimated annual amount of fees due by vessel owners in respect of fishing authorisations issued.

In December 2019, the Ministry of Fisheries and the EU held their first Joint Committee meeting on the sustainable fisheries partnership agreement[4].

3.3.5 Formal and informal rules

The Gambia's fisheries legislation is based on two main texts, namely the 2007 Fisheries Act and the 2008 Fisheries Regulation (amended in 2017). These different regulations set the general conditions for fishing in the Gambian EEZ (Baio, 2019).

There are other regulatory texts in other areas, but they are also relevant to fisheries:

- The 1994 National Environmental Management Act.
- The 1995 Merchant Shipping Act.
- The 2010 Maritime Administration Act.
- The 1984 Armed Forces Act (which provides for the protection of marine resources and territorial and coastal waters).
- The 2011 Food Safety and Quality Act (and the related 2014 Amendment Act).
- The 2011 Fishery Products Regulations:
    - Fishing zones: canoes and sport fishing vessels within 12 nm; beyond 12 nm for vessels <250 GRT; beyond 15 nm for vessels >250 GRT. In practice the limits of 9 nm for vessels <250 GRT and beyond 12 nm for vessels >250 GRT are used;
    - Gear restrictions, notably minimum mesh sizes, no trawling in the river Gambia, and no beach seines;
    - Minimum landing sizes for 22 species; and
    - Prohibition on finning of sharks and a requirement to land all sharks in The Gambia.

Two fisheries management plans exist. The Fishery Co-management Plan for The Gambia Sole Complex was finalised in 2012 with support from a USAID project and WWF (MoFWR, 2012). The National Sole Fishery Co-management Committee (NASCOM) and its associated Landing-site Committees (LACOMS) through the Community Fisheries Centre's Management Committees are delegated the exclusive rights to the artisanal sole fishery and the responsibility for its sustainable management. Management measures include minimum landing sizes, probation on drift nets, no fishing within 1 nm at any time, no night fishing from April to October, and discussion is ongoing about extending the closed zone to 2 nm. A second management plan,

[4] http://thepoint.gm/africa/gambia/article/fisheries-holds-first-joint-committee-meeting-on-eu-partnership-agreement

the Cockle and Oyster Co-Management Plan for the Tanbi Special Management Area, was prepared in 2011 (MoFWR, 2011). Full implementation and enforcement of both plans remains a challenge.

Protected areas to conserve mangroves exist in four areas: Bintang, Niumi, Baoblong, and Tanbi, but there are no marine protected areas.

3.3.6 Policy and financing constraints

The financing of the fishing sector is a major constraint for its development. This is felt as much in policy development as in implementation. As in most countries in the sub-region, fisheries sector development policies rely on funding from external partners that, very often, target or orient their interventions in areas of interest to them. Thus, all current and planned projects and programs are those of FAO, EU, World Bank, JICA, etc. (Table 10). There are, of course, regional funding initiatives of the SRFC or the Economic Community of West African States (ECOWAS). However, external donors often dictate the destination of their funds.

TABLE 10: EXAMPLE OF PROJECTS CARRIED OUT OR PLANNED BY THE PARTNERS

Partners	Areas of intervention				Duration	Budget (EUR)
	1	2	3	4		
FAO	Enhance enabling environment and capacity development for increased, sustainable and diversified agricultural and fisheries production and nutrition	Sustainable natural resources management for climate change adaptation and mitigation	Strengthened food and value chains for income generation and employment creation	Strengthened resilience and capacities for disaster risk reduction and management and climate change adaptation and mitigation.	2018-2021	387 816
EU	Improving food and nutritional security for the most vulnerable populations in the rural population	Combating climate change and its negative impacts, particularly with regard to coastal erosion	Promotion of jobs and training through the Youth Empowerment Project (YEP)		2018-2022	5.3 million
JICA	Construction of the jetty of Banjul	Market construction with fish from Bakoteh	Rehabilitation of three landing sites of inland fish in Bintang, Tendaba and Albreda, as well as access roads		2009-2011	41 447

There are also financial constraints in the implementation of fisheries policies. The budget allocated to the DoF is considered insufficient to ensure the fulfilment of all its missions, including research and the supervision of artisanal operations.

One of the main constraints of the fisheries sector in The Gambia is the lack of funding for professionals. Gambian actors in the artisanal sector have limited access to financial institutions such as banks and microfinance. In addition to the collateral requirements, interest rates on loans are deemed too high. Working capital from NGOs is very limited or non-existent. As a result, Senegalese traders, who have more facility for financing, dominate the fish trade, which requires significant funding. Gambian professionals generally do not have the means to compete with foreigners across the different activities in the fishing sector.

3.3.7 Education, training and business

Among the main technical constraints faced by the Gambian fishing sector is the lack of qualification of nationals in several areas. There is no school specialised in fishing, nor in the training of fishery technicians.

In shipyards, for instance, Gambians occupying key positions as ship captain or shipyard engineer are challenged to provide adequate repair and maintenance services. Some Gambian executives are trained either in Europe, as in England or the Netherlands, or in countries of the sub regions, such as Sierra Leone, Ghana.

Human resources for research, monitoring, aquaculture development and inland fisheries are largely lacking. The DoF, which is in charge of all these aspects, suffers from a lack of continuous training policy for its staff.

The sector also suffers from a staff shortage in quality assurance practices, particularly HACCP in the industrial and artisanal sub-sectors. The industrialists settled in The Gambia often hire Senegalese and other better-trained nationals.

The training, insertion and maintenance of young Gambians in artisanal fisheries is a major constraint. It turns out that the majority of Gambians are primarily farmers, and only part-time fishers in inland and estuarine waters. The marine fishery, which provides the bulk of landings, is dominated by foreigners, particularly Senegalese. Their return to Senegal during the holiday season is considered a “dead” period for the sector, felt on landing sites and processing activities, as well as in fishing industries whose activities are severely slowed down. Low landings during their absence hinder the sufficient and timely supply of fish through the various links of the value chain, leading to considerable increases in the prices of fresh fish and fish products.

Many young Gambians also believe that small-scale fishing is a low-income activity, making it difficult for them to enter the sector.

3.3.8 Technical constraints

If the Gambian fishing sector is still a slow and minor player in the development of the country, it is largely due to technical problems. The very weak technical capacity prevents the reduction of poverty expected of the sector by creating jobs and generating both income and cheap protein for the population.

The infrastructure for the valorisation of fishery products is insufficient and inadequate. The landing sites are underdeveloped and the fish are landed directly on the ground, which is littered with organic waste and wastewater.

The narrowness of the Banjul fishing jetty, which serves as the official fish landing port, as well as the dilapidated facilities of its shipyard, limit the country's competitiveness regarding landings by industrial fishing vessels.

The inability of fishing vessels to land in the country handicaps existing fish processing establishments that are under-supplied and limits their export capacity.

This situation prevents the factories from functioning optimally to stimulate employment, and generating foreign currency.

3.4 Value chain governance

3.4.1 Organisation

The fisheries sector in The Gambia is under the responsibility of the Ministry of Fisheries, Water Resources and National Assembly Affairs. The Ministry is responsible for defining fisheries policy and guaranteeing the safe and sustainable exploitation of resources for domestic and commercial purposes, to protect the population and promote food security. In early December 2019, the building of the Ministry of Fisheries was consumed by a fire that destroyed archives and equipment (the European Union delegation to the Gambia has subsequently announced a GMD 50 million grant to help rebuild the ministry[5], and the Chinese Embassy in Banjul donated GMD 2 million in office equipment[6]).

[5] https://standard.gm/fisheries-gets-d50m-eu-grant-to-repair-burnt-building/

[6] http://thepoint.gm/africa/gambia/article/china-responds-with-d2m-equipment-aid-to-fisheries-fire-disaster

The Department of Fisheries of the Ministry is responsible for the implementation of the fisheries policy. It is composed of five main units. According to a recent EU report, the number of staff for each unit has recently increased (MacFadyen et al., 2018):

- Fisheries development and research unit (17 technical staff and 2 support staff), responsible for research and statistics.
- Fisheries extension unit (42 technical and 3 support staff), responsible for extension and data collection at landing sites.
- Fisheries monitoring control and surveillance (MCS) unit (8 technical and 2 support staff), responsible for pre-licencing inspection, licensing (vessel authorisations) and MCS activities.
- Fisheries inspection unit (5 technical and 2 support staff), responsible for inspection of products at landings sites and on vessels under a memorandum of understanding with the Food Safety and Quality Authority, post-harvest technology, and issuing of IUU catch certificates.
- Aquaculture development unit (5 technical and 1 support staff), responsible for development of the aquaculture sector.

The DoF seems to have a hard time fulfilling its missions properly. The personnel is insufficient, poorly qualified, lacking financial and material means. Such lack of manpower and resources is a common denominator for the institutions in charge of fisheries in the West African sub-region. In Senegal, for instance, the main missions of their Department of Fisheries are divided among different directions, which also struggle to fill them correctly. The Thiès region in Senegal, which hosts more than three times the number of actors and fishing units than the whole of The Gambia, is served by only half as many staff as the Gambian DoF.

Other entities reporting to other ministerial departments are also involved in fisheries management in The Gambia:

- The Gambia Maritime Administration (GMA), responsible for managing, regulating and coordinating activities in the maritime industry, to ensure safety of navigation and protection of the marine environment, and for the registration of all vessels, including fishing vessels, under the Gambian flag.
- The Gambian Navy, under the authority of the Department of State for Defence, is responsible for the protection of fisheries and the territorial and coastal waters, along with other responsibilities related to border control, pollution, etc.
- The Ministry of Foreign Affairs, responsible for external relations.
- The Ministry of Environment, Climate Change and Natural Resource, and its National Environment Agency, responsible for environmental protection.
- The Food Safety and Quality Authority (FSQA), responsible for food safety and the issuing of health/hygiene certificates for exports.

In addition to the national institutes, there are professional organisations at national and local level that contribute to the management of fisheries. For instance, the artisanal sector is represented by/in:

- The National Association of Artisanal Fisheries Operators (NAAFO), an umbrella association which brings together 52 affiliated associations including artisanal fishers, but also traders and fish processors.
- The Gambia Artisanal Fisheries Development Agency (GAMFIDA), the only active NGO representing fishers, fish processors, fish traders, outboard engine mechanics, boat builders (canoes).
- The National Fisheries Platform, a permanent organisation to facilitate effective engagement with Government.
- The National Sole fishery Co-management Committee (NASCOM).
- Central management committees set up in each locality.

- Fishers' organisation grouping Senegalese nationals in the various landing sides where they are in activity.
- The TRY Oyster Women's Association (TOWA) which is a community-based organisation of over 500 women oyster and cockle harvesters in The Gambia working to raise their standard of living and become self-sufficient. This is achieved through skills building related to improved shellfish cultivation, product and market development, access to forms of credit, and alternative livelihood training (TRY, 2010).

The industrial actors (fisheries and fish processors) are represented by the Association of Gambian Fishing Companies (TAGFC).

However, the professional organisations in The Gambia, particularly those involved in fishing, are not very dynamic. They experience, for instance, a lack of involvement of Senegalese actors.

The Gambia does not have an industrial fleet owned by Gambians. Catches for industrial vessels that are Gambian-flagged but Chinese owned are presented in table 2)

Trade groups such as NAAFO and TAGFC, as well as the fisheries associations have inadequate organisational and administrative capacities. These organisations thus need strengthening and training in such areas as finance, advocacy, resource mobilisation and management, and technology (USAID, 2014).

The Gambia's fisheries sector operates under the authority and responsibility of the Ministry of Fisheries, Water Resources and National Assembly Matters. The DoF is mandated with 1) the management, development and conservation of the marine and inland fishery resources, 2) the enforcement of the fisheries legislation, 3) fisheries research, and 4) the promotion of aquaculture production. Until lately, the DoF was in charge of the responsibility of inspectorate and quality control of fish products in The Gambia (Inspection and certification of fish processing establishments is vested in the authority of the DoF).

The mandate of the DoF exceeds its limited budget and human resources. The lack of financial, human and technical resources do not allow to DoF to fully meet all these obligations. The absence of specialised academic institutions in the field of fisheries contributed a lot to the situation. In comparison, each of the four mandates of the departments of fisheries is under the responsibility of an autonomous directorate in most other SRFC states.

The consequences are a poor governance and management of the marine resources. Little scientific information is available for decision-making as The Gambia has no formal fisheries research institution to undertake scientific research on its own. Limited control over the resources is also noticeable, as well as a low level of aquaculture development.

3.4.2 Scientific support per value chain link

The DoF provides scientific advice on fisheries policy and evaluation of the actions carried out. Its insufficient knowledge of the biology, population dynamics and annual sustainable yield of demersal stocks and riverine resources, thereby seriously hinder quality policy formulation and decision-making. In short, there is a severe shortage of reliable statistical data, and data gaps. Scientific information is considered inadequate for good decision-making.

Nevertheless, some development partners such as FAO, EU and UN mobilise scientists when necessary to carry out studies in certain fields. It is in this context that the VCA4D team was informed, in the field, of two ongoing studies on the catfish and tilapia value chains recently commissioned by FAO.

3.4.3 Coordination

The coordination of activities in the value chain is ensured by the DoF in agreement with the types of actors, particularly with the professionals' organisations according to the different links involved. This is the case with the Association of Hull and Oyster Fishers in co-management of shellfish and oyster fisheries; with the National Advisory Committee for the Management of Small Pelagics, the National Association of Sole Operators (NASCOM) and other professional organisations such as NAAFO. Depending on the nature of the activities and the different parties involved, other structures from other Ministries may be involved in the coordination.

4 Economic analysis

4.1 Introduction

The aim of the economic analysis is to provide answers to the following two key framing questions:

- What is the contribution of the fisheries value chain to economic growth in The Gambia?
- Is this economic growth inclusive?

To appropriately address the two key framing questions, the following steps were undertaken in line with the VCA4D methodology:

1. Undertaking the financial analysis of the key actors.
2. Assessing the overall effects on the national economy (contribution to economic growth in terms of generated direct and indirect value added).
3. Analysing the sustainability and viability of the value chain within the international economy.
4. Assessing the inclusiveness of the value chain economic growth, by examining income distribution (business income, wages), employment creation and distribution.

4.2 Financial analysis of the key actors

The financial analysis involves assessing the profitability of the key actors identified consensually in the functional analysis, namely:

- Artisanal fisheries (encircling gillnet fisher, purse seine fisher, bottom gillnet fisher, stow net fisher, oyster collector/processor)
- Artisanal fish processors (smoking processor)
- Fish traders (retailer, medium fishmonger, large fishmonger)
- Industrial fish processors (freezing plant owner, industrial smoking plant owner, fishmeal plant owner)

4.2.1 Financial analysis of fishers

4.2.1.1 Main economic characteristics

The four most important artisanal fishing actors are considered in this analysis: encircling gillnet fisher, purse seine fisher, bottom gillnet fisher, and stow net fisher. These actors are operating all year round and are responsible for most fish caught, up to 80%. Encircling gillnet and purse seine fishers target small pelagic fish (sardinella, bonga) while bottom gillnet and stow net fishers target a wide range of coastal demersal fish (sole and cuttlefish mainly).

The typical purse seine unit usually consists of two canoes (because of the size of the net), the crew and the catches. The smaller canoe (17 m long on average) carries the net. The bigger one (21 m long on average) with a capacity of 20 t on average, carries the catch. The canoes are propelled by out-board motors (60 HP). The net is 800 m long with a depth of 48 m and makes the catch of fish possible by encircling. Among the species caught by purse seines, round sardinella and flat sardinella dominate.

The representative encircling gillnet fishing unit consists of a canoe of 16 m long and a capacity of 5 t, propelled by an out-board motor of 40 HP with a 300 to 500 m net and a depth of 10 to 20 m. The mesh used on board catches mainly bonga and less round sardinella, and flat sardinella.

Bottom gillnet targets sole and cuttlefish and supply quasi exclusively the industrial plant for exports. The canoe uses lengths of about 8 m and is powered by a 15 HP outboard engine. The total length of net is about 700 m. The mission was informed by managers of fish processing plants that the majority of the fishers involved in bottom gillnet activities are contracted by them for exclusivie supply. Fishing nets are supplied by the companies and fishers repay by selling the product to the plant.

Stow nets are especially used by artisanal fishers to catch shrimps in the estuary and tributaries. Shrimpers daily set out the net in the sea for hours and then haul and set them again unless the net needs be repaired. Some operate with two or four units of nets and each net is supported by an anchor. Shrimps captured by the artisanal fishers are landed locally in The Gambia and sold to the fish processing companies. The mission was, however, informed that some fishers land their catches in Casamance (south of Senegal) where prices are much higher.

The bivalve industry consists mainly of oyster harvesting, currently done on an artisanal level. The vast majority of harvesters are women. The harvesting season lasts from March through June. Most women work without a canoe. They walk to get to the oyster collecting zones. A few of them use non-motorized simple dugout canoes (3-4 meters in length), capable of carrying a couple of women who paddle from their base to the harvesting sites. The women have vertically integrated the activities of harvesting oysters by their presence throughout the value chain from production to marketing. The processing goes through a process of steaming, boiling, or roasting the collected products. Processed oysters are marketed in processing sites, neighbourhoods, urban market, weekly market days, and along roadsides.

4.2.1.2 Production and revenues

Bonga counts for 85% of the average yearly landings of surround gillnet fishers and round sardinella is the prevailing catch of purse seine fisher (72.5%). Cuttlefish is dominant in the landing of the bottom gillnet fisher and counts for 60% of the capture. Stow nets fishers target exclusively shrimps and women are involved in oyster collection. Table 11 indicates production by species of fishing actors.

TABLE 11. ANNUAL AVERAGE YEARLY PRODUCTION BY FISHERS (2014-2018)

Actors	Species targeted	Unit production (t)	Number of units
Encircling gillnet fisher	Bonga	102	149
	Flat sardinella	12	
	Round sardinella	6	
	Total	120	
Purse seine fisher	Round sardinella	254	41
	Flat sardinella	95	
	Total	349	
Bottom gillnet fisher	Sole	21	417
	Cuttlefish	3	
	Total	24	
Stow net fisher	Shrimp	9	103
	Total	9	
Oyster collector	Oyster	0.3	756
	Total	0.3	

Source: DoF database and field trips

Fish prices are generally characterised by extreme variability at the landing side. The fluctuations are a function of supply (quantities landed) and demand (market absorption possibilities). Other factors affecting the price level of fish are the availability of alternative species (the case of sardinella for bonga), the landing site (remoted landing sites affect negatively price of fish) and the season.

The bonga, which is more popular with the Gambian communities, is marketed on average at GMD 25 000 per t against GMD 20 000 for the species of substitution that are the two sardinella (quality 1). Fishmeal plant, however, paid only GMD 10 000 per t of fish (quality 2) for all species.

Historically, the Gambians are known for the consumption of bonga and not sardinella. Most of the sardinella produced during the early periods were transported to the Senegalese markets, as Gambians hardly bought them. As the production of bonga is declining, Gambians now start consuming sardinella (more available and more affordable) as an alternative consumption. Table 12 indicates income generated by fishers.

TABLE 12. INCOME GENERATED BY FISHERS

	Encircling gillnet fisher			Purse seine fisher			Bottom gillnet fisher			Stow net fisher		
Species	Quantity (t)	Unit price (GMD)	Gross revenue (GMD)	Quantity (t)	Unit price (GMD)	Gross revenue (GMD)	Quantity (t)	Unit price (GMD)	Gross revenue (GMD)	Quantity (t)	Unit price (GMD)	Gross revenue (GMD)
Bonga quality 1	79	25 000	1 975 000									
Bonga quality 2	23	10 000	230 000									
Flat sardinella quality 1	9	20 000	180 000	35	20 000	700 000						
Flat sardinella quality 2	3	10 000	30 000	60	10 000	600 000						
Round sardinella quality 1	5	20 000	100 000	51	20 000	1 020 000						
Round sardinella quality 2	1	10 000	10 000	203	10 000	2 030 000						
Sole							21	100 000	2 100 000			
Cuttlefish							3	190 000	570 000			
Shrimp										9	185 000	1 665 000
Total			2 525 000			4 350 000			2 670 000			1 665 000

4.2.1.3 Capital and investments

The investments on a fishing unit concern mainly the purchase of canoes, engine, fishing gear and accessories. The size and the quality of the wood used are decisive in the price of a canoe. Engines and fishing nets are sold to fishers by private mandated companies. The cost of gear depends on type, size, and material. The accessories consist of drums, anchors, buoys, ropes, lamps, lifejackets, knives, waxes, seals, a battery of 12 volts and paddles. Fishing equipment does not benefit from any tax cuts. Table 13 summarises the associated costs for the different fishers.

TABLE 13. CAPITAL AND INVESTMENTS COSTS (GMD)

Items/Fishers	Encircling gillnet	Purse seine	Bottom gillnet	Stow net
Gear	300 000	1 000 000	100 000	75 000
Engines	175 000	275 000	105 000	175 000
Canoes	250 000	400 000	85 000	120 000
Accessories	25 000	40 000	10 000	20 000
Total	750 000	1 715 000	300 000	390 000

Source**:** Field trip data

4.2.1.4 Cost structure

The Intermediate Goods and Services (IGS) consist of expenditure incurred in the course of fishing operations. They depend on fishing efforts deployed. They are fuel, lubricants, food on board, and small repairs. The food is based on the size of the crew and the time spent at sea. Fuel is the most important part in the operational costs. A litter of pre-mixed fuel costs GMD 50. The small repairs concern the costs of material for usual mending activities done by crew members. Crew and fishers share the operational costs.

Fixed costs mainly include depreciation of the various components of the capital equipment of the fishing unit and the cost of the fishing license. Small-scale fishery is open access in The Gambia, there is no license fee. The outboard engine is depreciated over 5 years and the canoe over 10 years. Depreciation is not computed in this analysis as fishers in their daily activity are considering a cash account. Renewed continuously, fishing gear is not subject to depreciation at the risk of double accounting. The replacement cost is covered by the maintenance of the gear.

The annual cost of maintenance and repair of the engine is roughly estimated at 20% of its purchase price. The repair and maintenance of canoes are estimated at 10% of the acquisition cost. They consist of changing board planks and spurs, painting and re-sealing them. The replacement cost of the gear is estimated annually at one fifth of the initial value of the net.

Table 14 summarises the IGS of fishers.

TABLE 14. FIXED COSTS AND INTERMEDIATE GOODS AND SERVICES (GMD)

Items/Fishers	Encircling gillnet	Purse seine	Bottom gillnet	Stow net
Fixed costs				
Depreciation				
Engine	35 000	68 750	21 000	17 500
Canoes	25 000	40 000	8 500	12 000
Total fixed cost (depreciation)	60 000	107 750	29 500	29 500
Intermediate goods and services				
Fuel	1 650 000	3 300 000	495 000	0
Food	240 000	450 000	150 000	45 000
Ice	0	0	187 500	0
Repair/maintenance				
Gear	60 000	200 000	20 000	15 000
Engine	35 000	55 000	21 000	0
Canoe	25 000	40 000	8500	12 000
Accessories				
Intermediate Goods and services	2 010 000	4 045 000	882 000	72 000

Source: Field trip data

4.2.1.5 Share system in the small-scale fishery

Artisanal fishers and the crew members share the economic risks of fishing trips. A sharing system is used for the remuneration of the factors of production (labour and capital equipment). The sharing is made between fishers (fishing unit crew) and owners of the equipment after deduction of the common expenses (fuel, food, small maintenance) from the output of the fishing trip. The applied rate varies according to the types of gear, the fishing communities, and the landing centre. However, a fairly common practice among the targeted fishing units in this study is as indicated in Table 15.

- Encircling gillnet: one share per fisher, one for the engine, one for the net and one for the canoe. The owner of the fishing equipment (canoe, engine and gear) receives 22% of the net earnings as a remuneration of his capital. The crew obtains the remaining 78%.
- Purse seiner: allocation of 1/3 of the net income to the fishing gear and the remaining 2/3 to the crew, the two canoes, and the two engines which a share per crew member and one part for each piece of equipment. The owner of the fishing equipment receives globally 45% of the net earning against 55% for the crew.
- Bottom gillnet: one part per fisher, one part for the engine, one part for the fishing gear, and one part for the canoe. Labour counts for 54% of net earnings and capital 46%.
- Stow net: As the fishing unit is handled by the only fisher owner, there is no salary to be paid. Capital equipment counts of 100% of sales revenues.
- Table 15 indicates the sharing system in the Gambian small-scale fishery.

TABLE 15. SHARING SYSTEM (%) IN THE SMALL-SCALE FISHERY

Factors	Encircling gillnet	Purse seine	Bottom gillnet	Stow nets
Capital	22	45	46	100
Labour	78	55	54	0

Source: Field trips

4.2.1.6 Financial profitability of fishing units

Fishing equipment is sold with no subsidies or tax cuts from the Gambian States authorities in charge of the fishery as well as intermediate goods and services.

For the financial analysis of the fisher's activities, we considered only volumes of fish being sold. Self-consumption and fish being distributed to elder fishers are being subtracted from the average landings. The intermediate goods and services count for 80% of the total expenses of a encircling gillnet (Figure 10), 92% for the purse seine (Figure 11), and up to 100% for the snow net (Figure 12). Fuel is the largest cost component of the IGS (up to 82% for the purse seine).

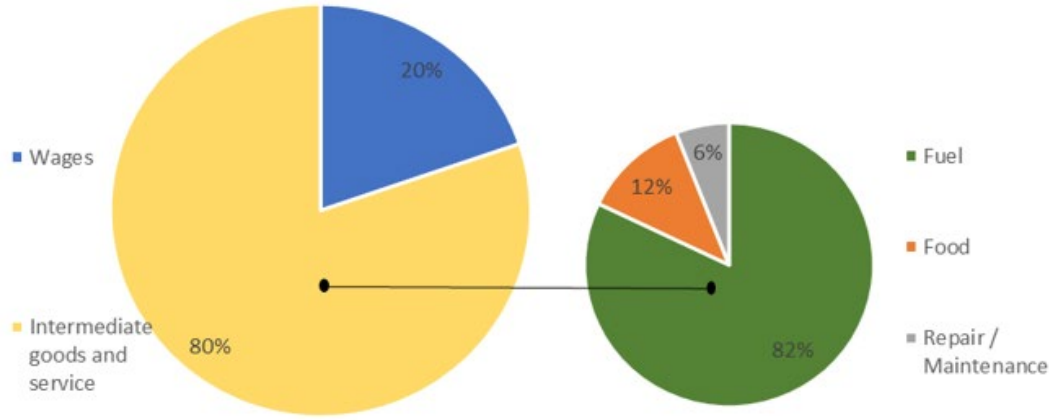


FIGURE 10. COST STRUCTURE OF THE ENCIRCLING GILLNET FISHER

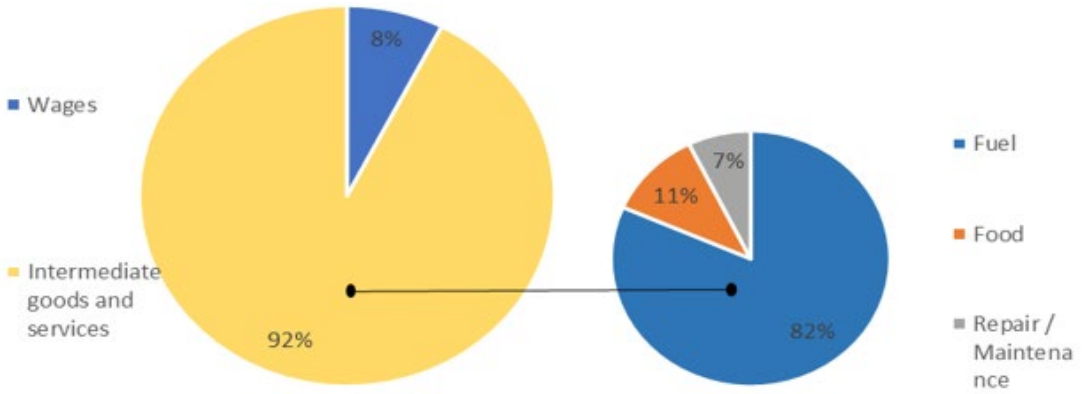


FIGURE 11. COST STRUCTURE OF THE PURSE SEINE FISHER

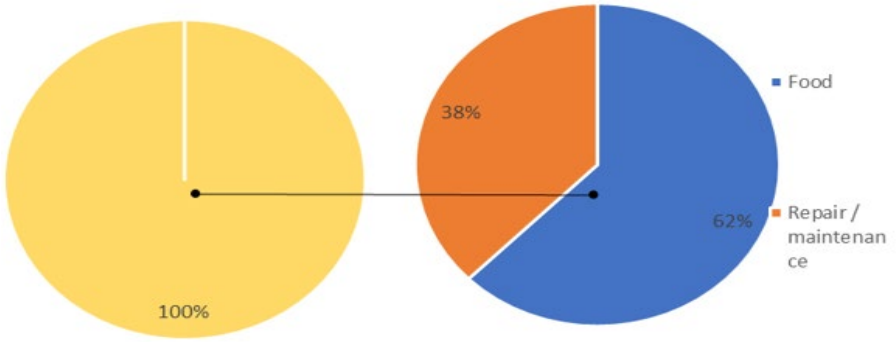


FIGURE 12. COST STRUCTURE OF THE STOW NET FISHER

Purse seine fishers register a negative average income and a net value added of GMD 305 000. The revenue generated is insufficient to cover the operating of the fishing unit. The net operating profit for the encircling gillnet fisher is GMD 19 700 for a net value added of GMD 515 000. The operating profit of the bottom gillnet amounts to GMD 795 500 and a net value added of GMD 1 788 000. Stow nets have better financial ratios with an operating profit and a net value added of GMD 1 593 000. This latest actor has no value addition apart from the net operating profit as he is a single worker in this fishing unit and is not subject to any taxes or financial charges. Globally, bottom gillnet and stew net fishing practices are financially viable. Fishers target high value species oriented to export markets. The different ratios of the fishing units are shown in Table 16.

In terms of remuneration, the revenue-sharing system is more profitable for crew members to the detriment of owners of fishing units. For example, for purse seine units where the net operating profit of the owner is negative, each on-board fisher receives annual gains of GMD 1 593 000. This raises a serious problem of renewal of capital equipment within fishing units. This situation is aggravated by the higher cost of engines, dugout canoes and fishing nets as no subsidies or taxes cuts are provided to the small-scale fishery. Last not least, the fishing units targeting small pelagic fish with low commercial value and oriented mainly to supply fishmeal plants.

TABLE 16. ANNUAL OPERATING ACCOUNTS FOR FISHERS

	Encircling gillnet	Purse seine	Bottom gillnet	Stow net
Output				
Sales	2 525 000	4 350 000	2 670 000	1 665 000
Total output	2 525 000	4 350 000	2 670 000	1 665 000
Expenses				
IGS	2 010 000	4 045 000	882 000	72 000
Wages	495 300	330 000	992 250	0
Total expenses	2 505 300	4 375 000	1 874 250	72 000
Profitability				
Net operating profit	19 700	-25 000	795 750	1 593 000
Value added	515 000	305 000	1 788 000	1 593 000

4.2.1.7 Fisher's net income, minimum wage and other social categories of income

The Gambia's minimum wage is the lowest amount a worker can be legally paid for his work. It is GMD 500 per day or GMD 15 000 monthly. Except purse seine units, the individual monthly incomes of the Gambian artisanal crew members are much higher than the guaranteed minimum professional wage (Table 17). Bottom gillnet crew members are gaining up to six time the minimum wage.

The average wage of Gambians working in the fishing segment was GMD 42 760 per month, ranging from GMD 13 200 for fishers on-board a purse seine up to GMD 87 560 for fishers on-board a bottom gillnet.

TABLE 17. LEVEL OF SALARIES OF ARTISANAL FISHERS

Fishing unit	Crew annual net income (GMD)	Fishing crew (number of individuals)	Individual monthly income (GMD)
Encircling gillnet	495 300	18	27 516
Purse seine	330 000	25	13 200
Bottom gillnet	676 480	8	87 560

Source: Own calculation

Compared to the personal of the fishery administration, incomes of bottom gillnet crew members are greater than all categories listed (Table 18). Encircling gillnet crew members' salaries are behind salaries of cleaner, watchman, driver, and messenger.

TABLE 18. LEVEL OF SALARIES FOR SOME PROFESSIONAL CATEGORIES OF THE FISHERY ADMINISTRATION PERSONAL

Professional category	Level of salaries
Principal fishery officer	85 000
Senior fishery officer	79 000
Fishery officer	62 000
Assistant fishery officer	57 000
Secretary	47 000
Cleaner	18 000
Watchman	18 000
Driver	15 500
Messenger	15 500

Source: DoF

4.2.2 Financial analysis of fish processors

4.2.1.8 Economic characteristics

Fish processing is mainly limited to drying and smoking. It is a very important activity within many fishing villages as a value-addition and income generating activity. Operations of smoking and drying fish are dominated by women. Artisanal processors use mainly round sardinella, flat sardinella, and bonga caught by encircling gillnet and purse seines fishing units.

In some villages, "Chorkor" ovens are built by donation agencies and are handled by the communities. Women paid a rent for each processing operation. Where these facilities are not available, due to relatively high cost of improved smoking facilities, smokers use barrel ovens with low handling capacity and operate in an environment with poor hygienic conditions (Figure 13). Even, some women dry fish directly on the sand. It happens to end up with poor quality products.

FIGURE 13. POOR HYGIENIC CONDITION FOR FISH PROCESSING (M. DEME, JULY 2019)

4.2.1.9 Cost structure

Women involved in artisanal fish processing activities do not invest in the construction of smoking ovens and drying racks. The ovens in the various fishing centres were built by partners or public projects and their management was entrusted to the communities. The women pay a symbolic sum for the use of these ovens.

Operating costs for smoking processor include raw materials (fish), transportation of fish to the processing site, wood, salt, packaging, renting of ovens, and labour (filling the ovens, reversing the keys during the smoking process and shelling the smoked fish). Fish is paid GMD 25 per kg for bonga against GMD 20 per kg for both round sardinella and flat sardinella. On average, smoking processors handle yearly 192 t of fish for 135 t of products (yield rate of 70%).

Costs for intermediate goods and services amount to GMD 4 648 000 corresponding to 85.6 of total expenses. Fish counts for 82.6% of IGS. Other major costs include wood (GMD 640 000).

Processed product is sold at a market price of GMD 45 per kg for sardinella and GMD 47 for bonga. The net operating profit for a smoking processor is negative (Table 19).

TABLE 19. ANNUAL OPERATING ACCOUNTS FOR ARTISANAL SMOKING PROCESSOR

Output		
Sales		5 337 000
Total output		24 000
Expenses		
IGS		
Fish		3 840 000
Wood		640 000
Salt		168 000
Wages		776 800
Total expenses		5 424 800
Profitability		
Net operating profit		-87 800
Value added		689 000

Women purchase fish directly from fishers and generally face stiff competition from fishmongers, supplying the local market with fresh fish, and fishmeal plants emerging in The Gambia. With limited cash availability and handling small volumes of fish, women processors become price-takers and forced to buy their raw materials at the prevailing market rates.

4.2.1.10 Processing of oysters

Processing of oysters is performed (vertically integrated) by the same women who harvest them from the wild. The processing of oysters involved steaming in pans for around one hour. During the process, the shells

open up and the meat is easily extracted. Some few women continue to smoke oysters on the metal grill over the fire. Women use a knife to extract the meat from the split open oysters. Before being marketed, products are washed, salted and sundried. Products are marketed in diverse places (processing site, urban market, along roadsides, weekly market days). From the measure of an empty milk tin used, the price of processed oyster is around GMD 600 per kg. The final consumers of such products are individual consumers for home use. In terms of financial analysis, each women collector handles during the period around 300 kg of fresh oyster. With a yield rate of 1.5%, the processed product is around 4.5 kg sold at the above mentioned market price of GMD 600 per kg. The net cash flow is around GMD 2 700 per season. Women collect wood in the adjacent forest and conduct work related to collecting oyster, boiling, washing, drying and sailing.

4.2.3 Financial analysis of primary distributors

4.2.1.11 Economic characteristics

The distribution of fish is the result of a large number of economic agents whose functions within the flow chain are relatively specialised. These actors intervene in the distribution of fish at different levels. In this study, three agents are being considered: retailer, medium fishmonger and large fishmonger. It was found during the field trips that women are especially active in the retailing fish trade while men dominate wholesaling activities. For the first ones, their very weak financial base and the rigors of fish trade (long absence away from the family, overnight stays in the interior of the country) confine them in the small distribution.

Wholesalers accomplish diverse functions: purchase of fish on beaches, conditioning and transport to markets, and distribution. They also fulfil an important function of financing small-scale fisheries to have the exclusivity of the catches. Wholesalers are self-employed and self-financed.

4.2.1.12 Cost structure

Common operating costs include raw materials (fish), ice, and taxes (Table 20). Transport cost is specific to retailer which resort to public transportation even though few of them use cycles and motorcycles to transport their fish from the beach to the market.

TABLE 20. ANNUAL OPERATING ACCOUNTS FOR PRIMARY DISTRIBUTORS

Primary distributors	Retailer	Medium fishmonger	Large fishmonger
Output			
Sales	3 240 000	9 420 000	40 650 000
Total output	3 240 000	9 420 000	40 650 000
Expenses			
IGS			
Fish	1 134 000	8 025 000	29 809 000
Fuel	-	312 500	717 500
Ice	81 000	320 000	2 250 000
Boxes	-	4 000	70 000
Maintenance of truck	-	20 000	50 000
Transport	72 900	-	-
Wages	-	20 000	150 000
Taxes	4 860	37 500	75 500
Total expenses	1 292 760	8 739 000	33 122 000
Profitability			
Net operating profit	1 947 240	681 000	7 528 000
Value added	1 952 100	738 599	7 753 500

Costs for intermediate goods and services counts for no less than 99% of total expenses for all primary distributors. Fish is the highest operating cost component, corresponding to GMD 1 134 000 (88% of IGS) for the retailer (Figure 14), GMD 8 025 000 (92% of IGS) for the medium fishmonger (Figure 15), and GMD 29 809 000 (91% of IGS) for the large fishmonger (Figure 16).

As for wages, medium and large fishmonger employs people intervening at different level of the distribution process (conditioning fish, driving trucks, sailing fish).

All fish distributors register a positive net operation profit and a value added. The net operating profit is GMD 1 947 240 for the retailer, GMD 681 000 for the medium fishmonger and GMD 7 528 000 for the large fishmonger. The lowest value added is register by the medium fishmonger (GMD 738 599) and the highest by the large fishmonger (GMD 7 753 500). Retailers generate a value added of GMD 1 952 100.

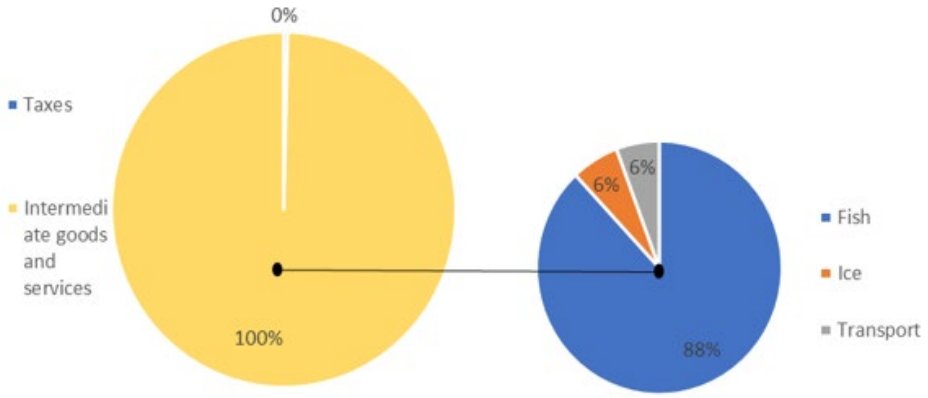


FIGURE 14. COST STRUCTURE OF THE RETAILER

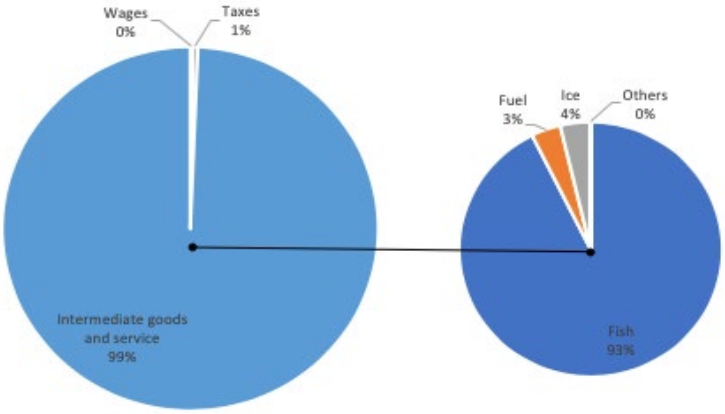


FIGURE 15. COST STRUCTURE OF THE MEDIUM FISHMONGER

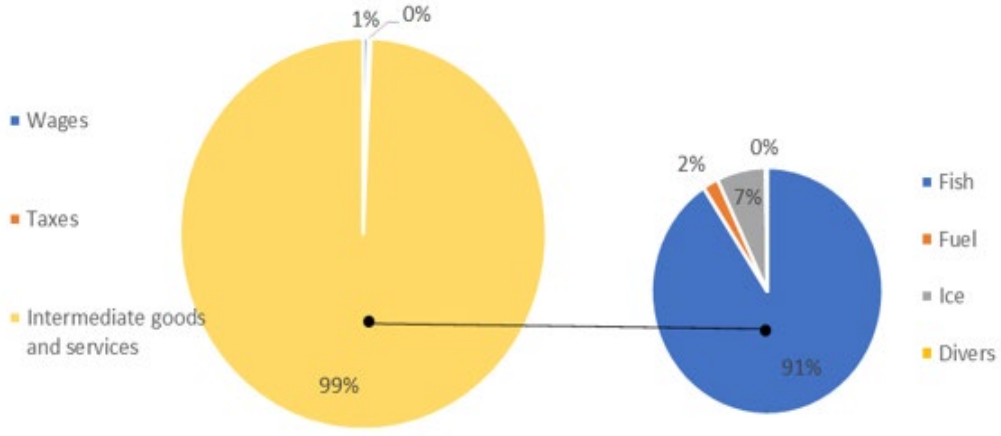


FIGURE 16. COST STRUCTURE OF THE LARGE FISHMONGER

4.2.4 Financial analysis of processing plant owners

4.2.1.13 Economic characteristics

Globally, 14 processing plants are established in The Gambia including one industrial smoker factory, 10 industrial freezers, and 3 fishmeal plants. The 14 fish processing plants depend on 90% of the small-scale fishery for their supply of fish. They are subject to periodic shortage of raw materials, largely related to the seasonality of the fisheries but also to the prolonged return of artisanal fishers to their countries of origin (mainly Senegal) on religious holidays or family ceremonies. For instance, the three operational fishmeal factories are supplied by the production of artisanal purse seine fishing units largely dominated by the Senegalese fishers and bound to the plants by exclusive sales contracts.

4.2.1.14 Cost structure

The cost structure of a freezing plant is largely composed of intermediate goods and services (92%) such as the cost of fish, electricity, packaging, fuel, and transport for both personal and products (Figure 17).

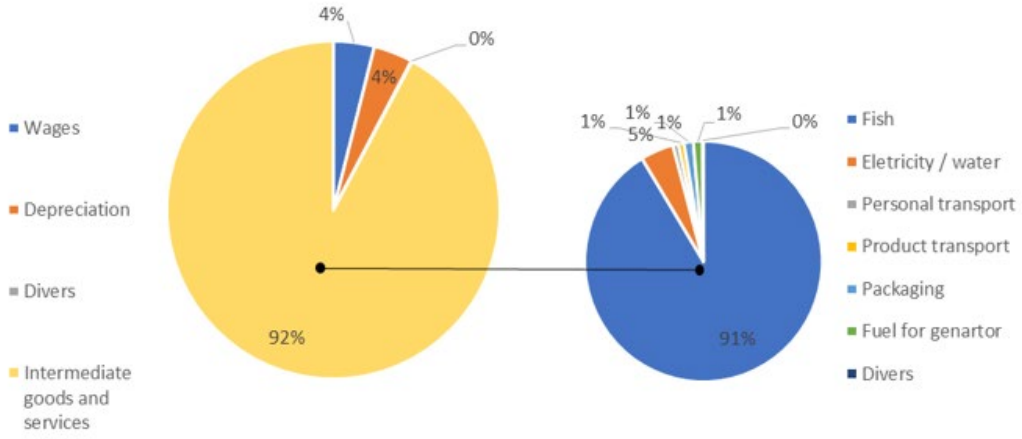


FIGURE 17. COST STRUCTURE OF A FREEZING PLANT OWNER

For the industrial smoking plant, 94% of total expenses are for intermediate goods and services of which fresh fish are the main cost component (93%) followed by electricity (2.8%) and location charges (1.3%). Other large expenses include wages (GMD 840 000), and depreciation (GMD 600 000) (Figure 18).

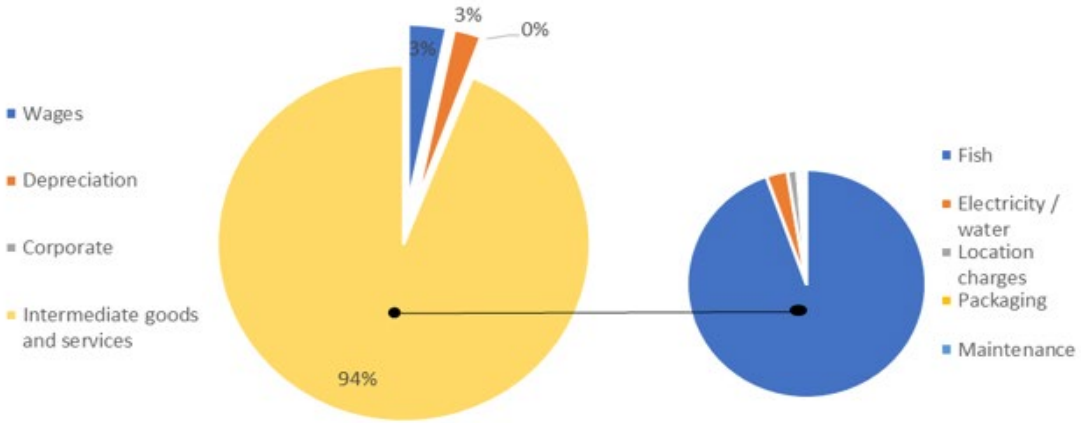


FIGURE 18. COST STRUCTURE OF A SMOKING PLANT OWNER

Like the two first processing plants, IGS are dominant with regard to the total expenses of fishmeal plants (93%). Among intermediate goods and services, the expenditure on fresh fish is the highest (GMD 22 133 500) followed far away by electricity (GMD 672 000), and location charges (GMD 308 000) (Figure 19).

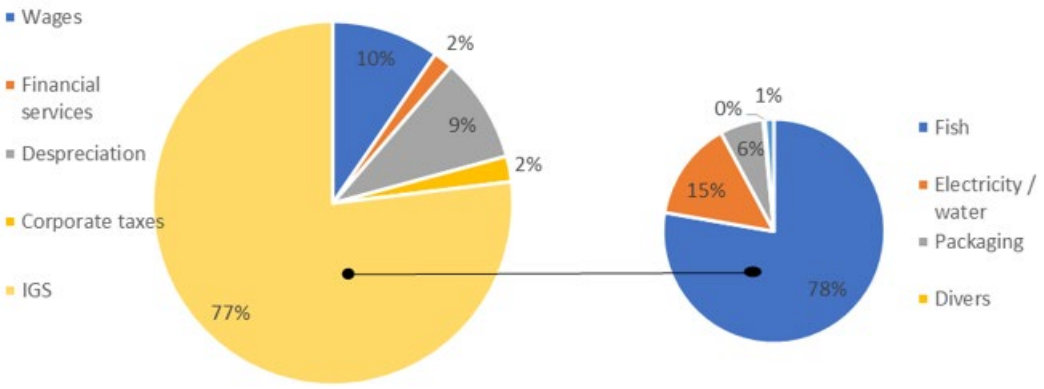


FIGURE 19. COST STRUCTURE OF A FISHMEAL PLANT OWNER

All processing practices are found to be financially viable. They all generate a positive profit (Table 21, Table 22 and Table 23).

The industrial smoking plant is handling far less fish than the freezing plant but it is realising a very close net benefit. Unprocessed products exclusively handled by freezing plant are less valuable in the international market.

The net operating profit is GMD 77 542 000 for a freezing plant and the net value added amounts to GMD 87 898 500. For the industrial smoking plants, the net operating profit and value added are, respectively, GMD 62 963 000 and GMD 64 643 000. The estimated value added resulting from the fishmeal plant is GMD 22 702 925 and the net operating profit is GMD 12 152 925.

Fish factories have difficulties securing fish supplies and thus tend to operate below capacity. Most of the fish plants operate intermittently due to high-energy cost and frequent power shutdowns. The supply of electricity is insufficient, unreliable and expensive. The use of power generation following the extended cuts of electricity is very costly, as The Gambia no longer waives taxes levied on gasoline and diesel-fuel for the fishing industry.

TABLE 21. FINANCIAL RATIOS FOR FREEZING PLAN OWNER (GMD)

OUTPUT	
Sales	316 910 000
Total output	316 910 000
Expenses	
IGS	
Fish	200 250 000
Electricity/water	9 900 000
Chemical products	132 000
Personal transport	1 650 000
Product transport	1 650 000
Packaging	2 780 000
Staff workwear	148 000
Communication	126 500
Fuel for generator	2 750 000
Maintenance	275 000
Insurances	275 000
Sub-total (IGS)	219 936 500
Wages	9 471 000
Financial services	715 000
Corporate taxes	170 500
Sub-total	10 356 500

Depreciation	9 075 000
Total expenses	239 368 000
Profitability	
Gross operating profit	86 617 000
Depreciation	9 075 000
Net operating profit	77 542 000
Value added	96 973 500

TABLE 22. FINANCIAL RATIOS FOR INDUSTRIAL SMOKING PLANT OWNER (GMD)

OUTPUT	
Sales	88 246 500
Total output	88 246 500
Expenses	
IGS	
Fish	22 133 500
Electricity/water	672 000
Location charges	308 000
Fuel	120 000
Salt	10 000
Hygienic materials	50 000
Packaging	100 000
Flake ice	60 000
Maintenance	120 000
Insurances	75 000
Maintenance	120 000
Sub-total (IGS)	23 768 500
Wages	840 000
Corporate taxes	75 000
Sub-total	915 000
Depreciation	600 000
Total expenses	25 283 500
Profitability	
Gross operating profit	63 563 000
Depreciation	600 000
Net operating profit	62 963 000
Value added	64 478 000

TABLE 23. FINANCIAL RATIOS FOR FISHMEAL PLAN OWNER (GMD)

OUTPUT	
Sales	89 207 925
Total output	89 207 925
Expenses	
IGS	
Fish	45 880 000
Electricity/water	8 500 000
Packaging	3 750 000
Maintenance	175 000
Communication	200 000
Insurances	750 000
Sub-total (IGS)	59 255 000
Wages	7 450 000
Financial services	1 350 000
Corporate taxes	1 750 000
Sub-total	10 550 000
Depreciation	7 250 000
Total expenses	77 055 000
Profitability	
Gross operating profit	19 402 925
Depreciation	7 250 000
Net operating profit	12 152 925
Value added	29 952 925

4.3 Effects within the national economy

Table 24 details value added figures for all segments of the value chain. It is the product of merging the individual operating accounts of the different value chain actors. The average annual value added generated by the Gambian fishery is estimated at GMD 2 496 169 635, which is a combination of wages (GMD 210 480 296), taxes (GMD 2 259 499), financial costs (GMD 5 517 157), depreciation (GMD 83 331 664), and net operating profits (GMD 2 194 581 019). The value of production at VC level is around GMD 3.3 billion.

TABLE 24. VALUE ADDED FOR DIFFERENT SEGMENTS OF THE VALUE CHAIN (GMD)

Agents	Final output	Intermediate Consumption (in and outside VC)	Wages	Taxes	Financial costs	Depreciation	Net Operating Profit	Value added (VA)
Encircling gillnet fishers	0	233 751 941	59 310 194	0	0	0	601 960	59 912 154
Purse seine fishers	0	40 720 401	16 232 793	0	0	0	-12 306 221	3 926 572
Stow net fishers	0	252 779 167	0	0	0	0	109 265 833	109 265 833
Bottom gillnet fishers	0	41 447 117	48 075 062	0	0	0	1 450 477 821	1 498 552 883
Retailers	34 886 569	16 377 723	59 763	0	0	0	18 449 083	18 508 846
Medium fishmongers	113 286 070	79 242 835	231 414	433 902	0	3 471 213	29 906 707	34 043 236
Large fishmongers	237 081 523	190 253 486	3 433 873	374 864	0	3 433 873	39 585 426	46 828 037
Fishmeal processors	157 642 849	99 839 289	5 519 807	0	0	5 320 296	46 963 456	57 803 560
Artisanal smokers	20 881 217	21 279 049	3 023 121	0	0	0	-3 420 952	-397 832
Industrial smokers	158 060 909	24 642 637	1 513 161	135 104	0	1 080 829	130 689 179	133 418 272
Industrial freezers	2 567 258 070	2 035 078 119	73 081 109	1 315 630	5 517 157	70 025 453	382 240 603	532 179 951
Oyster collectors	2 128 125	0	0	0	0	0	2 128 125	2 128 125
Value chain	3 291 225 332		210 480 296	2 259 499	5 517 157	83 331 664	2 194 581 019	2 496 169 635

The fishery sector also generates indirect effects on other national sectors (transportation, energy, small and medium industry) which are summarised in Table 25. The total value added of the fishery value chain in The Gambia is estimated GMD 2 855 019 007 composed of GMD 2 496 169 635 of direct value added, plus GMD 358 849 366 of indirect value added.

TABLE 25. DIRECT AND INDIRECT VALUE ADDED OF THE FISHERY VALUE CHAIN IN THE GAMBIA (GMD)

In GMD	Direct effects	Indirect effects	Total effects
Imports	299 363 934	146 100 496	445 464 430
Value added			
Wages	210 480 296	179 526 552	390 006 844
Taxes	2 259 499	98 467 183	100 726 686
Financial charges	5 517 157	52 139 000	57 656 161
Property income	0	0	0
Depreciation	83 331 664	0	83 331 664
Net operating profit	2 194 581 019	28 716 631	2 223 297 652
Total value added	2 496 169 635	358 849 366	2 855 019 007

4.3.1 Contribution of the value chain to the GDP

The Gambia Bureau of Statistics (National Accounts of the Gambia) calculates each year the global Gross Domestic Product (GDP) and the sectorial GDP. As far as fisheries is concerned, the indicator provided limits for the contribution of the sector to only fishing operations. It does not include the contribution of the post-harvest sub-sector, in particular the processing of fish products, considered as an activity of the secondary sector, and the marketing of fresh and processed fish products which, in their view, falls within the tertiary sector. This method of calculating sectoral GDP leads to an underestimation of the economic weight of the sector as a whole.

According to the National Accounts of the Gambia, the GDP in The Gambia worth GMD 43.3 billion in 2016. The Agriculture sector GDP is estimated at GMD 8.4 billion (Table 26). The fishery sub-sector (GMD 0.86 billion) is counting for 10.2% of the Agriculture sector and 1.9% of the national GDP.

TABLE 26. GROSS DOMESTIC PRODUCT BY TYPE OF ACTIVITY (IN '000 GMD)

	2014	2015	2016
Gross Domestic Product (GDP)	35 436 434	39 927 286	43 277 245
Agriculture, Livestock, Forestry, Fishing	6 849 689	7 646 613	8 429 074
Crops	2 889 447	3 135 638	3 337 651
Livestock	3 151 453	3 600 999	4 066 650
Forestry	141 086	153 505	161 510
Fishing	667 702	756 471	863 262

Source: National Accounts of the Gambia

Beyond the wealth created by the capture segment, our approach also considers processing activities as well as those of marketing products. Thus, the absolute contribution of the fishery sector in our approach is the sum of the value added of the production segment (fishing), artisanal and industrial processing of fish products, and marketing of products (fresh, processed).

If we consider the 2016 GDP computed by the National Accounts of the Gambia as representative of the 2014-2018 period considered in this study, the fisheries value added represents 6.5% of the Gambia's GDP. Considering the production segment, fishing contributes to 20.1% of the growth generated by the agricultural sector.

4.3.2 Contribution of the value chain to the balance of trade

The trade balance in fisheries provides information on the profile and importance of foreign trade in fishery products. Processors plants exports are estimated at GMD 2.883 billion (Table 24). For exporting marine products, The Gambia needs to import fuel, packaging materials, chemical products. These intermediate consumptions are estimated at GMD 0.299 billion (Table 25). The difference between the export of fish in

value and import of intermediate goods linked to fish exports indicates a trade surplus of around GMD 2.593 billion generated by the fishery sector. The trade balance of the fishing sector is largely in surplus.

4.3.3 Contribution of the value chain to public finances

The Government of The Gambia does not provide direct or indirect subsidies to the value chain actors. The sector does not benefit from any other funding allocation from other national or international bodies.

The main revenue expected from the fishery sector corresponds to fishing rights (license to operate). However, the open access prevailing in the small-scale fishery in The Gambia made that fishers have no licence or permit to pay.

The DoF has conceded the management of fishing docks, smoking sheds, boxes and fuel stations to the Community Fisheries Centres (CFC) with the goal of strengthening the artisanal fisheries. The fees and service charges collected are mainly used for the upkeep and maintenance of the facilities. The opacity and lack of transparency around these recipes prevents any evaluation.

Fish processing plants are subject to direct taxes (corporate taxes up to 27% of net profit) and indirect taxes (mainly value added tax of 15%).

Globally, contribution of the fishery sector to national budget (State and local collectivities) is estimated at GMD 100 726 686 (Table 25).

In addition to taxes and subsidies related to activities of the value chain, revenue generated from fishing agreement should be considered as part of the contribution of the fishery sector to public finances. The Gambia has signed both bilateral and multilateral agreements. Except for the European Union protocol, all other arrangements are confidential and surrounded by a strong opacity. The analysis will be then limited to the available EU protocol. The "Sustainable Fishing Partnership Agreement – SFPA" was signed in 2018 between The European Union and The Gambia (see also 3.3.4). The agreement covers a period of 6 years. The SFPA allows the EU vessels the possibility to fish 3 300 t of tuna and tuna-like species as well as 750 t of hake per year in the waters under the jurisdiction of The Gambia. In return, The Gambia receives from the EU a financial contribution of EUR 550 000 (GMD 30 800 000) per year. In addition, The Gambia would generate additional revenue from the licensing fee from European vessels, observers and support vessels fees. Around EUR 900 000 are then expected yearly as additional revenue if we refer to the estimation of the Ministry of Fisheries, which leads to a total amount of EUR 1 450 000 (GMD 81 200 000) per year. Half of the yearly financial compensation (EUR 275 000) are planned to be used to strengthen the sustainable management of Fisheries resources and the development of the Gambian fishing sector. Other advantages linked to the SFPA is the co-operation in the fight against IUU fishing as The Gambia facing weak surveillance and monitoring of national resources. The agreement is focused on marine resources (tuna and hake) where the Gambian have no capacities to exploit them. Consequently, the agreement is concerned with the surplus production and allocated quota is in line with International Commission for the Conservation of Atlantic Tunas (ICCAT) country catch allocation

4.4 Sustainability and viability of the value chain within the global economy

Exports of fishery products are liberalised in The Gambia and therefore fall exclusively to private actors. In addition, the fish exporters do not benefit from any subsidy or tax reduction in the conduct of their activities. The Gambian fishery industry roughly exhibits characteristics of pure and perfect competition. However, imported and exported goods and services are subject to various taxes and fees. The prices of these goods and services on the local market are higher than those displayed on the international market because of the additional costs incurred.

As the fishery sector value chain in The Gambia competes neighbours countries to the international markets in fish product exports, it is indicated to measure the balance of the goods and services produced and consumed by the value chain using international prices to give an indication of the overall economic gain or loss. Two standard coefficients dealing with the Domestic Resource Cost and the Nominal Protection Coefficient are being computed.

The Nominal Protection Coefficient of 0.883 indicates that the agents of the chain value do not generate more income than they have on the international market. The net operating profit of fish processors would be higher than what they are now if most raw materials were not imported.

The Domestic Resource Cost of 0.090 indicates that the value chain is viable in the international economy and leads to an economic gain for the national economy since the economic value created is higher than the cost of using the non-tradable factors of production. In other words, the VC has a comparative advantage in that it uses fewer domestic factors of production than it generates economic value calculated at international prices.

4.5 Growth inclusiveness

This part of the reports brings an economic perspective to reply to the framing question 'Is the economic growth generated by the Gambian fishery value chain inclusive?

4.5.1 Income distribution across the value chains

With a direct value added of about GMD 2 496 169 635, the main part is generated by producers (67%). Processors counts for 29% while contribution of traders to the value added remains weak (4.0%) (Figure 20).

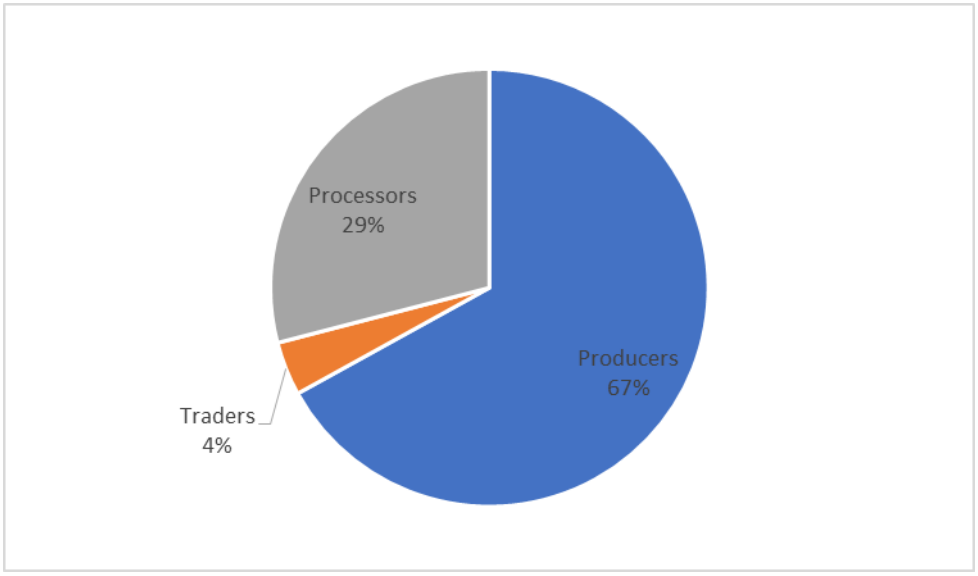


FIGURE 20. CONTRIBUTION OF PRODUCERS, TRADERS AND PROCESSORS TO DIRECT VALUE ADDED

The industrial processing segment would contribute more to the economic wealth by producing more elaborate products. The breakdown of Gambia's fish exports has shown that unprocessed products count for 70.3% of total exports (Table 27). This situation is not satisfactory from a stock management point of view, the export of unprocessed products leading to more pressure on overexploited marine resources (coastal demersal fish), nor from an economic point of view, since the level of value added of products is generally low.

TABLE 27. GAMBIAN FISH PRODUCTS EXPORTS IN 2017 ACCORDING TO THE NATURE OF PRODUCTS

Product nature	Dried	Fish Meal	Fresh	Frozen	Total
Volume (kg)	13 100	1 146 800	51 087	2 653 133	3 864 120
%	0.3	29.7	1.3	68.7	100.0
Average price (GMD/t)	45 000	77 800	230 000	227 500	
Total (GMD)	589 500	89 236 800	11 730 000	603 557 500	705 113 800

Source: Food Safety and Quality Authority

In the production segment, it is noticed the very low contribution of purse seine fishers (0.15%) (Figure 21) whose products are mainly oriented to the fishmeal plant. Artisanal fishing activities suppling the international market (bottom gillnet and stow net) though Gambian fish plants are counting for 64% of the generated value added.

Fishmeal production counts for only 2.3% (GMD 57 803 560) of the total fishery sector direct value added. Beyond its contribution to the national growth, communities were expecting other economic benefits (jobs creation for young people, better road connection) from the fishmeal industry. So far, there is no sign of these

expectations. In the meantime, communities are facing environment deterioration (sea and air pollution with noxious and bad odour coming from the factory). These negative impacts are strongly harming the tourism sector in the area according to respondents in the field. The bad smell from factories is disturbing the guests. It is often mentioned during discussions with communities, the dumping of toxic waste through pipelines and expected consequences are the damaging of the marine life, the biodiversity, and the well-being of people.

Fishmeal plants rely exclusively on small-scale fishery for their supply in raw materials (fish). These factories are in competition with the home market in fish supply. Bonga fish, mainly consumed by Gambian, has shown an increase in price. As less fish products are available in the home market, food security in The Gambia is being threatened.

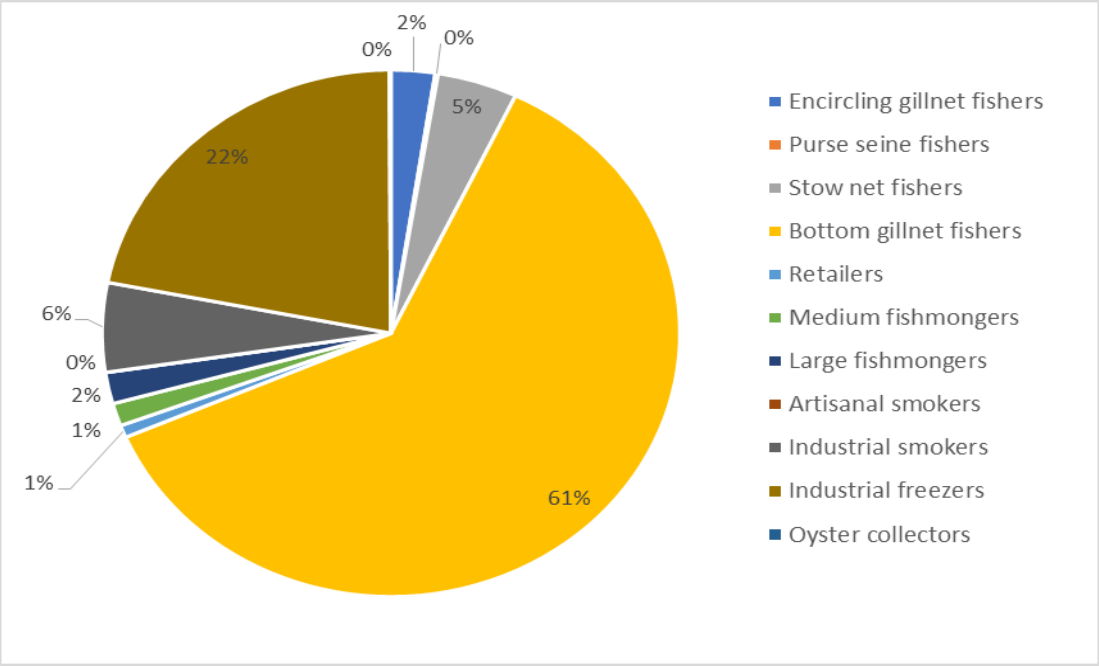


FIGURE 21. DIRECT VALUE ADDED GENERATION AMONG ACTORS

In the production segment, encircling gillnet fishers and stow net fishers contribute to direct value added as much as their share of net operating surplus they receive. Encircling gillnet fishers contribute to the growth of the economy even though they are generating less profit (Figure 22). The bottom gillnet is generating more value added than net profit (Table 24). The value chain can be considered reasonably inclusive from the perspective of the actors of the production segment. Retailers, medium and large fishmongers contribute also to the value added as much as they generate net operating profit (Table 24). The share of the value added is dominant for all fish processors (Table 24).

Figure 22, Figure 23 and Figure 24 indicate the share of the income, wages, and net operating surplus in the value chain.

The main part of the net income comprises operating profits benefiting the actors involved in the value chain (88%) of which 62% to fishers, 22% to processors and 4% to traders (figure 22). To a lesser extent, followed respectively wages (8.4%) and depreciation (3.3%). Taxes and financial cost count each one for less than 1% of the total value added. From fishers, 96.8 % of the operating profit is going exclusively to bottom gillnet fishers and stow nets fishers suppling fishing plants oriented to exports markets. Purse seine and surrounding gillnet fishers which products are distributed in the home market register little net profit showing that inclusiveness could be improved in the value chain.

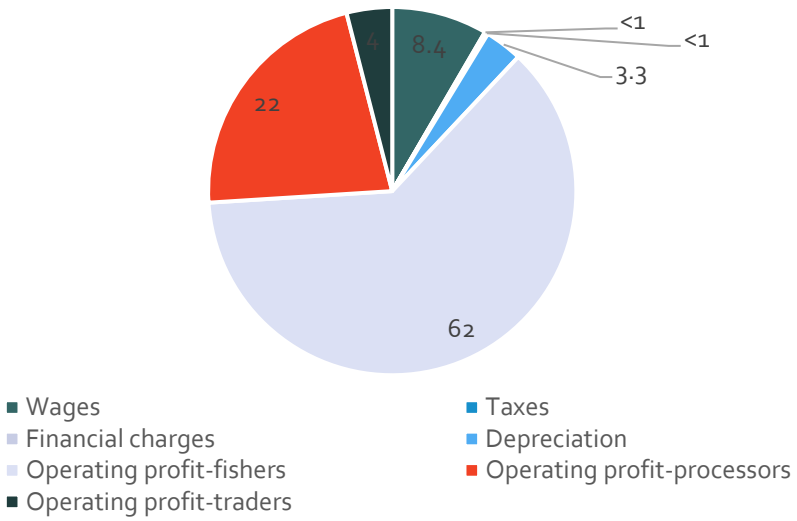


FIGURE 22. DISTRIBUTION OF THE INCOME (%)

Fishers are the main wage providers in the chain value (59%), followed by processors (39%). Retailers distribute only 2% of total wages (figure 23) as they provide limited job compared to processors and fishers. The revenue-sharing system prevailing in the Gambian small-scale fisheries is profitable to crew members. Purse seine is a perfect illustration as its net operating profit is negative, wages for individual crew member on-board is estimated at GMD 1 593 000. This raises a problem of renewal of capital equipment within fishing units as fishers do not benefit any tax cuts on fishing materials.

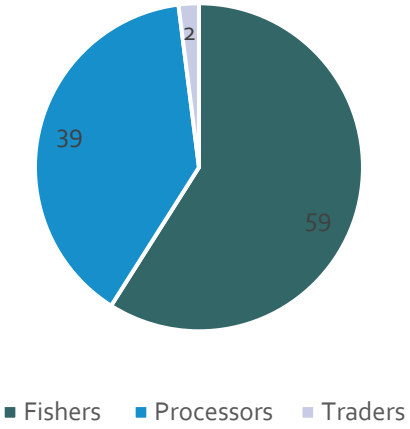


FIGURE 23. DISTRIBUTION OF WAGES (%)

As shown in figure 24, the net operating profit varies according to different group of agents. Fishers count for 59% of net operating profit linked to their cost structure and production efficiency. Limited to handle mainly unprocessed products, processors would be able to improve their profitability with more elaborate products. Traders activities remain informal and little investments are involved. All these factors played out over their share of the net operating profit.

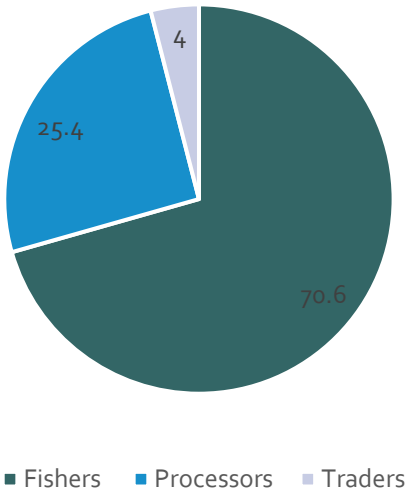


FIGURE 24. DISTRIBUTION OF NET OPERATING PROFITS (%)

4.5.2 Employment creation and distribution

The 2016 Frame survey conducted by the DoF estimates a total of 4 234 fishers throughout the country and 756 shellfish collectors. The importance of fishing jobs is often appreciated from the number of fishers in the strict sense. Indeed, jobs in other fishing related activities are drowned in the huge national informal sector. It is therefore necessary to appreciate the importance of jobs downstream and upstream of production. In addition to fishers, jobs in related and peripheral fishing activities should be considered.

Several categories of actors are involved in the distribution and the processing of fish. A total of 25 420 fish processors were counted compared to 10 330 in the fish product marketing segment. Our investigations in the field have revealed that a fish processor uses the services of at least five people to take care of all operations related to smoking, drying or salting fish (evisceration, washing and cutting of fish, filling ovens, handling of racks during the smoking process, and packaging of finished products). Therefore, it is close to 127 100 people who are involved in support activities for processing fish. For the distribution of fish, an average of three employees assist each fishmonger, for a total of 30 990 people.

A number of 14 fish processing and export companies are operational in The Gambia these last years. These establishments employ around 1 500 workers.

Outboard motor mechanics are playing an increasingly important role in production activities due to the high level of motorization of fishing boats in the marine artisanal fishery. The carpenters (canoe manufacturer) are also active along the Gambian coastline as canoes are locally made from wood. No information is available for the number of outboard motors mechanics and carpenters and the number of people employed. The DoF experts estimate at least at 500 people the number of people devoted to these activities.

Overall, 200 830 people derive their livelihoods from harvesting, artisanal processing and the distribution of fishery products.

4.5.3 Governance and innovation

Gambian industrial seafood processing plants import from Senegal most of the packaging and other material used. They are subject to cost increase and sometimes delays. Specific support in the form of an attractive framework will motivate foreign investors to establish small and medium packaging enterprises for the need of the local fish processing plants and for exports in the sub-region. Specifically, grant of a variety of tax and customs reductions as incentives to investment and access to finance are required.

Our analysis indicate that fish exports would contribute more to the economic wealth of The Gambia by sending more elaborate products to the international market, as unprocessed products count for up to 68% of total fish exports. This situation is not satisfactory from an environmental point of view, the export of unprocessed products leading to more pressure on the overexploited coastal demersal fisheries, nor also from an economic point of view since the level of value added of products is generally low. Support from

public authorities in the form of subsidies, tax refunds and facilitation to access financing for the fishing industry would allow millers to renew and direct their infrastructure towards the development of elaborate products bringing more value added and jobs. As a reminder, most of operational credit institutions in The Gambia operate very rigidly according to fishing stakeholders (personal contribution, savings obligation, rigidity of payment, low amounts granted, and high interest rate). Consequently, insufficient financial resources are the major impediment to the development of the export industry.

4.6 Conclusions on the economic analysis

The requirements in terms of quality, hygiene and sanitation are strong from one end of the chain to the other. For the catch, there is a low use of ice, the unhealthy landing sites with fish often lying on the ground. The fresh packaging is characterised by a lack of good quality ice (use of domestic ice in some areas as shown in Figure 25, a break in the cold chain due to the absence of cold rooms, adequate infrastructure for loading and unloading of fish and also of suitable refrigerated means of transport, the lack of safe and adequate practices for processing, packaging and handling and transport (for instance, direct stacking of fish in vans).

FIGURE 25. USE OF HOME ICE FOR CONDITIONING FISH (M. DEME, JULY 2019)

The unsanitary conditions of processing places, the archaism of several types of smoking (very energy-consuming for poor smoking quality), the lack of knowledge of good practices in terms of quality and safety are salient.

To remove these constraints, it will first be a question of upgrading what already exists to:

1. Improve the sanitation of fish landing, processing, storage and marketing spaces;
2. improve the handling and transportation of fish; and
3. improve transformation processes.

It is therefore essential to provide actors with training focused on improved methods of processing, packaging and storing fish to enforce and improve the health quality standards of fishery products.

The achievement of such results will, on the one hand, significantly reduce losses along the value chain and, on the other hand, ensure that the fish marketed meets minimum sanitary standards.

The major constraints noted are largely due to a lack of infrastructure which is detrimental to the development of the fisheries value chain. Beyond upgrading the existing, it will also involve creating new industrial ice production and storage units at the main landing points, equipping cold rooms at the main storage locations and marketing and popularization of the use of refrigerated containers throughout the supply chain of the fresh fish sector.

4.7 Summary of economic indicators

Framing Question 1: What is the contribution of the VC to economic growth?		Indicators	Results in the study
CQ1.1	How profitable and sustainable are the VC activities for the entities involved?	Net operating profit by type of actor	Encircling gillnet: GMD 601 960 Purse seine: GMD -12 306 221 Bottom gillnet: GMD 1 450 477 821 Stow net: GMD 109 265 833 Artisanal processor: GMD -3 420 952 Retailer: GMD 18 449 083 Medium fishmonger: GMD 29 906 707 Large fishmonger: GMD 39 585 426 Freezing plant: GMD 382 240 603 Industrial smoking plant: GMD 130 689 179 Fishmeal plant: GMD 46 963 456
		Benchmark of farmers' net income with minimum wage and/or job opportunities	Incomes for fishers are greater than salaries of most personal of the fishery administration (cleaner, watchman, driver, messenger…)
Framing Question 1: What is the contribution of the VC to economic growth?		Indicators	Results in the study
CQ1.2	What is the contribution of the VC to the GDP?	Total VA and components	Total VA: GMD 2 855 019 007 Direct effects: GMD 2 496 169 635 Indirect effects: GMD 358 849 366
		VA share of the GDP	6.5%
		Rate of integration into the Economy (total VA/VC production)	Total VA: GMD 2 855 019 007 VC production : GMD 3 291 225 332 Rate of integration: 86%
CQ1.3	What is the contribution of the VC to the agriculture sector GDP?	VA share of the Agriculture sector GDP	20.1% (contribution of the production segment) 33% (contribution of all fisheries activities)
CQ1.4	What is the contribution of the VC to the public finances?	Public Funds Balance	Taxes: GMD 100 726 686 Direct compensation protocol UE/Gambia: GMD 30 800 000 Additional revenue protocol UE/Gambia (licence, observers, support vessel fees…): GMD 50 400 000 The Government of The Gambia does not provide direct or indirect subsidies to fishery chain value actors.
CQ1.5	What is the contribution of the VC to the balance of trade?	VC Balance of trade	Fish exports: GMD 2.883 billion Intermediate consumption imports: GMD 0.299 billion Trade surplus: GMD 2.583 billion
Framing Question 1: What is the contribution of the VC to economic growth?		Indicators	Results in the study
CQ1.6	Is the VC viable in the international economy?	Nominal Protection Coefficient (NPC)	0.883
		Domestic Resource Cost Ratio (DRC)	0.090

Framing Question 2: Is this economic growth inclusive?		Indicators	Results in the study
CQ2.1	How is income distributed across actors of the VC?	Total wages	Fishers: GMD 123 618 049 Processors: GMD 83 137 198 Traders: GMD 3 725 050
CQ2.2	What is the impact of the governance systems on income distribution?	Income distribution	Producers: GMD 1 671 657 442 Traders: GMD 99 380 119 Processors: GMD 725 132 076 Salaries: GMD 210 480 296 Taxes: GMD 2 259 499 Financial costs: GMD 5 517 157 Depreciation: GMD 83 331 664
CQ2.3	How is employment distributed across the VC?	Number of jobs and self-employment	200 830

5 Social analysis

5.1 Introduction

In The Gambia, fishing is an essential sector for poverty reduction, a source of income and foreign exchange earnings for the country. The sector is the third largest supplier of food after agriculture and livestock and plays an important role from a nutritional point of view. Fishing activities are the main source of income for coastal communities and a safety net for rural communities in the interior of the country.

The economic analysis identified the contribution of the value chain to economic growth, through the estimated revenue for the country, the number of actors employed and the incomes of the different actors. The social analysis sheds light on the inclusiveness of these economic benefits and on the social sustainability of the value chain by analysing the working conditions of the actors, the rights relating to the exercise of activity along the chain, gender equality, food and nutritional conditions, the social capital of the actors as well as their living conditions. It also analyses the inclusiveness of these economic benefits.

5.2 Methodology

The social analysis was based on the typology of actors defined in the functional analysis (Table 28). The latter identified the different types of actors listed in the table below.

TABLE 28. TYPOLOGY OF THE DIFFERENT ACTORS IN THE FISHERIES CHAIN IN THE GAMBIA

				% by gender		% by nationality	
Actors	Categories/ sector	Production or processing system	Main species /Service	Men	Women	Gambians	Foreigners
Producers (fishers, aquaculturists, gatherers-collectors)	Artisanal fishing activity	Encircling gillnet	Bonga	100%	0%	5%	95%
		Purse seiner	Round sardinella			1%	99%
		Bottom gillnet	Sole			60%	40%
		Hook and line and long liners	Catfish			30%	70%
		Cast nets	Mullets			80%	20%
		Driftnet	Rays			10%	90%
		Stow nets	Shrimps			60%	
		Traps	Cuttlefish			80%	20%
		Oyster collection	Oysters	1%	99%	80%	20%
		Pond aquaculture	Tilapia	70%	30	80%	20%
	Industrial fishing activity	Shrimp trawlers	Shrimps	100%	0%	0%	100%
		Demersal trawlers	Cephalopods	100%	0%	0%	100%
Fish traders	Large fishmongers	Conditioning/ sale	Small pelagics	70%	30%	1%	99%
	Medium fishmongers	Conditioning/ sale	Small pelagics	60	40%	30%	70%
	Retailer (Banabana)	Conditioning/ sale	Small pelagics	30%	70%	80%	20%
		Conditioning/ sale	Rays	90%	10%	70%	30%
	Factory buyers	Conditioning/ supply	Small pelagics	99%	1%	5%	95%
Processors/conditioners	Artisanal	Smokers	Bonga	10%	80%		
			Rays	99%	1%	1%	99%

		Oyster collection	Oysters, cockles	1%	99%	99%	1%
		Driers	Catfish	1%	99%	5%	95%
	Industrial	Smoker	Catfish	0%	10%	100%	0%
		Freezers	Demersal	100%	0%	0%	100%
		Fishmeal production	Sardinellas	100%	0%	0%	100%
Employees	Employed in the processing industry	Handling		10%	90%	99%	1%
		Managers	Administration/engineering	2%	98	100%	0%
	Employed in the fresh industries	Handling		20%	80%	99%	1%
		Managers	Administration/engineering	95	5%	1%	99%
	Employees in fishmeal plants	Handling		99%	1%	90%	10%
		Managers	Administration/engineering	99%	1%	1%	99%
Service providers	Artisanal fishing	Carpenters	Fabrication / Repair	100%	0%	1%	99%
		Mechanics	Repair	100%	0%	1%	99%
		Carriers	landing of the canoes	40%	60%	99%	1%
	Industrial fishing	Carpenters	Fabrication / Repair	100%	0%	0%	100%
		Mechanics	Fabrication / Repair	100	0%	0%	100%
		Carriers	vessel landing	100%	0%	10%	100%

In order to collect data on each of the different categories of actors, visits were made to different places where these actors are active. Fishers, processors and fish merchants and service providers were interviewed at landing and processing sites. Visits were also made to some processing industries to find out about the situation of the actors in this segment of the chain. Visits were also made to retailers in a few markets. Similarly, a visit was made to the port of Banjul to meet workers in fishing boats. Apart from professionals, interviews were carried out with administrative structures, particularly those in charge of the fisheries sector or working with stakeholders in the sector or on fisheries products. The table in Annex A shows the different places visited and the actors met.

From each of the stakeholder categories, data were collected on the main consequences of value chain activities on saturation and their specific issues:

- Framing question 3. Is the VC socially sustainable?
    - CQ3.1. Are working conditions throughout the VC socially acceptable and sustainable?
    - CQ3.2. Are land and water rights socially acceptable and sustainable?
    - CQ3.3. Is gender equality throughout the VC acknowledged, accepted and enhanced?
    - CQ3.4. Are food and nutrition conditions acceptable and secure?
    - CQ3.5. Is social capital enhanced and equitably distributed throughout the VC?
    - CQ3.6. To what extent are major social infrastructures and services acceptable? Do the VC operations contribute to their improvement?

- Framing question 2. Is the economic growth inclusive?
    - CQ2.1. How is income distributed across actors of the VC?
    - CQ2.2. What is the impact of the governance systems on income distribution?
    - CQ2.3. How is employment distributed across the VC?

These data were collected through focus group interviews using an interview guide and through individual surveys using a questionnaire detailing, for each core question, the indicators informing it and the variables to be collected. The data collected from the various actors in the value chain were supplemented by field observations, a documentary analysis of the different secondary data sources relating to regulatory texts, the institutional and regulatory framework, gender, education, food and nutritional security, infrastructure, etc.

Finally, scores were built based on an ascending Poor – Moderate – Substantial scale, respectively represented by colours red, yellow and green.

5.3 Findings on the core questions

Criteria	Summary Findings	Score
Working conditions	In general, working conditions along the value chain are perceived as difficult. International regulatory provisions are not well applied in employment contracts. The majority of workers in the industries are day labourers while jobs in artisanal fishing are informal. Thus, the vast majority of workers in the value chain do not benefit from social security coverage, which has an impact on the income level, working and living conditions of the actors. There is a strong presence of children who often have only primary school education in activities that are subject to accident risks. Working conditions are difficult for these children and can compromise their schooling but also their health. Fishers and processors are at high risk of accidents. In general, the incomes of value chain actors are higher than those of public sector workers, especially in trade. However, the lack of financial resources of the Gambian players and their lack of knowledge of the international market mean that this segment is dominated by foreigners. Due to the many constraints, especially for young Gambians who have neither a fishing tradition nor training, fishing is not attractive.	
Land & water rights	Access rights to production and product development do not seem to be of great benefit to the Gambia and national professionals. Although the country's fisheries policy documents are in line with the VGGT, in practice, investors and institutions do not seem to adhere to it. Some investments such as fishmeal are perceived as harmful to local populations. Difficulties of access to information, the consultative nature of professional organisations and the lack of prior consent of the communities concerned by the investments make most decisions unpopular. The government's option to attract investors to the industrial sector comes in a context of weak fisheries governance and high prevalence of food insecurity and poverty, while investors seem to pay little attention to the concerns of local populations.	
Gender equality	Women are present at all segments of the chain where they play an important role. Although in production they are directly involved only in oyster and shellfish harvesting, some have their own fishing unit and/or provide funding and equipment to other fishers. 80% of processors and 50% of fish retailers are women, while 65% of the processing plant workforce is female. As economic operators, women are involved in various income-generating activities and in the acquisition of material goods. Financial constraints are a discriminatory factor for them because very few of them have access to credit. The perception of a highly gendered division of labour means that women are most often only invited to decision-making as transformers or traders. Women are affiliated with organisations in which they hold important positions of responsibility. Housewives first, then processors or traders, performing arduous and strenuous tasks, women have low incomes and are more vulnerable to poverty.	

Food & nutrition security	Due to shocks such as floods, drought and economic stagnation, food production in The Gambia has declined in recent years. Nevertheless, the evolution of food supply on the market in The Gambia is relatively stable thanks to the measures taken by the State. The decline in actors' incomes means that they have fewer resources to allocate to daily expenses, while the prices of most food products are now considered higher. Food products are perceived to be of lower quality and are the source of common diseases today. There is no improvement in nutritional practices except for those benefiting from food fortification projects and 99% of households consume cereals every day. Food shortage risks are still present in some value chain households with precarious and hypothetical incomes. If the prices of imported foodstuffs are more or less stable, the prices of local products can be up to three times higher due to their seasonal nature.	
Social capital	Some umbrella organisations such as TAGFC, GAMFIDA, NAAFO, NASCOM, TRY are often cited as being best involved in the value chain. These organisations are more inclusive than associations of professionals from the same segment. The negotiation capacities of organisations on the market are rather weak. Access to information by actors in the chain is generally perceived as low and the degree of trust in the relationships between actors is average. Professionals and communities are not involved in decisions that impact their livelihoods, such as fisheries agreements and the establishment of fish meal factories. Through participatory management, local knowledge is taken into account. There is participation in the rehabilitation or construction of roads, schools, health centres, and the awarding of scholarships for the benefit of communities by some actors in the value chain.	
Living conditions	Most professional households have access only to primary and secondary health facilities. Services are still not affordable for women who are responsible for household health expenditures. The actors acknowledged that they had noticed an improvement in their housing, but the dominant type of housing for most is a building with a sheet metal roof. Most households have only basic toilets with latrines and no access to safe drinking water. The school enrolment rate in The Gambia is high because the law makes the first six years of primary school free and compulsory. Nevertheless, the rate of access to secondary education is low. There are very few training schools and no training structures in the fisheries and aquaculture sector. Professional mobility within the chain is quite low, so job security is precarious. However, geographical mobility is very high.	

5.4 Working conditions

Criteria	Summary Findings	Score
Respect of labour rights	International labour standards are not respected in the value chain. In the industrial sector, the majority of workers are day labourers, while in the artisanal sector, workers in the sector are employed informally and occasionally. Thus, the vast majority of workers in the value chain do not enjoy security, which affects the level of income, working conditions and living conditions of the actors.	
Child labour	There is a strong presence of children in landing and processing sites where they sell small items or carriers, or as fishers on board of canoes or helping in processing workshops. These activities compromise their schooling and health.	
Job safety	Artisanal fishers are exposed to very frequent accidents at sea, while processors are exposed to injuries on a daily basis. The unsanitary nature of landing sites and processing sites as well as the lack of social infrastructure is one of the main constraints of the sector. Many processors suffer from lung disease due to smoking process.	
Attractiveness	Generally, value chain actors, particularly fish merchants and those in industries, have higher incomes than workers in other primary sectors and those in the public sector. However, the lack of financial resources, the lack of market control, the lack of qualification of Gambians provoke that	

	foreigners make more benefit in the VC activities. These constraints and a lack of fishing culture among Gambians make this sector not very attractive to young people.	

5.4.1 Respect for labour rights

The Gambia is a signatory to the various conventions of the International Labour Organisation, the latest of which is the Convention on the employment of seafarers, which it ratified in November 2018 and which entered into force on 19 November 2019 (GLMIS/ILO). The Gambia's Labour Code incorporates the various provisions of the ILO conventions (Government of The Gambia, 2018, 2007). However, in practice, these international regulatory provisions are not well applied in employment contracts. Indeed, the ILO requires that all fishers must have a written contract of employment. In view of the dangerous nature of fishing operations, Convention No. 138 provides protection against dangerous employment for people under 18 years of age. A medical examination is also required for all workers. Not all these provisions are applied.

Particular attention should be paid to compliance with international provisions in order to better protect workers in the craft sector.

The labour code in The Gambia guarantees the right of association to employees and employers, and the value chain actors are for the most part affiliated with organisations in which they defend their interests. However, it was reported that throughout the reign of the former regime, workers' organisations were not very dynamic and workers' freedoms were very limited. Strikes and demonstrations of workers were prohibited. Some of the processing plants visited showcased that Gambian workers are learning about union action because under the old regime there were no union protests. Workers now feel liberated and want to assert themselves; which makes them ask any kind of claim. Nevertheless, there is still no strong labour union in fishing enterprises as the law requires a minimum of 50 workers to register a trade union, a threshold that very few fishing enterprises can achieve because most workers are day labourers.

The latest 2018 Human Rights' report mentions that while the law sets the minimum contractual standards for hiring, training and conditions of employment and provides that contracts cannot prohibit trade union membership, The Gambia has not implemented the law effectively and there have been persistent violations of freedom of association (UN, 2018).

In the Gambian Labour Code, “contract of employment” means an agreement of service or apprenticeship whether oral or in writing, express or implied, between an employer and a person by which that person undertakes to make his or her services personally available to the employer in return for remuneration and in a manner that gives the employer control over the person’s work and working condition”. It appears that most workers have only verbal contracts even in processing industries where the majority of workers are day labourers. Factory bosses argue that the activity of their company is highly dependent on the fishing activity in The Gambia and this is very seasonal and periodic. This is due to the fact that almost all the fishers on which they depend are Senegalese and at each holiday period, fishing is slow. As a result, it is difficult for them to recruit permanent staff that they would have to pay even if the company is not active.

In artisanal fisheries, all employed workers have the status of service providers. Fishers are not included in the legislation and regulations concerning employment contracts because they are paid by the share and are not considered as employees. For example, because almost all value chain workers are found in artisanal fisheries where all contracts are informal and verbal, jobs in almost all stages of the VC in The Gambia are for the most part informal, casual or temporary. It also means that the vast majority of workers in the fish VC do not enjoy social security or any other benefit or entitlement other than their daily income. This precarious job situation in the fish value chain affects the level of wages and incomes, as well as the employment, working conditions and living conditions of the actors operating in the fishing sector.

The constitution and law in the Gambia prohibit all forms of forced or compulsory labour, including that of children. Admittedly, no case of forced labour has been reported, but according to some workers, the demands of fishing enterprises on workers, particularly vis-à-vis contract workers, amount to forced labour. Contractual workers are obliged to work sometimes beyond normal working hours when there is product and sometimes unpaid on these overtime hours. Also, in the artisanal sector, where family labour is predominant, some family members, especially young people and women, are sometimes forced to do some strenuous tasks. Women and children are the most exposed.

The law sets out the criteria that prohibit discrimination in employment and occupation, and the government often ensures enforcement in formal jobs. However, in the fishing sector it has been found that processing companies employ more female workers. This predominance of women in fishing enterprises is perceived by some as a social discrimination that allows the company to employ this category of workers, who generally have a low salary level.

5.4.2 Child labour

There is a strong presence of children in landing sites and processing where they are sellers of small items or carriers. In the fishing units of Senegalese, young boys are embarked very early in canoes by their parent to learn the job. In transformation, women often call on their daughters who support them in the activity. In the fishing units, most of the children have not been to school, whereas in the processing workshops, it is mainly children who are in primary school that are more in demand during the afternoons during the year school. Those who are in the secondary cycle are solicited when on holidays. When the VCA4D team visited the sites, some fishers said they removed their boys from school in Senegal to bring them to the Gambia and take them into the dugout canoes because they had no manpower. It is the same in the transformation segments, where some parents took their daughters out of school when they felt their low level at school to get them involved in trading activities.

The parents met, argued that fishing is above all a culture in which the youth must be impregnated very early, it must become ontological to the person and therefore requires impregnation from an early age. Moreover, Senegalese blame the Gambians for their lack of maritime culture that makes it difficult for them to learn fishing. In this regard, the FAO and the ILO make a difference between the work done by children and child labour, which are not necessarily the same thing. They state that if child labour compromises their well-being or hinders their education and development, this is not necessarily the case for all types of work. These may even be beneficial for the learning of older children. Training in fisheries could be classified in this type of work, as an introduction to fishing not relatable to child labour.

The level of involvement of children in hazardous activities is variable. Going at sea is often dangerous, especially for young people who are often engaged in diving to train the fish in the nets or clear the nets hung on the rocks. In artisanal processing, children are involved in the search for wood, water, eviscerating and fish cleaning that sometimes expose them to injuries.

5.4.3 Safety at work

Fishing professionals are considered to be among the most exposed to accidents, both operators and processors. With hundreds of deaths per year, fishing is considered the most dangerous job in the world. Going fishing has always been considered as a risky job. At sea, all fishers are exposed to sudden changes in weather, temperature changes, rain, strong winds and very strong waves. In addition to nature-related constraints, artisanal fishers in Gambian waters are exposed to risks of collisions with industrial boats and problems with their boats (engine failures).

With regard to accidents at sea, Table 29 gives a summary of the 2018 accidents report, the number of victims, the amount of compensation claims and the amounts disbursed for compensation.

TABLE 29. REPORTED SUMMARY OF SEA INCIDENTS 2018 IN GAMBIA, CONCERNING ARTISANAL FISHING VESSELS

Date of incident	Fishing vessel	Nature of incident	Impact	Initial claim (GMD)	Compensation (GMD)
01-04-18	Sheng Hang 807	Collision	2 deaths vessel, engine, nets	170 000 680 000	170 000 680 000
27-03-18	De Hong 1	cross over net	net cut in pieces	26 000	13 000
05-03-18	Kingston	cross over net	net cut in pieces	46 000	20 000
08-06-18	Al Sidrah	Collision	1 death	256 000	256 000
			loss of engine	25 000	25 000
			loss of fishing net	11 888	11 880

Source: The Gambia Department of Fisheries

The risk of an accident during processing is also very high. Women who are busy picking oysters or gathering molluscs, claim to have very often wounds caused by working tools or by shells. During the interviews with the actors, some women showed to the VCA4D team their gaping wounds and their rough, wrinkled hands caused by their processing activity (Figure 26). They usually work without gloves or boots as much in the search for products as during their processing. It is the same for women who transform the catfish. This species is very stinging and women are injured very often during its treatment. In addition, the transformation of these species requires evisceration, and cleaning in hot water and women are frequently burned.

FIGURE 26. OYSTER COLLECTORS/AQUACULTURIST WOMEN WITH HAND INJURIES

Due to the difficult working conditions and the unhealthy processing sites, women who smoke and dry fish are exposed daily to health risks, particularly those suffering from lung diseases. Smoking processes can last an average of 2 hours and women are constantly near the ovens to monitor it (Figure 27, Figure 28). They are equipped with a water container to mitigate the embers in case of strong flames so that the product does not calcify. They are thus exposed to the heat and smoke that invades the buildings in which the furnaces are located. Many of them report suffering from lung diseases and some have been asked to stop working for a certain period following a diagnosis in the health services. During product drying, women are exposed to the sun during the entire process with lack of shelter on the processing sites. Those who work in industries also face many risks and threats including mechanical accidents, excessive noise levels, exposure to chemicals and infections.

FIGURE 27. BONGA-SMOKING WOMEN IN THE SMOKE

FIGURE 28. OVENS AND SMOKEHOUSE

All these difficulties justify the fact that fishery professionals are considered as being among the most morally, physically and healthily insecure workers.

5.4.4 Attractiveness

On average, the levels of reviews or wages in the fishing sector are considered more or less attractive according to the segment. The income level of fishers and processors in the craft subsector is perceived as very average. The various constraints, particularly the scarcity of fish, the lack of market for processed products, the very irregular prices, the lack of work equipment, make the work in the fishing sector perceived by the great majority of actors as being a difficult and sub-paid activity.

The fishmonger's segment seems the most attractive. It is perceived by almost all actors as being the most rewarding. Nevertheless, it requires significant financial resources and a good network of customers both nationally and internationally. Unfortunately, the majority of Gambians working in this segment do not have enough financial means, which means that it is in the hands of Senegalese fishmongers. The more fortunate, make contracts with their fellow fishers to whom they often provide funding for the outings and some equipment and even the expenses on the occasion of their family ceremonies.

Work in processing plants seems to be more attractive than in the craft industry. Workers interviewed by the VCA4D team reported having acceptable wages compared to workers in other sectors, including the public. In one of the companies visited, the average monthly salary was EUR 110 for permanent and EUR 3.5 per day

for day labourers. In another factory employing only day labourers the remuneration was EUR 2.5 per day. These incomes are higher than the minimum wage in the formal sector which is GMD 50 (< EUR 1) a day. Generally speaking, fishery workers report having higher incomes than those in the public sector where pay levels are considered very low. The lack of qualifications means that Gambians are more employed in handling services (cleaning, frosting, packing and loading). Key positions such as quality and cold technician and managers are occupied by foreigners especially Senegalese in fresh factories or by Mauritanians in fishmeal factories. These factories are run by foreigners looking for qualified personnel. The competition between the factories and the scarcity of qualified personnel make factories obliged to increase the remuneration of their employees in order to keep them.

The fisheries sector in The Gambia does not attract young people in terms of income levels and working conditions. There are also very few professionals, fishers, processors and fishmongers who want to see their children practice their trade. Work in the sector does not look promising for young people and most young Gambians do not have a culture of work in this sector especially for fishing. The job of fisher asks for a technicality that requires a long learning from the bottom. Young Gambians whose parents are not fishers are, for the vast majority, interested in fishing only at an advanced age, especially after having failed at school. The lack of training and their lack of knowledge of the sector make fishing not very attractive to them. In addition to this handicap, work at sea is considered difficult for most young people. Fishing especially with nets requires physical strength and is perceived as exhausting. Those who go there are most often those who have not found anything else to do.

The DoF had started to train young people in fishing activity in use such as Encircling gillnet and Bottom gillnet. Two teams of three people each were trained and equipped in pirogue, motor and Bottom gillnet in Sanyang. A third group of three people who had been trained had received a Bottom gillnet and motor and were waiting for their canoe. This crew, who was using a substitute boat while waiting for their boat, perished at sea while returning from a ceremony in another village. This fatal accident of this third group slowed the enthusiasm of many young people who wanted to start fishing.

5.4.5 Conclusion on working conditions

Working conditions in the value chain are generally perceived as difficult, but especially in the segments of production and artisanal processing. Although working conditions vary greatly from one segment to another, the actors are confronted with various problems due to the natural and technical environment and are victims of sometimes fatal accidents due to bad weather, engine failures or handling of products. The risks of accidents are high, and their consequences are aggravated by various technical or human factors. Women face health problems due to unsanitary workplaces. The sector uses some forms of child labour, in certain cases compromising their schooling and health. From the point of view of social security, in the artisanal production, fishing is organised around the mode of remuneration by share on the fish catch, while in the transformation and trade phases jobs are also informal. Thus, in times of crisis, the situation becomes difficult for most actors in the chain. Most young people are not attracted to the sector because of the difficult working conditions and their lack of culture and training in fishing activities.

5.5 Land and Water Rights

Criteria	Summary Findings	Score
Adherence to VGGT	In the country's fisheries policy documents, the objectives are consistent with the VGGT but through their actions, investors and institutions do not seem to adhere to them. Some investments, such as on fishmeal factories, are seen as damaging local people by denying them access to the resource, negatively impacting their food security and livelihoods. As a result, the Gambia does not seem to benefit much from taxes because of the many benefits it offers to investors.	
Transparency, participation and consultation	Most stakeholders deplored the lack of prior disclosure of information on investments in the country, in particular the establishment of fishmeal factories. Difficult access to administrative documents, the consultative nature of professional organisations and the lack of prior consent of the populations concerned by the investments make most decisions unpopular	

Equity, compensation & Justice	Fishing legislation and access rules are generally considered fair, but some people think that these rules are more profitable for foreigners, especially for investors who enjoy many benefits. No other government measures have been reported in the event of livelihood disruption, even in the case of expropriation of workplaces. Local actors deplore the treatment of their complaints for which court decisions are often more favourable to investors.	

5.5.1 Adherence to VGGT

The Voluntary Guidelines on Responsible Governance of Tenure of Land, Fisheries and Forests (VGGT) set out internationally accepted principles and standards for responsible practices with the ultimate goal of ensuring food security for all and promoting the progressive realization of the right to adequate food in the context of national food security. They assume that the eradication of hunger and poverty, as well as the sustainable use of the environment, depend to a large extent on how people, communities and other actors access land, fisheries and forests. Their livelihood depends on their ability to gain safe and equitable access to and control over these resources.

In the field, the various actors involved in the value chain, both investors and agents of the institutions, did not mention these guidelines. Nevertheless, in the country's fisheries policy documents, the objectives are consistent with the VGGT.

The regulations impose a title of access to fishers for both artisanal and industrial players (Table 30, Table 31). However, in practise, there is often no need for title or access to the resource for artisanal fisheries. Fishing licenses required for canoes in the law are not enforced.

TABLE 30. FEES FOR LOCAL FISHING VESSEL LICENSES

Type of fishing	Amount of the fee
Trawlers (for fish & Cephalopods)	GMD 1228.50 per GRT per year
Shrimp trawlers	GMD 1560 per GRT per year
Seiners/Pelagics Trawlers (for small pelagics)	GMD 715 per GRT per year
Processing vessels	GMD 1950 per GRT per year
Tuna vessels	GMD 1170 per tones of tuna
Tuna vessels for Purse Seiners	A lump sum of GMD 52 000 per year (equivalent to catch of 100 t of tuna per year) prior to the licensing of the vessel
Tuna vessels for long liners and pole and line vessels	A lump sum of GMD 19 500 per year (equivalent to a catch of 50 t of tuna per year prior to the licensing of the vessel
Sport fishing vessels	GMD 3 250 per vessel per year

Source: (Mendy, 2009)

TABLE 31. FEES FOR FOREIGN FISHING VESSEL LICENSES

Type of fishing	Amount of the fee
Trawlers (for demersal fish and cephalopods)	GMD 3 250 per GRT per year
Shrimp trawlers	GMD 4 062.50 per GRT per year
Seiners/pelagic trawlers (for small pelagics)	GMD 1625 per GRT per year
Processing vessels	GMD 1950 per GRT per year
Tuna vessels	GMD 1560 per t of tuna caught
For purse seiners	A lump sum of GMD 273 000 per year (equivalent to catch of 100 t of tuna per year) prior to the licensing of the vessel
For long liners and pole and line vessels	A lump sum of GMD 136 500 per year (equivalent to catch 50 t of tuna per year prior to the licensing of the vessel
Sport fishing vessels	GMD 3 250 per vessel per year

Source: (Mendy, 2009)

With regard to foreigners and mainly Senegalese fishers who are in the majority in the country, their access to Gambian waters is governed by a reciprocal agreement between the two countries signed in 2010 which covers both artisanal and industrial fishing. The bilateral agreement on fisheries access is reciprocal and did not foresee for financial compensation to access fishing opportunities in addition to the same titles provided by law for nationals of both countries. Because the payment of permits is not applied, this agreement deprives the Gambia for the possibility to impose a tax on Senegalese fishing units. This free access is perceived as a loss of gain for the Gambian state, especially since the vast majority of canoes operating in the EEZ of the country are of Senegalese origin. The protocol that was renewed in 2017 maintains the same provisions of 2010 but, limits the number of Senegalese canoes to 250 per year, to 200 canoes with a driving power less than or equal to 40 HP, 25 canoes of 41 and 60 HP and 25 canoes with a power of over 60 HP. However, no control is carried out on the number of Senegalese canoes whose number is sometimes tripled according to the period.

Although the agreement stipulates that all catches in the respective waters of The Gambia and Senegal must be landed and sold in the country where they are made, Senegalese fishers do not respect this provision and very often land their catches in Senegal, especially when the price is better than that offered in The Gambia. This situation poses a problem for the supply of Gambian fish factories and even households.

There are other fisheries agreement in place with other countries, notably with China, the European Union and the countries of the West African subregion, in accordance with terms and conditions agreed between The Gambia and its partners. These agreements very often include a financial contribution. Under the recently signed EU sustainable fisheries partnership agreements with the Gambia, the EU will contribute EUR 550 000 per year for 6 years, which will be used to develop fishing capacity and improve public revenue. Moreover, the annual financial contribution paid by the EU vessel owners is set at EUR 315 000, corresponding to the estimated annual amount of fees due by vessel owners in respect of fishing authorisations issued. The agreement was judged a win-win for the Gambian authorities, who consider it to be the best agreement the country has ever had with the EU.

Investments in the fisheries sector is seen as a key factor in reducing food insecurity and poverty. These investments can potentially benefit local communities by facilitating access for actors, capital, technology, knowledge and markets. They can also be a factor of macroeconomic benefits by increasing growth. However, in the Gambia, in social terms, the results of investments in the value chain have yielded mixed results. Some investments have often hurt local populations by denying them access to resources, thus negatively impacting food security and rural livelihoods.

As far as the processing industries are concerned, the Gambia does not seem to benefit greatly in terms of taxes because of the many advantages granted to investors to attract them to the country. As it happens, in seeking to promote investment in the fisheries sector, the Government of the Gambia offers a set of incentives to potential high-value investors.

They are exempt from customs duties on approved capital goods, machinery, appliances furniture and equipment that will be used for the establishment of the project. They are also exempt from the approved quantity of semi-finished products, spare parts, raw materials and other supplies to be used in the production process. They are also exempt from sales taxes for the aforementioned imported products and turnover tax. They receive preferential treatment for the allocation of land for the proposed investment site and the establishment of infrastructure.

The Government argues that export-oriented investments can lead to better employment opportunities for women, both in artisanal and industrial processing factories. It emphasizes the expansion of the export-oriented fish processing industry in order to create important employment opportunities especially for young people and especially for relatively unskilled women, with positive effects in terms of poverty reduction. It is also argued that investment in export-oriented facilities can be used to develop some infrastructure for the domestic market where women predominate, including ice production.

The level of compliance with the rules in the exercise of the profession in the sector is considered very average. The Gambia does not have the means to effectively monitor and control the activities and numbers of canoes from other neighbouring countries and industrial vessels operating illegally. Gambia's flag change practices and under-reporting of GRTs result in economic loss as many vessels, including trawlers, pay their license fees based on GRTs. In addition, the law requires each licensed vessel to land a minimum of 10% of

its annual catch in the country (or pay an amount equivalent to that of the government), under-reporting of foreign catch represents a monetary loss for the Government of The Gambia.

5.5.2 Transparency, participation and consultation

The Gambia, like other countries in the West African sub-region, is committed to good governance of fisheries. The Gambia adheres to the Fisheries Transparency Initiative (FITI), demonstrating its commitment to promoting transparent and inclusive fisheries management as key conditions for the sustainability of the sector. However, most of the professionals interviewed denounced the lack of transparency in fisheries management, especially with regard to the prior disclosure of information relating to investments made in the country and especially in certain locations. They deplored the licensing conditions for foreign fishing vessels and the establishment of processing plants for fish products, particularly for fishmeal factories. It was also denounced the fact that, with the complicity of some Gambians, strategies are developed to circumvent the constraints of agreements with the presence of mixed companies, the loan of flags to foreign vessels (Figure 29, Figure 30).

FIGURE 29. CHINESE BOATS NOT YET CLASSIFIED AS INDUSTRIAL OR ARTISANAL AND CHINESE SHIPYARD

FIGURE 30. CHINESE SHIPBUILDING YARD OR WORKSHOP THAT ALSO SERVES AS A LANDING PLACE IN A GAMBIAN VILLAGE

The access of actors, especially craftsmen, to administrative documents is a real problem, according to most people we met. The sharing of data by the DoF has been highlighted as a problem of transparency in fisheries management. It was pointed out that there is a serious lack of information and dissemination of laws and regulations, fisheries agreements between The Gambia and other countries, as well as documents concerning factories in The Gambia. For example, professionals have no knowledge of the activities of fishmeal factories. Fishery department officials have lamented the opacity encircling these factories, that work without departmental officers being aware of the activities. It was also regretted the lack of access to

the results of scientific researches, that would help professionals to orient their activities and especially to apply the management measures they have to respect, although scientific advice is unavailable to them.

There are basic community bodies, associations of actors operating in the same links (fishers, processors, wholesalers, retailers) and such umbrella organisations, NAAFOO, GAMFIAD, TRY grouping different groups of actors. However, most of the leaders of these organisations say that they are often consulted and participate in meetings but are not yet well involved in major decisions such as the granting of operating titles and investment priorities in the sector especially.

Their non-participation in decision-making is mainly related, according to them, to the advisory nature of professional organisations. Their opinions are only considered as advisory in the various decision-making frameworks. They are not well represented in these frameworks and often only have observer status.

Most of the decisions have a direct impact on fishers, processors and local populations, but their prior consent is not very often sought. The facilities of the fish factories, the massive presence of foreigners on sites without access rights sometimes.

5.5.3 Equity, compensation and justice

The exploitation of fisheries resources and their exploitation on land are governed by the fishing legislation and access rules seem fair, although some think that the rules are more profitable to foreigners including investors who enjoy a lot of benefits.

It is noted that some management measures have disrupted the livelihoods of actors, but no alternative government measures have been taken. The alternative strategies that are often taken emanate from the impacted actors themselves. This is the case of the closure of oyster picking from June to February. During this period, a project had set up a fund to grant credits to women of TRY so that they could engage in other activities. Thus, some of the women of the association were active in the manufacture and sale of soap, others in the fish trade particularly from catfish. These credits were repaid during the harvest season at a rate of 10%. This funding according to some has stopped for some time.

Generally, the expropriation concerns the displacement of the actors occupying places on the landing sites, of transformation or in the markets in case of need of public utility. In the cases reported, no compensation system has been put in place. The most striking example is the expropriation of the Gunjur Women's Processing Site. The women were displaced for the purpose of setting up the fishmeal plant on the same site (Figure 31) while they had been occupying the premises for more than 40 years. They were displaced without any form of compensation even though for most of them, a good part of their facilities was lost as a result of this eviction.

Regulatory provisions exist in the country to receive complaints from complainants and settle disputes in value chains. Nevertheless, according to most of the actors interviewed, the complaints against investors, especially with regard to investors, are not treated or even when they are treated, they are always favourable to investors.

Many fishers have complained that they have repeatedly lodged complaints against industrial boats that have not been followed up. The Gunjur people had sued in August 2017 the Chinese fishmeal company, which they accused of illegally dumping toxic waste directly into the ocean. They had asked for the withdrawal of a pipeline from the plant installed in the ocean and also asked the company to pay GMD 15 million (EUR 277 000) in damages. The people deplore the treatment that has been granted to their complaint whose decision of justice is more favourable to the company. Earlier, the National Environment Agency launched a lawsuit in June 2017 against the Chinese company, but an amicable settlement between the Chinese factory and the Gambian government led to the withdrawal of the complaint.

FIGURE 31. LOCATION OF A FACTORY IN GUNJUR ON AN ARTISANAL PROCESSING SITE

5.5.4 Conclusion on Land and Water Rights

It appears that the failure of the control system to access the Gambian EEZ and the facilities granted to the processing industries represent a factor of loss for the Gambia. The government's option of attracting investment in the industrial sector has favoured the latter too much, while insufficiently taking into account the concerns and impacts on the local population. The case of fishmeal plant facilities, the construction of shipyards, and the presence of Chinese fleet types not yet classified as industrial or artisanal fishing, constitute a test of the level of tolerance of the Gambian authorities to the social economic and ecological benefits of investments they want to attract. These investments in the value chain are made in a context of weak fisheries governance in the Gambia and high prevalence of food insecurity and poverty. The Gambia government will then have to monitor investments along the value chain and ensure that environmental and social impact assessments are conducted and that the necessary mitigation measures are implemented.

5.6 Gender equality and social inclusion

Criteria	Summary Findings	Score
Economic activities	Although the activities of women in production are limited to oysters and shellfish, some have their own fishing gear (canoe, motor and gear) for maritime fishing that their families manage. They also provide funding and equipment for fishers. 80% of the processors and 50% of the small fish traders are women. The workforce in the processing plants is 65% female.	
Access to resources and services	As economic operators, women are involved in different income generating activities and acquisition of tangible assets (land, house, car). While the law guarantees them the same rights as men for production and development in the fisheries sector, financial constraints are a discriminating factor between men and women. Very few women have access to credit from banks.	
Decision making	The perception of a highly gendered division of labour (men's fisheries / women's processing) means that women are more often invited to make decisions as processors and traders of fishery products. Nevertheless, through some organisations like TRY, they are decision makers on production decisions. Depending on the VC segment, they organise their activities individually or collectively, have their own income but are not autonomous in the management and use of their income.	
Leadership and empowerment	Women are affiliated with organisations at landing and processing sites, retail fish markets, and hold important leadership positions and voice their opinions.	
Hardship and division of labour	Housewives first, then engaged in various activities of the chain, women sometimes take care of hard and strenuous work such as the landing of the canoes, handling transportation.	

5.6.1 Economic activities

Women are important pillars at every link in the value chain, either directly or indirectly. It is true that fishing in The Gambia, as in the other countries of the subregion, is characterised by a very marked specialisation of the actors in the different activities according to sex. Thus, there is no female fishers because fishing is considered to be a profession of men in the "Senegambian" culture but also because of its physical harshness. As a result, at the production level, women are active almost exclusively in collecting shellfish. Nevertheless, even if women do not participate directly in fishing trips at sea, some own fishing equipment (canoe, engine and gear) that is run by their families, especially those who are married to Senegalese men. They also finance and equip fishing units through advances they make to owners. They are also in charge of landing and selling the products of certain units.

Apart from fishing activities, where they are physically absent, the presence of women in the sector is dominant in the artisanal processing where they represent the overwhelming majority of the actors and also in the marketing of the fresh products as fishmongers but especially retailers. Already in 2009, it was estimated that 80% of processors and 50% of small fish traders are women in The Gambia (AfDB, 2009). Sixty-five percent of the workforce in the processing plants is women between the ages of 25 and 40. Nonetheless, women contribution to the economic growth within the sector is weak compared with that of men. The only woman-owned industrial processing plant in the country is owned by an expatriate woman who bought a factory that had ceased its activities. Even though she is based outside the country, she encourages other women in the sector including women's organisations to have their own business, following the example of TRY.

5.6.2 Access to resources and services

Women in the value chain are economic operators and are therefore involved in various income-generating activities and the acquisition of tangible assets. Thus, apart from their production equipment and/or valuation of fish products, they invest in the acquisition of land, houses, vehicles, etc.

In principle, all actors, both men and women, have the same rights to access production and valorisation activities. Only one of the main constraints that limit women's access to the means of production is the weakness of their financial means. This situation is a serious handicap in a context where fish is scarce, very often creating a strong competition between men and women for the purchase of products. In this competition, women generally have a weak bargaining power, compared to other actors in the sector, especially the big fishmongers who are more influent and more particularly the Senegalese who dominate this link in the chain. This bargaining power is an important element for setting prices and margins; it is a key determinant of net income from the business. In addition, there is competition from new players of Asian or European origin who offer more competitive prices for the purchase of the raw material and capture a large proportion of landed products. Thus, with the scarcity of the resource and the consequent decline in landings, the availability of products for women is increasingly uncertain and is accompanied by a decrease in the volumes treated. Similarly, it is also noted a high degree of dependence of women processors and traders vis-à-vis upstream activities including the production of fish that the exclusive business of men. Women's participation rates are correlated with the performance of fishers' landings.

In the marketing of fish products, men and women tend to operate at different scales and serve different markets. This results in gender-specific trading patterns along the value chain. Women operate mainly on a small scale, which involves the direct marketing of fish and low profit margins, while commercial men operate on a larger scale with more capital-intensive techniques and higher profit margins. Women serve inner urban markets while men control mainly more distant, sub-regional and export markets. The general trend seems to be that women tend to operate in low-income and domestic sector. On the other hand, segments in the chain that attract investments, especially the export sector, tend to be the domain of men, particularly Senegalese (UNCTAD, 2014).

Therefore, even if the law guarantees equal rights for men and women for their access to production and exploitation, financial constraints are a discriminating factor between men and women in the exercise of their activities. Measures should be taken to correct imbalances in financial resources between women and men. In this sense, the Gambian state should set up a special credit line for women to enable them to cope with competition from other actors, particularly foreigners.

It appears that very few women have access to credit from banks because of complex procedures, lack of collaterals, and the lack of flexibility of banking organisations. The vast majority of people are therefore

moving towards informal credit systems that do not require any contribution or guarantee, but which are often at very high interest rates of 10% to 20% sometimes.

This is the case of the loan granted by the Social Development Fund to fishing professionals whose interest rate was 20% according to the professionals met. The association of Brufut transformers had received GMD 100 000 in 2010 which it had distributed to its members (GMD 10 000 to 5 000 per member). The loan term was 12 months with interest rate of 10%. This rate is considered very high by women. NASCOM also provides loans to its members at interest rates of 10%. The TRY association benefits from a credit and savings system for its members and helps them in their fundraising strategies and commercial strategies.

It is especially through their collective tontine savings scheme, called "Kafos" that women find funds to strengthen their financial means, but the amounts are low. Access to the formal financial system is a catalyst for women's economic empowerment and allows them to increase their personal wealth.

Many of the women processors interviewed reported having received training. Some even said they participated in exchange visits to other countries in the subregion, particularly in Senegal, with support from partners. The TRY women have been trained in new, more environmentally friendly oyster harvesting methods that do not involve the destruction of mangroves. They also benefited from training in management and organisation.

In the Tanji, Gunjur, Sanyang, and Brufut sites, professionals reported that FAO had organised a 5-day training for women processors. The training focused on personal hygiene and precautions, and new modern techniques and methods of fish smoking. The participants met positively appreciated these trainings and declare to have become aware of the misdeeds of the old method of smoking fish which is dangerous because it uses a lot of fuel (charcoal and wood) and releases a lot of smoke. They are thus willing to abandon this old method to move towards newer, more environmentally friendly, modern methods of smoking fish that expose them less to the dangers of smoke and therefore benefit their health status. These new methods that also ensure a better quality of smoked fish in the country could add value to products that can be exported to other countries.

However, according to the beneficiaries in addition to training, they must have sufficient furnaces on the processing sites to put their theory into practice. FAO has built a new fish smoking centre in Gunjur, but it should be expanded on the site and in other places.

In processing plants, unskilled women receive training from skilled employees. In one of the companies visited by the VCA4D team, the quality manager is responsible for training other agents in hygiene, quality and packaging. Another officer provides training in labour law. In the markets visited, retailers receive training in hygiene, quality, sales, handling (frosting) and organisation from partners.

Women's access to support services, such as the trainings mentioned above, would greatly enhance their ability to take advantage of new export opportunities. It is often said that training is needed in three simultaneous areas: technical training on handling, processing and marketing of fish and fish products, and marketing and financial management (Keus et al., 2015).

5.6.3 Decision making

The perception of a highly gendered division of labour (male fishing /women's processor) has shaped the generalized approach to production decision-making in the sector in The Gambia (Siles et al., 2019). Women are generally not represented in associations of fishers and they are usually absent from decision making on this important link in the value chain.

However, through some organisations, Gambian women are able to participate actively in decision-making about production. This is the case of the Association of Women Oyster Farmers, which is very influential in the decision-making process. In collaboration with the government and external partners, TRY Oyster Women's Association has exclusive rights in the harvesting areas. It is considered one of the first African women's fisheries organisations to obtain such rights. In 2012, the Association received the Equator Prize, a prize awarded by the United Nations Development Programme (UNDP) to recognise community efforts to reduce poverty through the sustainable use of biodiversity (UNDP, 2013).

This example of self-management arrangements by women oyster farmers shows that women's role in decision-making must go beyond post-harvest and marketing. Although some believe that TRY women benefit from this recognition and support as oyster processors and traders, policies and interventions that

aim to empower women must create more opportunities for greater participation in governance of the resources.

In the different links of the value chain, women organise themselves as part of their work, individually or collectively. However, as we said earlier, their full autonomy is hampered by their dependence on other links in the chain, particularly production. Nevertheless, some, such as those of TRY, have more autonomy because they collect, process and market oysters and shellfish themselves.

Box 1. TRY example of women's autonomy in the organisation of their work

The TRY manager highlighted the difficulties she faced at the beginning in organising collaboration between women from different backgrounds and often marginalized communities. Nevertheless, it also attributes to these women the vision to organise the Association and the dedication they have shown. She argues that, although they are not educated, these women are very intelligent and receptive to new ideas and technologies. When they had the opportunity to participate in the BaNafaa project, they quickly adopted it with conviction and dedication. They are now realizing the economic and social benefits of their activities, including better equipment for oyster pickers and an increased ability to manage a profitable business. With increased access to credit, women were able to buy canoes, gloves and life jackets, allowing them to harvest oysters safely. They also purchased processing and storage equipment to diversify oyster products and transport them to regional markets. The head of the association hoped that each oyster farming woman in the TRY Association would build her own house and send her children to university. It aims to continue to attract other Gambians and women from other countries who work in oysters in order to speak with one voice and raise the standard of living of all people on the West African coast.

In the Gambian society, it is the woman's duty to meet the needs of the family, including food, clothing, training and education, medical expenses without the contribution of men. In this situation, women are the main providers of property in households and have a duty, not a right, to earn their own income to support their households. Although women's contribution to the household is considered a duty, women have little autonomy over control over their own income. It is often their husbands who set investment priorities and guide spending, and often against their wives' wishes. For this reason, some women have argued that they do not always declare all their income to their husbands so that they can sometimes manage it independently. Nevertheless, without their husbands' consent, women limited in deciding independently on a number of expenses. The vast majority of women met and living with their husbands are in this situation.

It is mainly women heads of household who have full control over their income. Nevertheless, according to some, the situation is tending to improve as women begin to have more autonomy.

Thus, women's independent income must be understood here as "women's financial capacity to support themselves". On the other hand, everyone's direct access to resources and the power to decide how they will be used, largely determine the degree of autonomy to which each spouse is entitled (Belleau and Cornut St-Pierre, 2012). Consequently, women certainly have an income independent of that of the other members of their household and more particularly of their husbands, but they are not independent with regard to the monetary management of their income. In a context where women in households aspire to more freedom, financial autonomy is seen as a prerequisite for the freedom to choose one's path. Investing in the economic empowerment of women is the surest way to achieve gender equality, poverty eradication and inclusive economic growth.

Women actively participate in all types of transactions at the various links in the value chain, both at the industrial and artisanal level, although their role is better known in processing and marketing.

5.6.4 Leadership and empowerment

At all levels of the value chain, women are affiliated with organisations at landing and processing sites, retail fish markets, in their neighbourhoods. Gambian women are more active in the fishing sector than Gambian men because they are involved in processing, including smoking, shellfish and retailing fish. Most fishers are foreigners and very few are affiliated to organisations in the host country. As a result, organisations other than those bringing together fishers are essentially dominated by the presence of women.

Because of their high representativeness in the organisations, women hold important positions of responsibility. In mixed organisations, the distribution of positions of responsibility follows the gender balance. Most often, a woman is president or vice-president, general secretary or assistant to the general secretary, etc. Nevertheless, even if women remain the majority in organisations, there is still a predominance of men in the bodies because of their authority. This predominance of men is an extension of the societal configuration based on a sexual division of labour that assigns women mainly a reproductive role.

Women's participation in local governance structures and decision-making at the territorial level is considered low. The still high female illiteracy rate and other socio-cultural factors contribute to women's limited participation in the decision-making process. Some women do not have the confidence to try to govern or make decisions about their land. In addition, patriarchy continues to hinder the full acceptance of women and their participation in decision-making positions. Cultural phenomena have created the stereotype "that men are superior to women" and a "process of socialisation that has also led men and women to perceive men as leaders and women as supporters. These perceptions are supposed to place women in the private sphere as wives, mothers and daughters while men are expected in decision-making in the public sphere, the economic and political arena.

As leaders in organisations, they participate in all debates and express their opinions. However, the vast majority of grassroots women who are not office members do not often speak out. On the one hand, the socio-cultural constraints mentioned above apply in mixed bodies, where women do not have the right to raise their voices in the presence of men and in some bodies they do not even have the right to speak. Despite the progress made, this situation remains very serious because women's voices have not been heard in decision-making bodies so far. On the other hand, some women do not want to contradict their leaders. The latter do not often wish for contradictory debates, especially when it comes to renewing their mandate.

5.6.5 Hardship and division of labour

Women, as housewives first, are engaged in various income-generating activities related to fishing. They divide their time between household chores and daily income-generating activities, sometimes spending up to 16 hours between the two types of activities. Due to their many household and family tasks and security problems, they cannot go inland to access more lucrative markets for processed fish and fresh produce as men do.

In all parts of the value chain, the risks of women taking on hard and tiring work are still high. For a long time, women were the specialists in landing catches in Gambia. From the pirogue to the place of handling or processing, they take care of the transport with containers of a capacity of 40 to 50 kg (Figure 32). Since the installation of fish meal factories that attracted the purse seine units, men have entered the trade to take care of the landing of these units, which are moored further offshore and more difficult for women to access. Women now limit themselves to landing catches from encircling net units.

FIGURE 32. WOMEN OPERATING AS CARRIERS AT LANDING SITES

Women working in the processing industries spend long hours with their hands in cold water, without gloves. They are held from 9 am to 5 pm with a one-hour pause between 2 pm and 3 pm. Sometimes, if there is a lot of product, they extend until 7 pm.

In artisanal processing, women are very often forced to handle the transport, weighing and stacking of products themselves to reduce handling costs. It is often their female colleagues who provide services on the sites who carry out this work. The same applies to the marketing of fresh or processed products, where some women transport their products on foot to the points of sale. Some go door-to-door and sometimes travel more than ten kilometres during the day.

5.6.6 Conclusion on gender equality and social inclusion

Women make an enormous contribution to the value chain as processors, traders or employees. However, they represent are the most vulnerable actors in almost every link in the chain. Apart from oyster farmers, their activities are very dependent on landings. Due to their limited financial resources, they have little negotiating power compared to other actors in the sector, particularly Senegalese and industrialists. Thus, to promote inclusive development and a reduction of gender inequalities in the value chain in The Gambia, it is imperative to strengthen women's economic empowerment by establishing special lines of credit for women at low repayment rates, providing them with adequate production and conservation infrastructure, and providing them with more training. The application of the legislation on equal opportunities developed by the National Strategy for Equity and Gender Equality (SNEEG) could also contribute to this.

5.7 Food and nutrition security

Criteria	Summary Findings	Score
Availability	Due to floods, drought and economic stagnation, food production in The Gambia has declined in recent years. Nevertheless, the evolution of food supply on the market in The Gambia is relatively stable thanks to food imports.	
Accessibility	The decline in actors' incomes means that they have fewer resources to allocate to daily expenses, while the prices of most food products are now considered higher.	
Utilization and nutritional adequacy	Food products are perceived as currently of lower quality, which is a source of common diseases today. There is no improvement in nutritional practices except for those benefiting from food fortification projects and 99% of households consume cereals every day.	
Stability	The risks of food shortages are still present in some value chain households with precarious and hypothetical incomes. If the prices of imported foodstuffs are more or less stable, the prices of local products can be up to three times higher due to their seasonal nature.	

Analysing the food security and nutrition situation in The Gambia, the World Food Programme argues that levels of poverty, food insecurity and malnutrition have remained unchanged or worsened over the past ten years despite the considerable progress made in recent years. The Gambia's poverty rate remains at 48%, while food insecurity has risen from 5 to 8% percent over the past five years due to weak food production systems and the effects of successive shocks such as the Ebola epidemic in 2015 and the resulting reduction in tourism, or drought and floods (WFP, 2018). In 2018, Gambia suffered a new drought that led to a food security emergency.

Food security is the first condition for good nutrition. It exists "when all human beings have physical, social and economic access at all times to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2009). This term includes four determinants or conditions: food availability, economic and physical access to food, food use and stability over time. Nutrition is the sum of the processes by which the body uses food for energy. This item examines the situation of these four elements at the level of the actors in the fish value chain in The Gambia.

5.7.1 Food availability

Due to shocks such as floods, drought and economic stagnation, food production in The Gambia has declined in recent years. The 2018 drought drastically reduced the country's food production. Rainfall in 2018 began

during the first days of June, followed by periods of drought and low rainfall in August. This situation has finally put an end to the continuous sowing of field crops while threatening the good germination of seeds already sown according to the National Food Security Council of the Republic of The Gambia. This alarming rainfall situation had led the Council to meet urgently with development partners to discuss the effects on crops, livestock and food security and appropriate policy responses (FAO, 2018c).

The National Food Security Council had stated that rice production was expected to fall by 45%, leaving a production level of about 15 098 t, which can cover about 8% of the regions' rice needs, leaving a deficit of 92% (185 126 t). This shortfall is estimated at GMD 5.2 billion (EUR 102.14) million. Groundnuts were also expected to fall by 25 519 Mt for a cash value of GMD 689 103 000 (EUR 13.58) million (Foroyaaa Newspaper[7]).

Admittedly, production has not been so catastrophic, but production has fallen sharply. The fisheries stakeholders met and who live essential from agricultural products have all recognized the production of food has dropped sharply.

Despite the deficit in national food production, the evolution of food supply on the market in The Gambia is relatively stable. Indeed, the Government had measured food needs on the basis that approximately 1 711 318 people will be under food pressure throughout 2019. Thus, the Government, through the various food and nutrition programmes and with the support of its development partners, estimated that 200 224 million t of rice and 99 256 million t of coarse grains would be needed in 2019 to help alleviate the pressure of severe food insecurity in the six typical agricultural regions (Foroyaaa Newspaper[8]).

The Gambia has one of the highest per capita rice consumption rates in the region. Local production represents only a small fraction of the quantity of rice consumed, leaving a high demand for imported rice. As for other food products, their level of supply is also stable as the government and traders continue to import large quantities of sugar, dairy products and other condiments. Thus, foodstuffs are for the most part considered to be available in the market.

The World Food Programme also distributed 875 t of food aid in the country, transferred USD 3 million (EUR 2.78 million) in cash between October 2018 and March 2019 and assisted 159 000 people in September 2018 (WFP, 2018).

With regard to fish, supply on the market is considered to be increasingly scarce due to population growth, increased export quantities and the establishment of fish meal industries. In addition to these anthropogenic factors, there are natural factors such as global warming, which causes species to move further and further away from the Gambian coast, making it more difficult to catch them, making markets less supplied and their prices higher.

5.7.2 Food accessibility

Most actors in the fish value chain report a decline in income even though, on average, the revenues of these players are higher than those of many other sectors of activity. As a result, they have less income to allocate to daily expenses. Nevertheless, food is considered one of the main priorities of households and is the first item of expenditure. Many of the actors interviewed, particularly fishers, processors and retailers, say they are finding it increasingly difficult to meet their food needs. Mothers seem to be the least affected by food security issues. The vast majority of them declare that they cover their food needs with the income derived from their activity. Fishers, processors and retailers are the actors in the chain, most of whom have reported an increase in expenditure allocated to food in terms of qualitative changes due to increased consumption of meat, fruit and other types of food.

A World Food Programme survey in 2016 showed that the majority of Gambian households earn no more than GMD 20 500 per year and their monthly expenses are about GMD 10 643. Average household food expenditures represent about 52% of total expenditures (WFP, 2016).

However, populations in coastal areas, particularly those living on fisheries, are considered to be the least affected by food insecurity than in rural areas where the number of food-insecure households ranges from

7 https://allafrica.com/stories/201809200096.html
8 https://allafrica.com/stories/201809200096.html

12% to 18%. Fishing in The Gambia contributes to poverty reduction by providing professionals, especially women and their families, with an alternative to improve their livelihoods (WFP, 2016).

The prices of most food products are now considered higher by the stakeholders met. This increase in food prices combined with lower income increases the level of poverty among the population and makes them more vulnerable. Women who provide food supplies to households make tontines of food products. At the various processing sites visited, they work in small groups of 10 to 15 people and pay a daily fee. After a certain period of time, usually a week, they buy foodstuff (oil, tomato, soap, or other foodstuff) with the amount collected to distribute to the members of the tontine. With this system, they access a good part of their supply more easily without having to pay a large sum of money at once to buy food or to make the more expensive retail purchase.

The price of fish is also getting more and more expensive. Fishers interviewed argue that the price of fish is more expensive because their catches are declining and they have to go further to find fish. This has led to an increase in expenditure on outings, which will result in an increase in catch prices.

5.7.3 Use and nutritional adequacy

Most stakeholders perceive food products as being of lower quality nowadays, especially dairy products, tomatoes and broths. The poorer quality of the products is, in their opinion, the source of diseases such as hypertension and diabetes, which are very common in many people today. Some stakeholders stated that they no longer have access to the good fish that has become very expensive because most species are now destined for export. Women processors report that they can only access the less fresh bonga because of competition from fishmeal factories. As a result, the quality of their product is lower and their profit margin decreases.

Stakeholders do not seem to see any changes in their nutritional practices and the WFP notes that the nutritional status of the population has not improved significantly, especially among the most vulnerable categories of women, adolescent girls and children under 5 years of age. It is this worrying nutritional situation that led the EU and FAO to set up a four-year project in September 2017 entitled "Improving Food Security and Nutrition in the Gambia through Food Fortification" (FAO, 2018c). This project aims to achieve national, regional and global nutrition objectives through the fortification of frequently consumed staple foods, bio-fortified crops and micronutrient supplementation. WFP also, as part of its nutrition prevention activities, provided supplementary feeding to 26 000 children aged 6-23 months in 2018 and 19 250 pregnant and lactating women received monthly rations in the form of supergrain and enriched oil (WFP, 2018).

While these types of programmes are important for improving nutritional practices, especially for young children, they cover only a small part of the population, the vast majority of whom are finding it increasingly difficult to access adequate and quality food.

Most stakeholders did not notice any change in eating habits and did not notice any change in its diversity either. However, the World Food Programme noted that nearly two out of three households (64.2%) in The Gambia have a high food diversity (WFP, 2016). It should be noted, however, that it is more a diversification of dishes than a diversification of foodstuffs. Cereals, and particularly rice, are the most frequently consumed food and 99% of households consumed them seven days a week (WFP, 2016). Only 15% of households eat vegetables every day during the week. The poorest households are less likely to eat meat, fruit and dairy products. Urban households have a more diversified diet than rural households.

The fisheries sector is the main supplier of animal protein to the diets of many Gambian households due to the relative availability and accessibility of fish compared to meat. National per capita fish consumption per year is 25 kg compared to an African average of 8.2 kg. The artisanal fisheries sub-sector in The Gambia provides over 90% of the local fish consumed as fresh, smoked or dry salted. Households mainly consume small pelagic, particularly bonga, fresh or dry-smoked. Rural households in particular use dry-smoked bonga while urban households have more access to fresh or hot-smoked fish with low or medium water content.

Almost all of the actors interviewed said that fish was becoming scarcer and that prices on the local market were rising. This situation has resulted in a decrease in the quantity of fish consumed. In the past five years, the proportion of people considered food insecure has risen from 5% to 8%, partly due to fluctuating populations of bonga fish as a result of FMFO fishing, according to the Changing Markets Foundation “Fishing for Catastrophe” (CMF, 2019).

“Our food security is under serious threat, the majority of Gambians live on less than USD 2 (EUR 1.85) a day and local populations are in direct competition with the fishmeal factories” said an environmental activist from Gunjur.

The establishment of three fishmeal plants in the country is cited as one of the main causes of high fish prices. In the opinion of the stakeholders, these factories constitute a threat to food security and jobs for those involved in processing. The fishmeal factories offer better prices to fishers who prefer to sell their catches there. Processors are forced to buy the raw material at a higher price. This high purchase price of the raw material is reflected in the resale price of the processed products and is the cause of the decreasing accessibility of fish. This situation jeopardizes artisanal processing, which is one of the most important livelihoods for many people in fishing communities, especially women. "Before, we used to buy a basket for GMD 100 (EUR 1.80), now it can go up to GMD 500 (EUR 9)," explained a fish smoker.

Two separate surveys conducted by international NGOs —Greenpeace International and Changing Markets Foundation— have recently warned that the scale of Gambian FMFO production is unsustainable and that the country's food security is threatened if the industry is not curtailed. It is estimated that 4-5 kg of fresh fish are used to make 1 kg of fishmeal. FAO recommends an urgent reduction in the intensity of bonga and sardinella fishing in the sub-region, which are essential for food security and livelihoods, particularly in Senegal and the Gambia.

5.7.4 Stability

The risks of food shortages are still present in some value chain households with precarious and hypothetical incomes. Apart from remittances from migrant parents, most households rely only on their own income to buy food.

As The Gambia is highly dependent on food imports, whose prices fluctuate on world dollar exchange rates, their prices also continue to fluctuate and, above all, to rise. However, stakeholders have noted greater price stability for imported commodities in recent years. On the other hand, the prices of local products such as cereals and fish, which are seasonal, can be double or even triple. The price of fish is very dependent on the seasons and the presence of Senegalese fishers in Gambia.

5.7.5 Conclusion on food and nutrition security

To address the main food security problems faced by households involved in the value chain, priority should be given to interventions that strengthen the livelihoods of stakeholders. This will include a specific focus on promoting the creation of small businesses focused on value creation and value chains, promoting the provision of training and technical skills development opportunities for young people in various livelihood sectors such as fisheries, and promoting the diversification of diets by boosting local crop production.

5.8 Social capital

Criteria	Summary Findings	Score
Strength of producer organisations	The negotiation capacities of organisations on the market are rather weak. Nevertheless, some umbrella organisations such as TAGFC, GAMFIDA, NAAFO, NASCOM, TRY are often cited as being best involved in the value chain. They are also more inclusive than associations of professionals from the same link.	
Information and confidence	Access to information by actors in the chain is generally perceived as low and the degree of trust in the relationships between actors is average.	
Social involvement	Professionals and communities are often not involved in decisions that impact their livelihoods, such as fisheries agreements and the establishment of fish meal factories. The process of involvement of organisations in the EU SFPA is a first steps toward their better integration in negotiations. Through participatory management, local knowledge is taken into account and stakeholders participate in the rehabilitation or construction of roads, schools, health centres and scholarships for the benefit of communities.	

5.8.1 Strength of producer organisations

Although there are different types of professional organisations, member actors judge the level of participation of organisations as average in general. Nevertheless, some umbrella organisations are often

cited as being best involved in the value chain. These are the Association of Gambian Fishing Enterprises (TAGFC), which is responsible for meeting the needs, problems and constraints of operators in the industrial fishing sub-sector; Gambia Artisanal Fisheries Development Association (GAMFIDA), which works to promote and develop different categories of artisanal fishing operators in the sub-sector; and the National Association of Artisanal Fisheries Operators (NAAFO), which aims to defend the interests of all groups in the artisanal fishing sector; National Sole Co-Management Committee (NASCOM) which has been granted exclusive rights to artisanal sole fishing as responsible for its sustainable management in the sole fishing area that extends from the Atlantic coast and the shores adjacent to the estuarine areas of the Gambia River to 9 nautical miles (nm) offshore; the TRY association presented above which is an association responsible for coordinating the activities of women oyster gatherers in the Tanbi National Wetlands Park (Ramsar designated site).

However, apart from TRY, the activities of other organisations concerning the proper involvement of professionals in product development and in particular access to financial and technical resources is not very visible in the field in the opinion of most professionals. NASCOM and the Advisory Committee are perceived by most stakeholders as technical arms of the administration and not as true defenders of the interests of professionals in the value chain.

The inclusiveness of organisations depends on their nature. In the various landing, processing and market sites, actors working in the same field find themselves in associations that concern them exclusively. Thus, there are fishers' associations, fishmonger associations, processors' associations, fishers' associations, oyster farming associations, etc. In the field, it was noted that these types of associations are not always inclusive of a certain category of actors, particularly foreigners. Many Senegalese transformers say they are not involved in associations on their work site. They denounce a kind of ostracism of nationals towards them. The same applies to fishers, most of whom do not identify with local associations because they have not been involved. A Gambian fish farmer who collects oysters says he has asked to join the association of women oyster farmers but has never received an answer. Nevertheless, the umbrella organisations (NAAFO, GAMFIDA, TAGFC) seem more inclusive since they bring together various types of actors in the value chain.

Often, the leaders of organisations are elected by a vote of the grassroots members following a general meeting. However, the duration of mandates is often not respected according to most of the actors interviewed. General renewal meetings are not held on the due date, therefore making members in office out of the legal regulations. Leaders do not wish to be replaced and have no interest in renewing proceedings. This situation raises the problem of the representativeness and legitimacy of most leaders towards grassroots members.

The bargaining groups of organisations in the marketplace appear to be quite weak at the receipt of TRY and TAGFC. By centralizing the sale of the harvest products and adding value, they try to place it on the market through the important market in the sub-region and abroad. The TAGFC faces economic operators such as Senegalese fishers and industrialists as well as the main dominant players in the chain. The ability to negotiate, which is an important element in setting prices and margins, is a determining factor for professionals who expect to see their income from their activities. To this end, professional organizations in the value chain should seek the services of a specialized organization in this field, such as the Centre for the Promotion of Exports from Developing Countries (CBI) based in the Netherlands. This organisation has set up a platform in Senegal to support the Senegalese fisheries sector to improve its export position in the European market and to strengthen collaboration among value chain stakeholders and support organisations.

5.8.2 Information and trust

Access to information by chain actors is generally perceived as low. Apart from the sole for which some well-informed actors claim to have detailed information on customs duties and fishing profitability, information on flows, prices, contracts, fees, taxes, exploitation authorisations is not accessible, especially for artisanal actors.

Thus, many stakeholders deplored the fact that since the opening of fishmeal factories, no information has been obtained on their activities concerning their production capacity, the quantities of fish processed and the quantities of flour exported. The same applies to fishing licences granted to foreign vessels, the information of which is accessible only upon request to the government, with the exception of access agreements with the EU, which are available on the EU website. Scientific data on the state of stocks of the main stocks are not accessible to professionals according to the organisation managers. The fish merchants

deplored the lack of information on the international market and on the understanding of international contracts.

The lack of information from stakeholders on the value chain contributes to the lack of visibility of the real impacts on the economy and food security of the various links in the chain in the sector.

The degree of trust in the relationships between the actors in the value chain is average. The sometimes divergent interests between the different actors and the competition between them can pollute trust relationships. In production, for example, fishers targeting small pelagic argue in favour of fishmeal plants, which are a cheap market for them, while processors and consumers accuse these plants of being at the root of the rise in fish prices and the decrease in availability on the market. Fishmeal factories provide funding to Senegalese fishers for bonga and sardinella and have priority over catches. At the moment, local fish merchants, who very often only buy on credit, are finding it increasingly difficult to access the fresh produce of these two species, which are their main sources of income in the chain. Similarly, nationals accuse Senegalese fishers and fishers of having joined forces to control the entire demersal species chain to the detriment of nationals who cannot penetrate this very solid network.

On the side of industrial actors, it is also denounced the poaching of qualified executives by certain factories that have just been set up in order to offer them better salaries. There is also competition between factories on foreign markets.

Nevertheless, it was also noted that this relationship of trust between fishers and their financiers, fishers or industrialists and between actors working in the same link. There are different types of formal or informal arrangements and agreements between actors that enter into contracts for financing or the supply of products.

5.8.3 Social involvement

The heads of the organisations met deplored the fact that professionals are not involved in fisheries agreements, which have a major impact on their activities. The government is the only official representative to negotiate the SFPA, with the EU and the participation of professional organisation shall be further strengthened.

Gambian fisheries stakeholders report to feel now freer to express their concerns about decisions that impact their livelihoods; something that was impossible under the old regime. Moreover, they state that the first fishmeal factories arrived at the time when the Gambia was under dictatorship and people could not demonstrate against a decision by the state. Now, the actors feel concerned by decision making, express their opinion and protest. Admittedly, their full participation in decision-making is not yet very effective, but clear progress has been noted according to some actors.

The participatory approach called co-management that is advocated in fisheries management is above all the consideration of the knowledge and know-how of local populations about the resources they use. Thus, most of the new knowledge on sole has been provided by fishers and industry using methods of aggregating data from local knowledge and confirmed by participatory research involving local populations. Similarly, the measure of closing the oyster harvesting was taken while taking into account women's knowledge of oyster breeding periods and their knowledge of mangroves.
Different forms of voluntary participation of value chain actors in communities were reported. A manager of a fishmeal factory in Gunjur says he has employed 80 local workers, provided assistance to the community with about GMD 3.2 million (EUR 58 200), helped the school and repaired the main road to the village every year. A fresh processing plant in Banjul claims to provide scholarships to students and actively participates in the monthly cleaning days held in the city. In Tanji, the fishers' association is involved in the construction of mosques and classrooms and supports health services. In other localities, the organisations present support local authorities in the various activities.

5.8.4 Conclusion on social capital

Like all sectors of the economy, the fishing sector is marked by a trend towards the grouping of economic actors to carry out collective missions in relation to and in addition to State initiatives. These representative structures participate in a concerted fisheries management movement defined as the recognition by the DoF of the non-state interests and organisation of actors. However, these organisations are not yet fully playing

their role in the value chain. They have very little involvement in decision-making and have little influence on markets dominated by foreign actors.

5.9 Living conditions

Criteria	Summary of main Findings	Score
Health services	Most professionals have access only to primary and secondary health facilities closer to communities and less expensive. Services are still not affordable for women who are responsible for household health expenditures.	
Housing	The actors acknowledged that they had noticed an improvement in their housing, but the dominant type of housing for most is a main building with a sheet metal roof and households have only basic toilets made up of latrines and do not have access to drinking water.	
Education & training	The school enrolment rate in The Gambia is high because Gambian law makes the first six years of primary school free and compulsory, but the access rate to secondary school is low. There are very few training schools and no training structures in the fisheries and aquaculture sector.	
Mobility	The degree of professional mobility from fisher to fisher or processor or vice versa is quite low. Thus job security is precarious. On the other hand, geographical mobility is very high.	

5.9.1 Health Services

The vast majority of the stakeholders interviewed reported having access to health facilities, but at very different levels. The health system in The Gambia consists of three levels: primary, secondary and tertiary. The primary level service, called Village Health Services (VHS), gives access to community health structures that are often the first point of contact between individuals, families and communities. Secondary level refers to the provision of basic health services, including basic emergency obstetric care. It must meet up to 70% of the population's basic health care needs. As for the Tertiary level, it concerns the General Hospitals, which serve as reference points for the major health centres by providing specialised services.

Most fishers, processors, labourers in the processing industries and other service providers report having access to only the first two levels of health services. The latter are the closest to the communities and cheaper for access fees. Most landing sites have first aid rooms to manage certain types of patients before they are evacuated to health facilities if necessary.

Tertiary level institutions are mainly concentrated in Banjul. The actors who declare that they frequent them, especially private establishments, are most often employees of industries that have medical coverage, fish merchants and canoe owners whose incomes are more substantial.

Access to health services is correlated with opportunities for access to different types of health facilities. They depend on the level of household income and the proximity of institutions. Generally, it is women who pay for medical expenses in households. Due to the low incomes of most of them, households' access to quality institutions and care is not always easy.

The affordability of health services for households is very relative according to the actors, but in general health structures are considered expensive. For example, the price of consultation in Brikama's health facilities is GMD 25 for nationals and GMD 50 for foreigners. This price, considered affordable by some, is perceived as expensive by others. Some generic drugs are given free of charge to patients in health centres, but the vast majority of prescription drugs are only available in private pharmacies and their prices are considered very expensive by most. Others refer to periods when access to health care was free throughout the country and currently consider household access to health services to be very expensive.

In The Gambia, as throughout the sub-region, it is in private health facilities that the best skills and services are found, although they are not within the reach of the vast majority of Gambians. The shortage of doctors and other qualified medical personnel is a major problem in the Gambian health system. It is noted that at least half of the qualified public service staff eventually leave because of low wages and difficult working conditions. Some join the private sector while many others leave the country completely. As a result, public sector health professionals are often overworked and medical resources are strained.

5.9.2 Housing

Most of the stakeholders acknowledged that they had noticed an improvement in their housing. Generally, investment in housing is also a priority in households and a good number of the stakeholders interviewed state that they live in houses built or under construction. The dominant type of housing for most people is ae building with a sheet of metal as roof. However, a large part of the actors still occupies rudimentary housing, particularly Senegalese fishers who are tenants in fishing centres. It is mostly the fishers who live in buildings with cement slabs as well as the owners of fishing units, particularly the owners of purse seines or long tidal line pirogues. Those who work in the processing industry, especially bosses and managers, live in luxury homes. They are almost all foreigners.

Access to drinkable water and sanitation for households of value chain actors seems to be a problem (Table 32). Nevertheless, depending on the different types of professionals and localities, the situation seems to vary. The households of Sanyang, Tanji, Bakao and Brufut mostly have individual standpipes. The infrastructure in these localities has developed in recent years both in terms of road infrastructure and access to drinking water. These villages benefit from their proximity to the capital Banjul. In Gunjur, on the other hand, most households obtain their supplies from wells.

Regarding sanitation in households, it appears that most households have only basic toilets with latrines. The 2018 Multiple Indicator Report published in July 2019 indicates that 40% of the population in rural areas do not have access to sanitation and 4% of the rural population practice open defecation. By type of environment, 45.9% of urban households have access to improved sanitation facilities, compared to only 24.3% in rural areas (GBoS, 2018). The fishing villages are of a rural type, i.e. between urban and rural, which means that they have a lower sanitation rate than cities but higher than those of typical rural villages.

As for access to drinkable water, according to this survey, only 32% of households have improved the source of potable water to their premises and that the use of unprotected wells for drinking water is common in rural areas (21.8% to up to 30%). This situation leaves large segments of the population under five years of age at risk of illness and death. WaSH (water, sanitation and hygiene) related diseases currently account for 20% of under-five deaths in The Gambia.

TABLE 32. SOME VALUES OF INDICATORS OF HOUSEHOLD ACCESS TO DRINKING WATER AND SANITATION

Description indicator	Value
Percentage of household members using improved sources of drinking water	90.4
Percentage of household members using improved sources of drinking water either in their dwelling/yard/plot or within 30 minutes round trip collection time	84.8
Percentage of household members with a water source that is available when needed	87.3
Percentage of household members using improved sanitation facilities	61.8
Percentage of household members using improved sanitation facilities which are not shared	47.1
Percentage of household members with an improved sanitation facility that does not flush to a sewer and ever emptied	69.8
Percentage of household members with an improved sanitation facility that does not flush to a sewer and with waste disposed in-situ or removed	18.0

Source: (GBoS/UNICEF, 2019)

5.9.3 Education and Training

Most of the actors interviewed stated that their children have access to primary school either in the public or private sectors. In general, the primary school enrolment rate in The Gambia is high (Table 33). Gambian law makes the first six years of primary school free and compulsory, and the primary completion rate is over 70%. Gambian women value their children's schooling and most of those interviewed say that their school-age children are in school.

However, even if education is compulsory in The Gambia, the education system does not reach everyone. According to the CIA Factbook[9], in 2018, 72 096 children in The Gambia were not in school. Adult literacy rates are considered as low as in 2015, only 55.5% of men and 47.6% of women were literate.

TABLE 33. VALUE OF SOME INDICATORS ON YOUTH SCHOOLING IN THE GAMBIA

Description indicator	Value
Percentage of children age 36-59 months who are attending an early childhood education programme	23.8
Percentage of children in the relevant age group (one year before the official primary school entry age) who are attending an early childhood education programme or primary school	74.6
Percentage of children attending the first grade of primary school who attended early childhood education programme during the previous school year	69.0
Percentage of children of school-entry age who enter the first grade of primary school	58.2
Percentage of children of primary school age currently attending primary or secondary school	78.1
Percentage of children of lower secondary school age currently attending lower secondary school or higher	44.2
Percentage of children of upper secondary school age currently attending upper secondary school or higher	30.7

Source: (GBoS/UNICEF, 2019)

Households' access to secondary education appears to be more difficult. Most of the actors interviewed state that many of their children have not reached the secondary level because of their low level or lack of means to pay for their schooling. The Education Sector Strategic Plan 2016-2030 (MoBSE/MoHERST, 2017) recognises that it is at the secondary level that the greatest challenge remains where the current Gross Enrolment Ratio (GER, the total enrolment in a specific level of education, regardless of age, expressed as a percentage of the eligible official school-age population corresponding to the same level of education in a given school year) of 44% remains. Some deplored the trend towards the privatisation of education, which is becoming more and more expensive. The same is true of school supplies, which are considered very expensive for households. Some have stated that they cannot afford the school fees for all their children and are forced to remove children who do not have a good level from school very early on. Others are often kept by their parents in canoes or processing workshops and do not have the opportunity to continue their studies.

Concerning vocational education, the actors deplored the lack of a training school, particularly in the fisheries and aquaculture sector where there is no training structure. Most of the technicians and managers in the processing industries are Senegalese and Mauritanian. Lack of access to vocational training and employment opportunities for young Gambians is widely cited as a major factor contributing to irregular migration towards other countries. In response, the International Organisation for Migration (IOM) has launched a vocational training programme to equip young Gambians with the skills they need to engage in entrepreneurial activity or seek employment.

In this context, The Gambia should consider opening a specialised school for fisheries and aquaculture technicians to train managers in this field and help professionals in the sector to build their capacities.

Continuous training of value chain actors by investors has been reported in the processing industries. It is often the quality managers who train other workers without qualifications in hygiene and quality standards. Some managers of these factories go abroad to be trained, particularly in sub-regional countries such as Senegal. The continuous training of other actors such as fishers and processors is provided by NGOs or bodies such as the FAO or the EU and concerns training modules on safety at sea for fishers or marketing, financial management, hygiene and quality for processors and fresh retailers.

Independently of housing conditions, access to drinkable water, access to education and training, vocational training and health services, the living conditions of actors in the fish value chain in The Gambia are also dependent on infrastructure related to the production and processing of fishery products. However, the fish

9 https://www.cia.gov/library/publications/the-world-factbook/geos/print_ga.html

value chain in The Gambia suffers from poor road infrastructure and lack of facilities at landing and processing sites.

Regarding road infrastructure, it is noted that VC actors suffer from poor road conditions, which makes travel in the country difficult and sometimes impossible. Landing sites lack modern facilities (cold rooms, coolers...) and access to them is often difficult. The products landed from the pirogues are often landed directly and at best on tarpaulins.

5.9.4 Mobility

If we consider the professional mobility which consists for an actor to change its role in the value chain i.e. to move from fisher to fisher or processor or vice versa, it is quite low. Certainly, it happens that some fishers who no longer have fishing equipment convert into fish merchants or traders of processed fish, but this is not very frequent. Few processing women also turn into ponders or vice versa.

The geographical mobility of actors is very high. Fishers are constantly on the move, especially foreigners. Traders in fresh or processed products, especially men, are highly mobile since they supply the interior of the country and even the sub-region.

With regard to job security, it appears that the value chain offers important employment opportunities in both production and product development. However, the seasonality of activities and the increasing scarcity of fisheries resources make it difficult for the workforce to access employment opportunities safely. Only in industries where workers are on permanent contracts have employment security. The other daily workers, who are the most numerous, work only according to the availability of raw materials, which is very seasonal. Fishers and processors are the categories whose activities are more unstable because they depend on the state of the sea, the state of their equipment and the presence of the resource. In these circumstances, measures to diversify the activities of the actors should be encouraged to enable them to find other sources of income outside the fish value chain.

5.9.5 Conclusion on living conditions

International organisations such as WHO and FAO have noted that living conditions in The Gambia have improved slowly but steadily in recent decades, yet the vast majority of the Gambian population still lives in precarious conditions, particularly with regard to health care, access to safe drinking water and the availability of adequate facilities in homes. Even if the primary school enrolment rate is high, the school completion rate is still too low because of the difficulties parents have in meeting their children's school fees. The lack of training schools, particularly in the field of fisheries and aquaculture, is one of the causes of the lack of managers in the Gambia seafood value chain.

5.10 Social profile

The scores on social profile of the value chain appear generally low and reflect all the difficulties of the vast majority of stakeholders, particularly Gambian nationals. Apart from gender equality, which has a moderate score and demonstrates the importance of women in the value chain in terms of their massive presence in almost every link, other social indicators are weak. It appears that the right of access to exploitation and value enhancement had a greater impact on the profile radar and reflects the failure of the fisheries governance system in the Gambia. The consequences of this poor governance result in a loss of foreign exchange for the Gambian government and a decrease in the income of national actors leading to difficult living conditions and food and nutritional insecurity of the population.

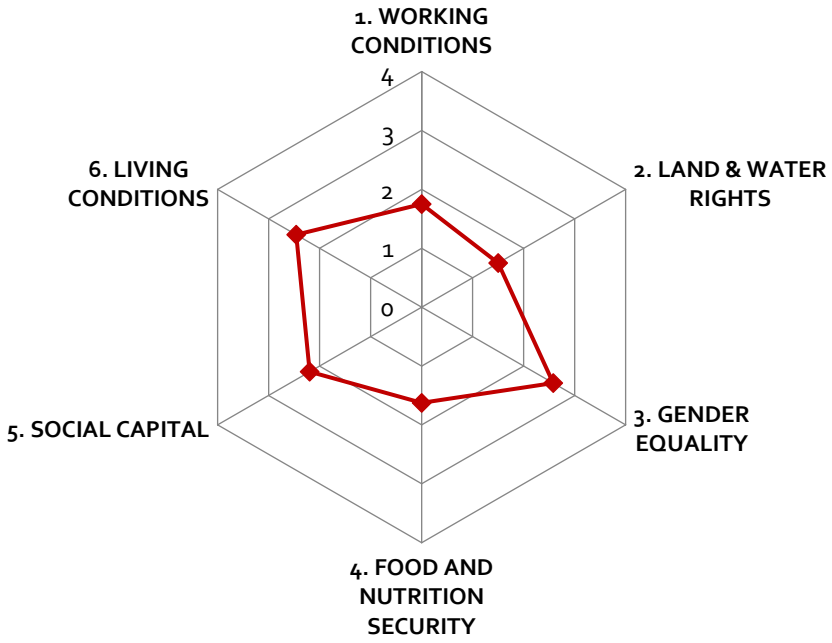


FIGURE 33. SOCIAL PROFILE OF THE GAMBIA'S SEAFOOD VALUE CHAIN

5.11 Overall conclusions

It seems that despite the abundance of fisheries resources in The Gambia, the country does not seem to maximise the social benefit from this wealth and the social sustainability of the value chain faces various constraints. Most actors work in difficult conditions and are exposed to many risks of accidents. The Gambia struggles to enforce access rules in its EEZ and this situation benefits foreign actors, especially in the most profitable links, both in the industrial and artisanal sectors. Most of The Gambia's fish catches are landed, processed and exported from foreign ports. These products are then exported not as products of The Gambia, but as products of these countries. This deprives The Gambia of foreign exchange, jobs and fish for local consumption.

Women, who are the majority in the value chain, have the greatest difficulty in accessing products due to their limited financial resources. They also have the lowest incomes as they are limited to the local market with low value added products due to a lack of adequate infrastructure for processing and trading of products. They have a weak capacity to negotiate on the market with foreigners, especially Senegalese traders and fishing industrialists. More than 80% of Gambians derive their daily protein requirements from small pelagic stocks and in particular bonga because these resources are the most affordable. However, the establishment of fishmeal plants could compromise the availability of small pelagics.

The professional organisations, which were supposed to be the sentinels of defence of the interests of the Gambians, are little involved in decision-making, most of which is often done and implemented without their knowledge.

The Gambia has developed a strategic plan 2017-2021 to reverse this trend so that nationals can benefit from the many opportunities offered by the sector, especially women and youth. Thus, the Gambia had set itself the following objectives, among others: ensuring the rational and sustainable use of marine and inland fishery resources and developing aquaculture; using fish as a means of increasing food security and livelihoods in rural areas and improving the nutritional standards of the population; increasing employment opportunities and the participation of Gambians, especially women and young men, in all aspects and at all levels of the fisheries sector; and increasing net foreign exchange earnings.

However, the fisheries governance system appears not to be meeting the objectives of this plan. Due to a poorly monitored EEZ, uncontrolled fishing permits, unsupported national stakeholders, wishful thinking in aquaculture, and numerous benefits granted to investors without taking into account the concerns of local people, the seafood industry in The Gambia does not yet appear to be sustainable to meet the expectations of the population.

6 Environmental analysis

6.1 Introduction (goal and scope)

The LCA-based environmental analysis aims at answering the framing question "Is the value chain environmentally sustainable?". This question is answered through its declination on LCA's areas of protection (AoP: human health, ecosystems and resources), key impact categories of interest such as climate change and water depletion, as follows.

The LCA of the Gambian fisheries value chains aims at determining the potential impacts of its current functioning on the three common AoP addressed by LCA. To estimate these impacts, we constructed LCIs representing the various types of systems on each link of the value chain (i.e. the various distinctive fisheries, artisanal and industrial processing, and distribution), in terms of representative **units of production (UP)**. To do so, we collected primary and secondary data for the most representative system types, as defined by the actor typologies (section 3.1.2, Figure 8). The LCIA methods recommended by the ILCD 2011 Midpoint+ v1.09 method (EC-JRC, 2012) and the EC's Product Environmental Footprint (PEF) initiative (EC, 2013) were retained (Table 34). The updated list of methods presented in the recent Product Environmental Footprint Category Rules Guidance (Version 6.2 - June 2017) was not followed because the newest choices are not available yet in SimaPro. This list of midpoint indicators was complemented with ReCiPe (2.2 Endpoint World H/A (Hierarchy/Average)) endpoint indicators[10]. ReCiPe was chosen because it features endpoint indicators on the three LCA areas of protection, based on many relevant impact categories (Huijbregts et al., 2016). The hierarchical (H) perspective was chosen because it is based on the most common policy principles with regards to time frame and other issues and is thus often encountered in scientific models (Goedkoop et al., 2013).

TABLE 34. PEF AND ILCD-RECOMMENDED IMPACT CATEGORIES AND IMPACT ASSESSMENT MODELS

Impact Category	Impact Assessment Model	Impact Category indicators	Source
Climate Change	Bern model - Global Warming Potentials (GWP) over a 100-year time horizon	kg CO_2 equivalent	Intergovernmental Panel on Climate Change, 2007
Ozone Depletion	EDIP model based on the ODPs of the World Meteorological Organisation (WMO) over an infinite time horizon	kg CFC-11 equivalent	WMO, 1999
Ecotoxicity for aquatic fresh water	USEtox model	CTUe (Comparative Toxic Unit for ecosystems)	Rosenbaum et al., 2008
Human Toxicity - cancer effects	USEtox model	CTUh (Comparative Toxic Unit for humans)	Rosenbaum et al., 2008
Human Toxicity – non-cancer effects	USEtox model	CTUh (Comparative Toxic Unit for humans)	Rosenbaum et al., 2008
Particulate Matter/Respiratory Inorganics	RiskPoll model	kg $PM_{2,5}$ equivalent	Humbert, 2009
Ionising Radiation – human health effects	Human Health effect model	kg U^{235} equivalent (to air)	Dreicer et al., 1995

[10] Endpoint indicators are dimensionless after normalisation and weighting, as the three AoP have different units (DALY, $, and species.yr). In ReCiPe, impacts on AoP can be also expressed as "points" (Pt). Endpoint indicators express a) the relative contribution of an impact category to the cumulative impacts of the product system on an Area of Protection, and b) the cumulative environmental performance (impacts) of the product system. Endpoints only make sense in comparative contexts.

Photochemical Ozone Formation	LOTOS-EUROS model	kg NMVOC equivalent	Van Zelm et al., 2008 as applied in ReCiPe
Acidification	Accumulated Exceedance model	mol H+ eq	Seppälä et al.,2006; Posch et al., 2008
Eutrophication – terrestrial	Accumulated Exceedance model	mol N eq	Seppälä et al.,2006; Posch et al., 2008
Eutrophication – aquatic	EUTREND model	fresh water: kg P equivalent marine: kg N equivalent	Struijs et al., 2009 as implemented in ReCiPe
Resource Depletion – water	Swiss Ecoscarcity model	m^3 water use related to local scarcity of water	Frischknecht et al., 2008
Resource Depletion – mineral, fossil	CML2002 model kg	kg antimony (Sb) equivalent	van Oers et al., 2002
Land Transformation	Soil Organic Matter (SOM) model	kg (deficit)	Milà i Canals et al., 2007

Intended outcomes of the assessment include:

- A comparison among artisanal and industrial fishing activities, per landed t of fish. The various artisanal fleets are compared amongst them and with the industrial fleet.
- A comparison of artisanal and industrial fish processing (drying, smoking and freezing), per t of product.
- A comparison of various distribution routes.

Data collected was insufficient to conduct formal (e.g. statistical) sensitivity and variability analyses. Stock assessment data was also insufficient to compute impacts of biomass removal on the stock and on the ecosystem.

6.1.1 Functional unit

Two main functional units were retained: 1 t of fresh whole fish and 1 t of processed fish product (e.g. frozen, dried or smoked fish and fish portions). These functional units have been widely used in comparative seafood LCAs (Avadí et al., 2018; Avadí and Fréon, 2013). The reference flows are the annual landings per vessel category, for fisheries, and the amount of fresh fish required to produce 1 t of fish product, for processing. Fresh and processed fish are not directly compared. The technological scope encompasses current technologies deployed in the region, and the temporal scope corresponds to the 2014-2018 period.

6.1.2 Allocation

Economic mass-weighted economic allocation was applied to assign fisheries impacts between landed target fish and by-catch, for fisheries featuring by-catch. No impacts were allocated to fish residues from artisanal or industrial processing, as they are considered as wastes without a market price, following the dominant French philosophy on agri-food residues impacts (Avadí, 2020; Koch and Salou, 2016).

6.2 Life Cycle Inventory

The following LCIs based on primary data collected in the field by the team members as listed in Annex A, corresponding to the key actors identified consensually in the functional analysis[11]:

- Producers (artisanal and industrial fisheries and shellfish collection systems)

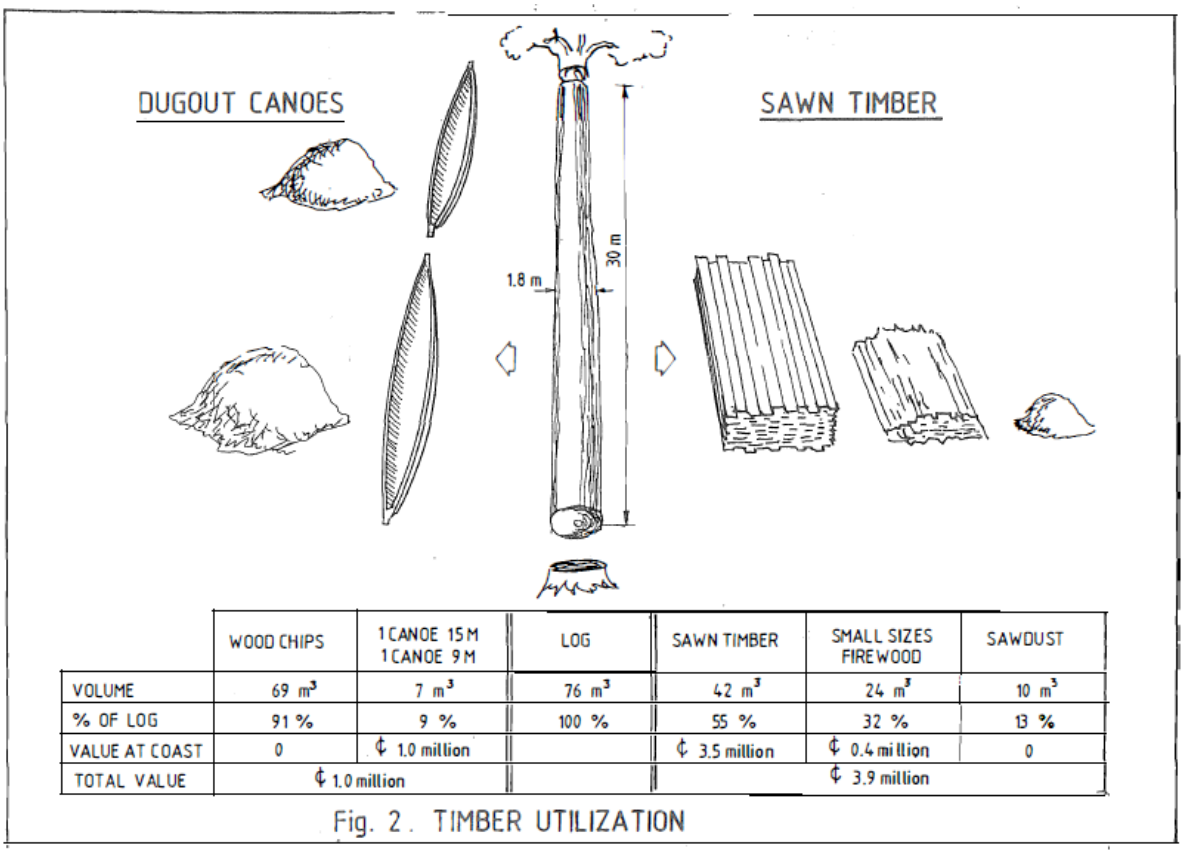
[11] Operational and environmental data were available on more actor types, thus enabling the inclusion of more actors in the environmental analysis than in the economic analysis, due to 1) the sensitive nature of economic data required for the latter, and 2) the fact that the economic analysis was only concerned with fisheries landing in The Gambia, while the environmental analysis also included fisheries operating in The Gambia but landing abroad.

- Processors (artisanal drying, artisanal and industrial smoking, industrial freezing)
- Distributors (in terms of fish transportation activities across trader types)

Abridged life cycle inventories of sub-fleets modelled for the assessment are presented in Table 35, and of fish processors in Table 36.

Two thirds of solids in the antifouling paint were assumed to be lost as antifouling emissions to the ocean, as usually assumed in fisheries LCA (Avadí and Vázquez-Rowe, 2019b; Hospido and Tyedmers, 2005).

LCIs of shellfish collection are very basic, as no complex means of production are involved in that activity, except for dugout canoes (Figure 34), hand tools, and fuel for braising. A 2 m long dugout canoe weights up to 370 kg, and the amount of fuel consumed per unit of production (shellfish harvester) adds up to 1.7 m3 wood per year (sourced from Senegal, from commercial operations), for processing 273 kg shellfish flesh per year for a yield of 91 kg/year of dried shellfish products.



	WOOD CHIPS	1 CANOE 15 M 1 CANOE 9 M	LOG	SAWN TIMBER	SMALL SIZES FIREWOOD	SAWDUST
VOLUME	69 m^3	7 m^3	76 m^3	42 m^3	24 m^3	10 m^3
% OF LOG	91 %	9 %	100 %	55 %	32 %	13 %
VALUE AT COAST	0	¢ 1.0 million		¢ 3.5 million	¢ 0.4 million	0
TOTAL VALUE	¢ 1.0 million				¢ 3.9 million	

FIGURE 34. SCHEMATICS OF DUGOUT CANOES USED IN WEST AFRICA. SOURCE: GULBRANDSEN (1991)

The production of ice for the artisanal fisheries is performed by both government-run and private plants. These plants produce between 1300 and 1600 t ice per year, consuming between 59.1 and 77.5 kWh/t ice.

Transport distances for fish distribution within The Gambia are relatively modest. As the bulk (67%) of artisanal landings destined for direct human consumption take place in the coastal landing sites, most of the fish is distributed through markets, and most of the population lives between the Atlantic coast and Farafenni, two transport distances were estimated to represent the two main scenarios for fish products transport: the 25 km Tanji to Brikama segment and the 150 km Tanji to Farafenni segment. Impact of transporting fish up-country were estimated based on these two reference distances (Figure 35).

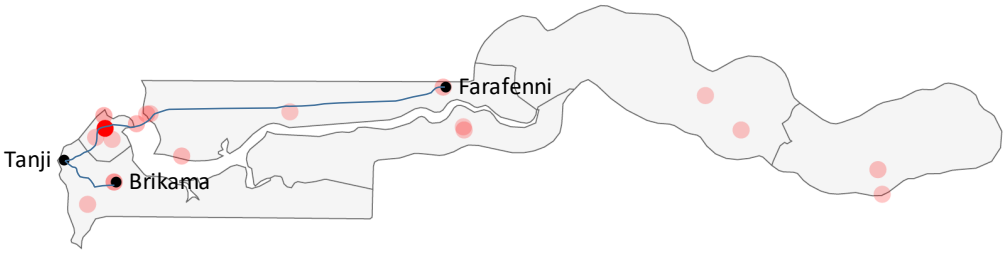


Figure 35. The Gambia population density and routes from Tanji to Brikama and Farafenni. Source: adapted from http://worldpopulationreview.com/countries/gambia-population/

Background inventory data was obtained from Ecoinvent v3.5, including the provision of all fuels, grid electricity (Senegalese grid electricity retained as proxy), tap water and industrial inputs (chemicals, plastics and other materials).

TABLE 35. ABRIDGED LIFE CYCLE INVENTORIES OF SUB-FLEETS (UNITS OF PRODUCTION FOR FISHERIES) IN THE GAMBIA (AVERAGE 2014-2018)

		Artisanal units of production								Industrial units of production		
Item	Units	Set/bottom gillnet	Encircling gillnet	Purse seine	Hook and line/ long line	Traps and cages	Drift nets	Cast nets	Stow nets	Shrimp trawlers (SN), 90-230 GRT	Demersal trawlers (CN), 20-90 GRT	Demersal trawlers (CN), 150-400 GRT
Fishery												
Total units	Count	417	149	41	125	35	298	47	103	6	20	29
Atlantic units	Count	236	101	41	90	25	30	20	0	6	20	29
River units	Count	181	48	0	35	10	268	27	103	0	0	0
Target species		Sole, cuttlefish, lobster, ladyfish, catfish	Bonga shad, round and flat sardinella	Round and flat sardinella, horse mackerel	Catfish, white grouper, rays, ladyfish	Cuttlefish, octopus	Rays and sharks (Atlantic), pink shrimps (estuary)	Mullets	Pink shrimps (estuary)	Pink shrimps	Octopus, cuttlefish, squid, sole	Octopus, cuttlefish, squid, sole
Total landings per sub-fleet	t/y	14 118	17 919	12 489	1 955	1 955	2 932	977	1 955	677	1 453	8 721
Fleet motorisation	%	92	93	93	28	92	93	N/A	9	100	100	100
Vessel characteristics												
Dominant build type		Wooden, planked	Wooden, planked	Wooden, planked	Wooden, planked	Wooden, planked	Wooden, planked	N/A	Wooden, planked	Steel	Steel	Steel
Length	m	10	18	22	7	8	18	N/A	5	41	24	41
Width	m	2	5	8	2	2	5	N/A	1	7	N/A	N/A
LSW	kg	3 139	5 323	6 876	2 667	2 718	5 155	N/A	2 316	22 972	7 617	22 665
Engine	HP	22	32	53	15	20	40	N/A	N/A	721	309	1259
FUI	L/t	372	163	104	420	47	441 - 474	N/A	N/A	1553 - 2 213	2 117	2 117
Landings per vessel (incl. by-catch)	t/y	33.9	120.3	304.6	15.6	55.9	9.8	20.8	19.0	282.0	72.7	300.7
By-catch	%	16.6	3.4	-	36.0	-	45.7	-	70.0	66.7	10	10
Fuel	L/y	12 600	19 600	31 800	6 561	2 600	4 667	N/A	N/A	438 025	153 839	636 575

		Artisanal units of production								Industrial units of production		
Item	Units	Set/bottom gillnet	Encircling gillnet	Purse seine	Hook and line/ long line	Traps and cages	Drift nets	Cast nets	Stow nets	Shrimp trawlers (SN), 90-230 GRT	Demersal trawlers (CN), 20-90 GRT	Demersal trawlers (CN), 150-400 GRT
Lubricating oil	L/y	-	-	-	-	-	-	-	-	9.2	9.2	9.2
Ice	t/y	1.1	-	-	1.1	1.1	-	-	-	-	-	-
Bait	t/y	-	-	-	20.3	-	-	-	-	-	-	-
Refrigerant (R22)	kg/y	-	-	-	-	-	-	-	-	0.69	0.69	0.69
Allocation key for main catch	%	88	93	100	67	100	72	100	61	77	93	93
Vessel construction												
Wood	m3	4.0	6.7	8.7	3.4	3.4	6.5	N/A	2.9	0	0	0
Engine	kg	57	97	112	50	57	97	N/A	N/A	1 283	565	2 220
Gear	kg	100	200	500	23	6	400	5	25	4 260	1 098	4 542
Galvanised nails	kg	10.13	17.17	22.18	8.60	8.77	16.63	N/A	7.47	N/A		
Iron rods	kg	284.88	483.02	623.94	241.98	246.67	467.81	N/A	210.20			
Antifouling paint	kg	11.14	18.89	24.40	9.46	9.65	18.30	N/A	8.22			
Tarpaulin	kg	15.24	25.84	33.38	12.95	13.20	25.03	N/A	11.25			
Tar	kg	32.70	55.44	71.62	27.78	28.31	53.70	N/A	24.13			
PET foam	kg	197.51	334.88	432.58	167.77	171.02	324.34	N/A	145.73			

Sources: DoF data, DoF (2016), field visits to landing sites, engine providers, UNEP (2014), field visits to artisanal vessels construction sites. Proxy data for industrial sub-fleets was retrieved from Senegalese shrimp trawlers data (M. Deme; F. Ziegler, pers. comm.) and Mauritanian cephalopods/demersal trawlers (Vázquez-Rowe et al., 2012). Primary data for artisanal driftnets targeting shrimps was complemented with Senegalese data (F. Ziegler, pers. comm.). **Notes:** Landings per fleet and total landings differ slightly from the official figures because by-catch estimations from UNEP (2014) have been added to compute the FUI. By-catch by demersal trawlers was unknown, but assumed at 10% and consisting of small pelagics (which are or should be landed in The Gambia). The demersal trawler fleet was divided in two segments to highlight the size diversity, but not enough data was available to estimate FUI for each segment, thus the whole fleet was modelled as a homogenous type of unit of production. The weighted average of (artisanal) pelagic FUI is 150 L/t, and of demersal is 401 L/t. The weighted average of industrial demersal FUI is 2 055 L/T. The allocation key was computed based on the relative prices of target catch and by-catch (Table 3, Table 4). **Abbreviations:** FUI – fuel use intensity, LSW – lightship weight, GRT – gross registered tonnage

TABLE 36. ABRIDGED LIFE CYCLE INVENTORIES OF PROCESSING FACILITIES (UNITS OF PRODUCTION FOR PROCESSING) IN THE GAMBIA (AVERAGE 2014-2018)

		Artisanal units of production		**Industrial units of production**		
Item	Unit	Artisanal fish drying	Artisanal fish smoking	Freezing plants	Smoking plant	FMFO plants
Samples / sites		3/3	3/3	2/1	1/1	3/3
Cold storage capacity	t			580	12	
Fish processed	t/y	21.5	134.8	1 658	61	16 642
Product yield	t/y	7.2	47.2	1 314	26	3 698
Conversion ratio		3.0	2.9	1.3	2.3	4.5
Water	m3/y			33 522	240	29 789 974
Ice	t/y			1 169	6.0	
Salt	kg/y	5 775			200	
Electricity	kWh/y			1 008 846	51 923	254 629
Chemicals (detergents, etc.)	L/y			1 989		22 634
Refrigerating gas (R-22)	kg/y				27.2	
Cardboard	kg/y			6 572	130	
Plastic	kg/y			16 115	20	8 538
Diesel	L/y			25 300	600	
Charcoal	kg/y				6 000	
Coconut husks	kg/y				2 000	
Wood	m3/y		93			
Heavy fuel (R500)	MJ/y					39 941 865
Antioxidants	kg/y					1 664
Wastewater	m3/y			33 522	240	29 789 974
Waste	t/y	1.1	6.7	343	4	

Sources: primary data except for fishmeal plants (FMFO), which was retrieved from Fréon et al. (2017)

6.3 Life Cycle Impact Assessment

6.3.1 Absolute and relative impact assessment

All detailed endpoint results are presented in Annex C.

The relative environmental impacts of the Gambian fisheries are variable among types of production units, with those not consuming fuel (cast nets and stow nets) having the lowest impacts (Figure 36a). The impacts of demersal fishing activities are considerably higher than those of pelagic fishing, which is in line with previous findings in the literature, mainly due to the associated fuel use intensity (Parker et al., 2018).

The impacts of fish processing are higher for artisanal processing (except for the shellfish sub-value chain) than for industrial processing (Figure 36b). This is due to the important weight losses (residues, water evaporation) associated with artisanal processing, which moreover processes fish from high-impact fisheries (mainly demersal); while industrial freezing produces a minimal amount of residues and fishmeal production benefits from economies of scale and processes fish from low-impact fisheries (small pelagics).

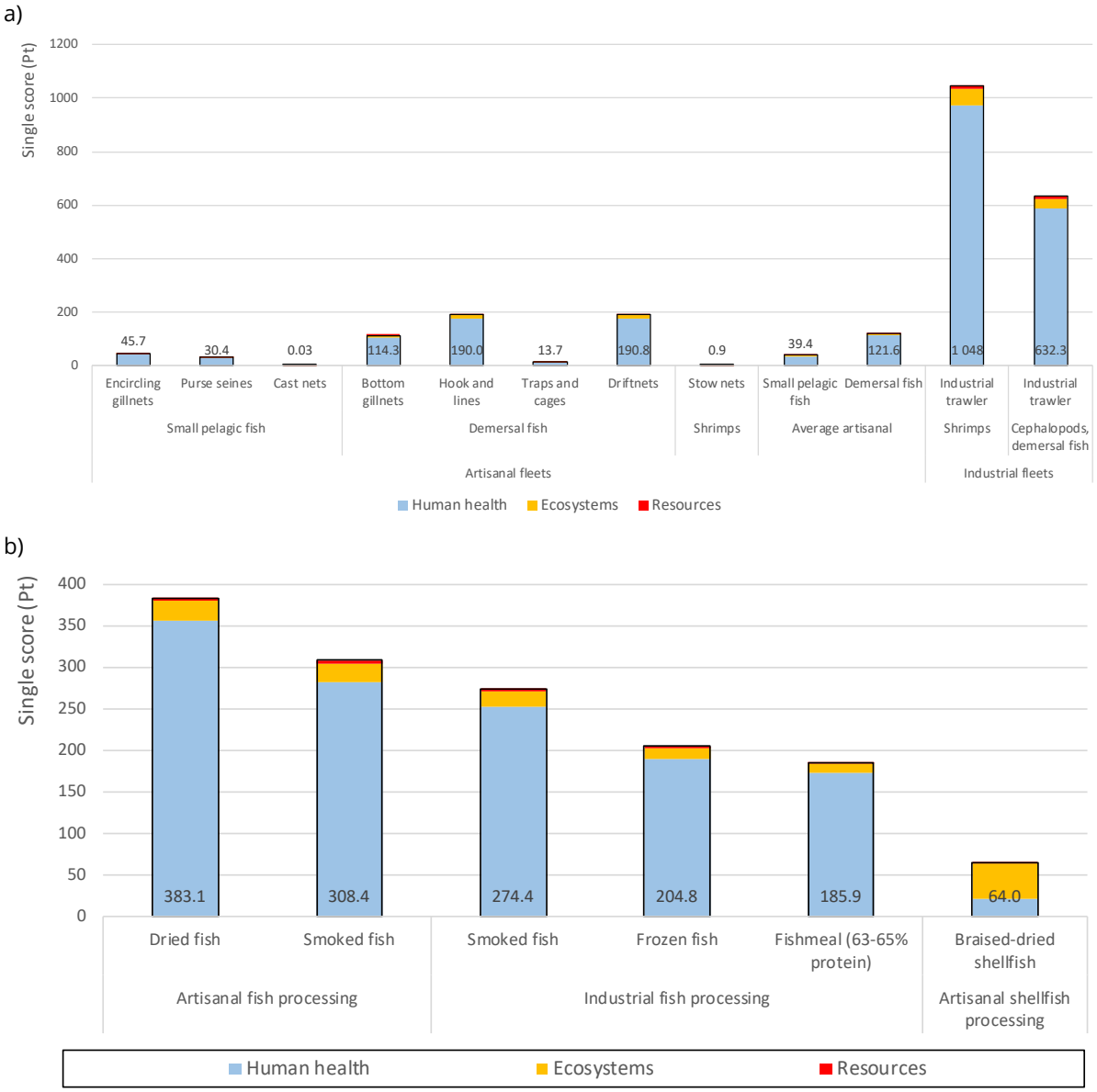
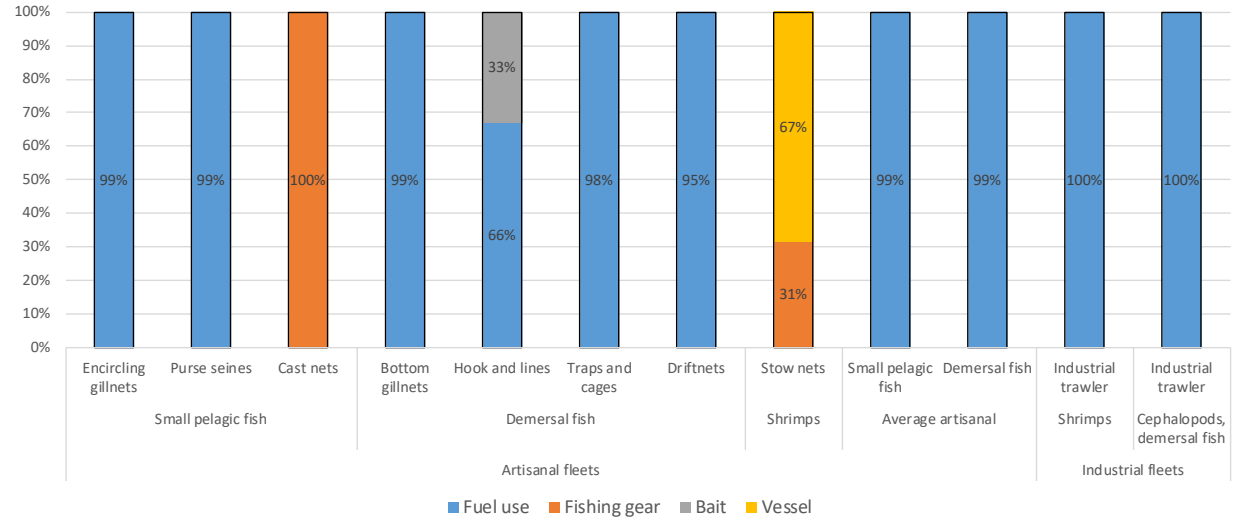


FIGURE 36. ENDPOINT ENVIRONMENTAL IMPACTS OF A) FRESH FISH PRODUCTS (LOG SCALE) AND B) PROCESSED FISH PRODUCTS, PER T OF PRODUCT AND PER AREA OF PROTECTION

A contribution analysis shows that the environmental impacts of the whole value chain are determined by the fuel use intensity of the various sub-fleets (Figure 37). For most fishing activities, fuel consumption contributes to >90% of impacts (Figure 37a). The impacts of fish processing are determined mainly by the impacts of the supplying fisheries, except for shellfish processing, for which the main driver for impacts is the combustion of wood as fuel (Figure 37b). The environmental performance of fishmeal production is not driven by fuel consumption, as happens for instance for the Peruvian fishmeal industry (Fréon et al., 2017), but by the FUI of the supplying fisheries. This can be explained by the important differences in FUI providing the fishmeal industry around the world: Peruvian purse seiners consume <20 L fuel per t fish (Fréon et al., 2014b), while Gambian purse seiners consume 104 L /t and encircling gillnets 163 L/t. Mean African encircling gillnets feature a FUI of 31 L/t (Parker and Tyedmers, 2014), and the global mean FUI for pelagic fish has been estimated at 42 L/t (Parker et al., 2018). The fuel consumption of shrimp-targeting vessels, both industrial and artisanal, resemble those of the respective Senegalese fleets, as described in Ziegler et al. (2009).

a)



b)

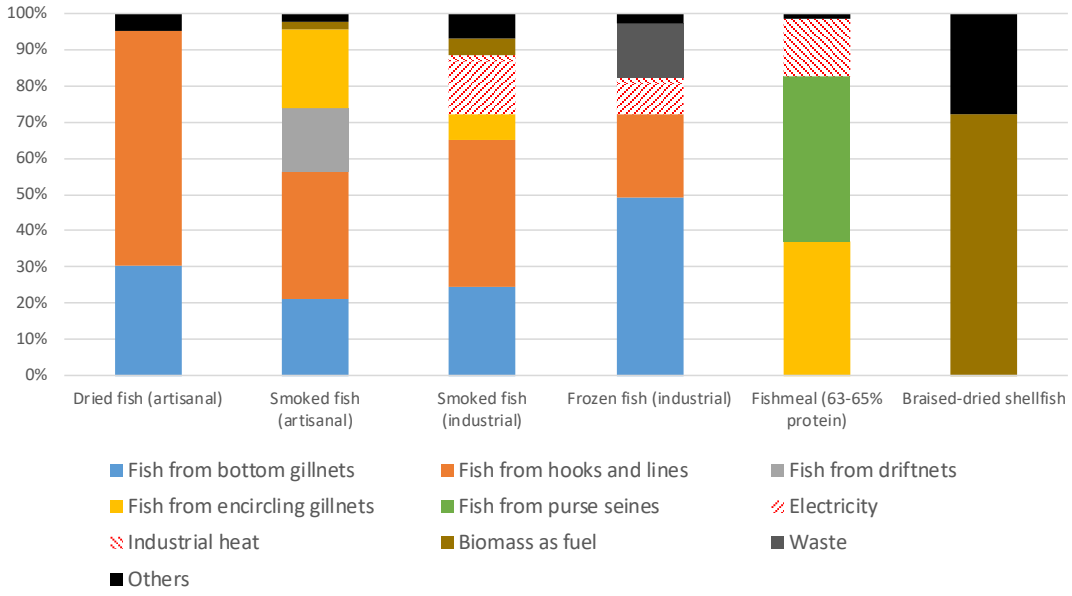


FIGURE 37. CONTRIBUTION ANALYSIS OF A) FRESH FISH PRODUCTS AND B) PROCESSED FISH PRODUCTS, PER T OF PRODUCT AND RELATIVE TO ENDPOINT IMPACTS (PT)

When the impacts are disaggregated by impact category, it is noticeable that those categories associated with fuel provision and combustion (fossil resource depletion, terrestrial eutrophication and acidification; human toxicity and smog formation) are the main contributors to fisheries impacts (Figure 38a). Fish processing impacts, in the other hand, are dominated by human toxicity associated with biomass and fuel combustion, as well as by freshwater ecotoxicity associated with waste and wastewater management (Figure 38b).

FIGURE 38. ENDPOINT ENVIRONMENTAL IMPACTS OF A) FRESH FISH PRODUCTS AND B) PROCESSED FISH PRODUCTS, PER T OF PRODUCT, DISAGGREGATED PER IMPACT CATEGORY (PT)

Fishmeal production, in particular, compares negatively with Peruvian and global fishmeal production, mainly due to the relatively higher impacts of raw material provision (Figure 39), and marginally to different technology levels, Peru for instance increasingly using state of the art indirect drying fuelled by natural gas instead of the direct drying fuelled by heavy fuel most commonly used in West Africa.

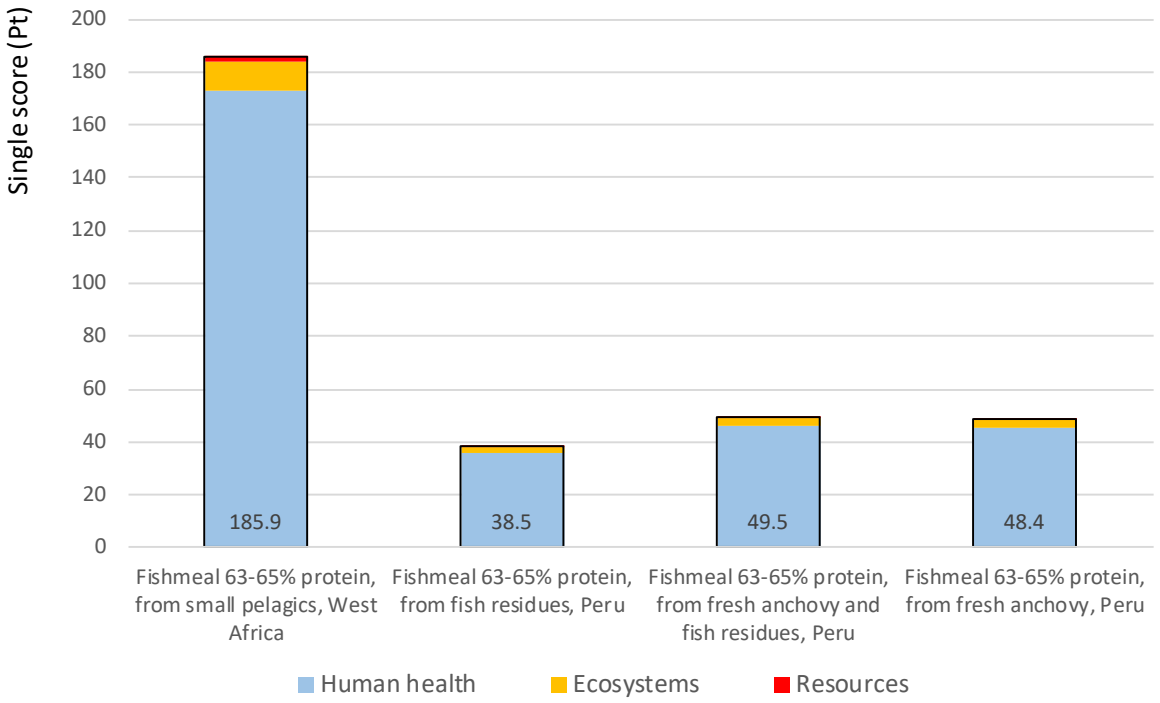


FIGURE 39. COMPARISON OF WEST AFRICAN AND GLOBAL FISHMEAL PRODUCTION, PER T OF PRODUCT AND PER AREA OF PROTECTION

Transport of fish products has a relatively minor contribution to overall impacts, even including the production of ice used in transport of fresh fish (Figure 40, Figure 41). Actual impacts are probable higher, due to the condition of Gambian roads and vehicles, many of which probably do not fulfil the European emission standards "Euro 3" specification, as is common in Africa (Notten et al., 2018).

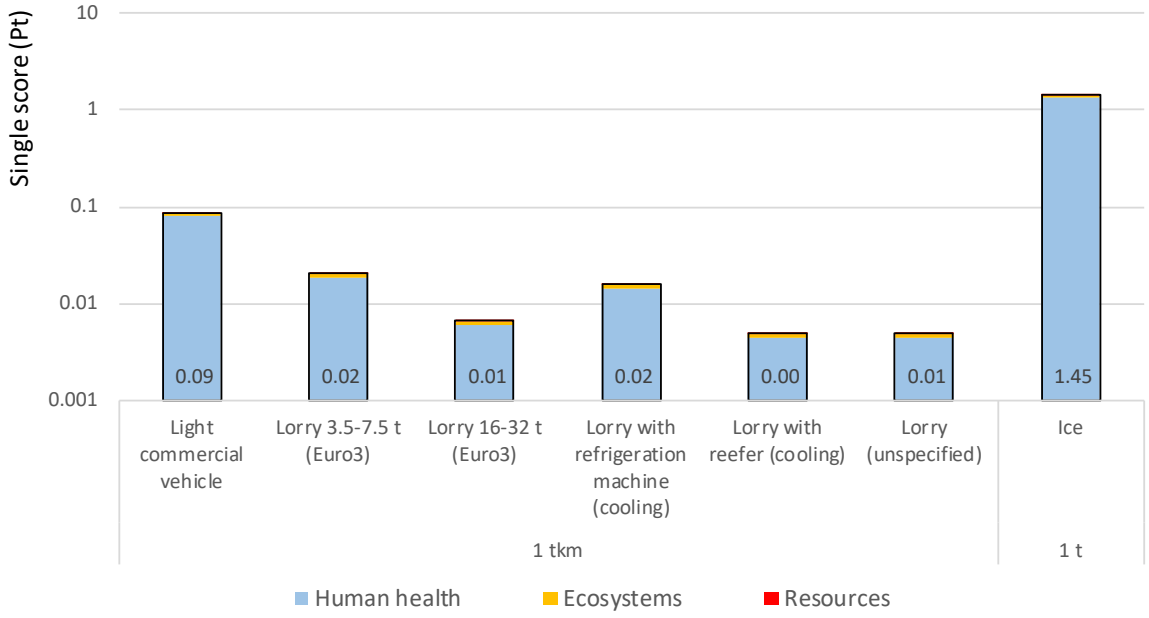


FIGURE 40. IMPACTS OF TRANSPORTING 1 TKM OF PRODUCT (LOG SCALE), UNDER DIFFERENT VEHICLE STANDARDS, AND IMPACTS OF PRODUCING 1 T OF ICE IN THE GAMBIA

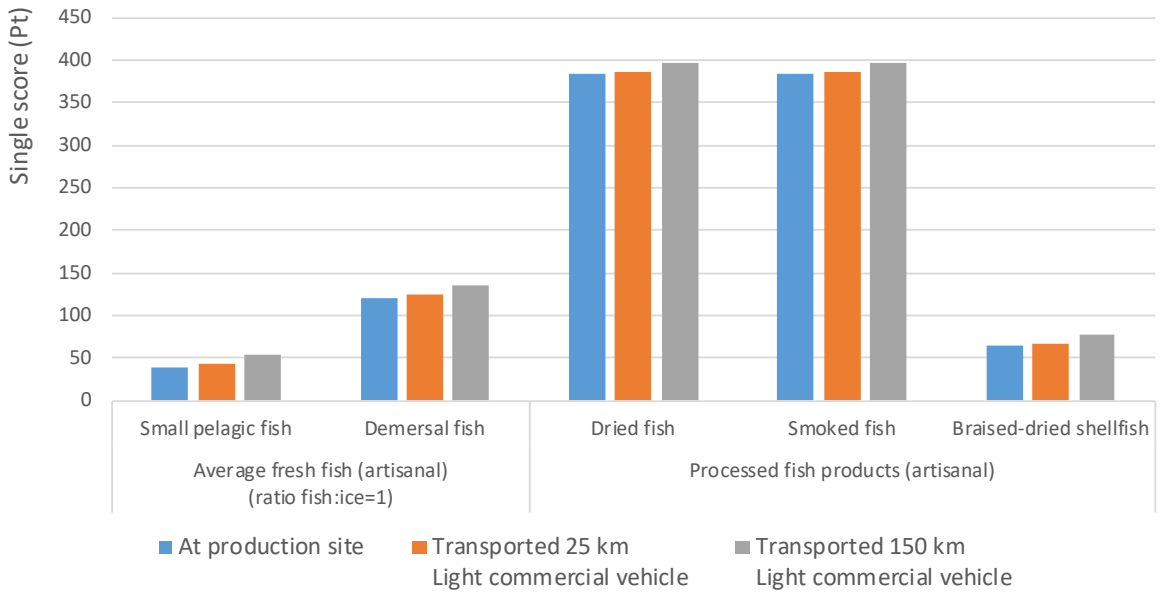


FIGURE 41. IMPACTS OF TRANSPORTING 1 T OF FISH PRODUCTS, OVER TWO REFERENCE DISTANCES

6.3.2 Sensitivity and variability

The sources of uncertainty are well understood. In artisanal fisheries, the FUI (which depends on both average landings per vessel and its associated fuel consumption) is the main driver of uncertainty. In artisanal fish and shellfish processing, their processed volumes, yields, losses and fuel consumption are a key source of uncertainty, as actors seldom keep records, and thus all data were obtained from recalls. Regarding industrial fisheries and fish processing, their historical and detailed data is not easily accessible, as the companies are very secretive with it (fishmeal companies did not release any data at all, thus West African proxies were used).

A large variability in fisheries performance may be assumed, due to seasonal and interannual dynamics of the targeted stocks, as well as variations in fishing skills (including the so-called skipper effect (Vázquez-Rowe and Tyedmers, 2013) which influences fuel use efficiency). These fisheries factors also affect the processing industries provided by fisheries.

6.4 Interpretation

The impacts of industrial fleets are higher than those of demersal artisanal fleets, which is counterintuitive because industrial vessels usually benefit from economies of scale (Fréon et al., 2014a). The reasons of this specific dynamic in Gambian fisheries are multiple: the unusual shape of the Gambian Exclusive Economic Zone (EEZ) and the respective fishing zones for the artisanal and industrial fleets (see section 3.3.5), the status of targeted stocks limiting economies of scale, and even the skipper effect limiting the performance of industrial vessels (Vázquez-Rowe and Tyedmers, 2013). Moreover, the proxy Senegalese and Mauritanian data used to model industrial fisheries and fishmeal production may not be fully representative of the Gambian conditions.

The impacts of Gambian fisheries and processing activities, including transport of fish products, affect predominantly the AoP human health. These impacts are driven by inefficient fuel (liquid fossil fuels, wood, other biomass) consumption. Industrial fisheries in particular are very inefficient, FUI-wise, with a large normalised impact on human health.

Nonetheless, given the low percentage of industrial captures to the overall captures (17%, vs 83% by artisanal fleets), the impact of the average captured t of fish remains relatively low (Figure 42).

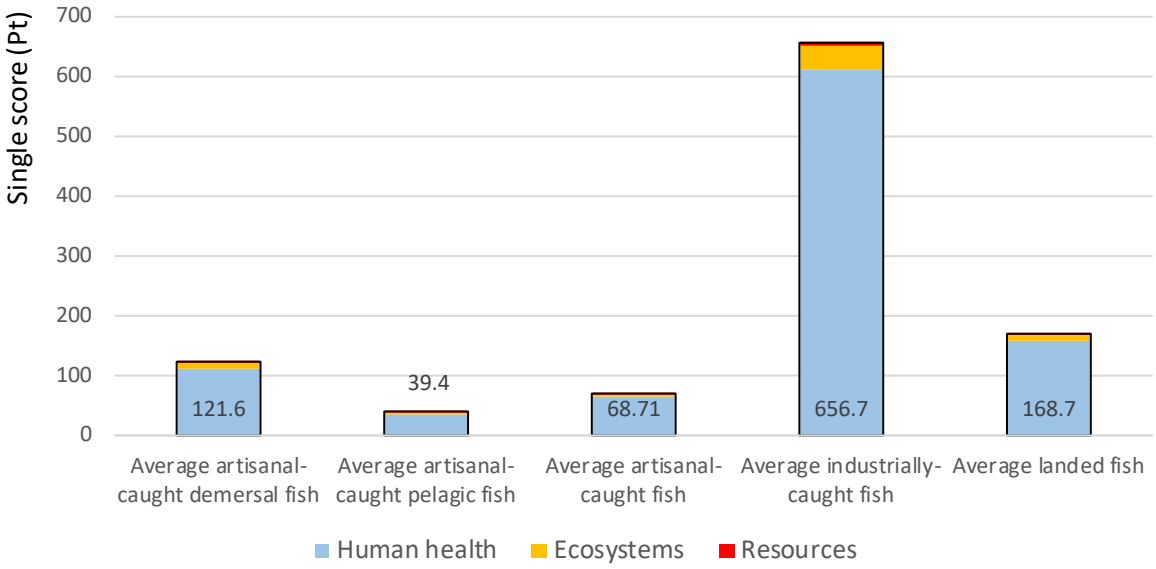


FIGURE 42. ENDPOINT ENVIRONMENTAL IMPACTS OF AVERAGE FISH CAPTURES, PER T OF PRODUCT AND PER AREA OF PROTECTION

If the contribution to total captures by industrial fleets is expected to increase, attention should thus be payed to improving their fuel use efficiency, and their potential contribution to stocks depletion.

In fish processing, the fishmeal industry, despite suffering from the high inefficiencies of the providing artisanal fisheries, feature lower impacts per t of product than all other fish processing activities, including artisanal ones. This is in part due to the other processing industries consuming mainly demersal fish, which features even higher fisheries impacts than the small pelagics consumed by the fishmeal industry. Moreover, fish processing features important losses (cleaning residues, etc.), while the fishmeal industry does not.

Overall, the dominant contribution of impacts to human health is not due to the applied LCA methodology, but to the nature of contributing inventory items. As all activities are dominated by fuel combustion, it is only natural that most of the damage is exerted on human health.

The overall conclusions from the environmental assessment are presented in section 7.1.4.

7 Conclusions and recommendations

7.1 Framing questions

7.1.1 What is the contribution of the value chain to economic growth?

The average annual direct value added generated by the Gambian fishery is estimated at **GMD 2.5 billion** GMD representing 6.5% of The Gambia's GDP and 20.1% of the wealth generated by the agricultural sector. The fishery sector also generates indirect effects estimated at GMD 358 849 366. The fishery registers a trade surplus of around GMD 2.583 billion. Contribution of the fishery sector to State and local collectivises budgets is estimated at GMD 100.726 million.

The economic analysis has demonstrated that **the Gambian fishery value chain is generally sustainable from an economic point of view**, given that actors of all segments are creating value added and are also creating value added. Purse seine fishers have a negative net operating profit linked to two major factors, a sharing system more favourable to fishermen on-board and low fish landing price related to contracts signed with fishmeal plants. Artisanal processors with low financial asset are facing competition to both fresh fish traders, industrial smoking plants and fishmeal plants for fish supply.

The Nominal Protection Coefficient of 0.883 indicates that the agents of the chain value do not generate more income than they have on the international market. Value chain is viable in the international economy and leads to an economic gain for the national economy since the value added is higher than the cost of using the non-tradable factors of production.

The Domestic Resource Cost of 0.090 indicates that the value chain is viable in the international economy and leads to an economic gain for the national economy since the value added is higher than the cost of using the non-tradable factors of production. In other words, the VC has a comparative advantage in that it uses fewer domestic factors of production than it generates economic value calculated at international prices.

7.1.2 Is this economic growth inclusive?

Relatively to employment creation and distribution, 4 234 fishers and 756 shellfish collectors are active along the Gambian coastline. In the post-capture segment, a total of 10 330 fishmongers and 25 420 fish processors are counted employing respectively around 30 399 and 127 100 people. Processing and export companies employ around 1 500 workers. Outboard motor mechanics and carpenters and people employed in these two activities are at 500. Overall, 200 830 people derive their livelihoods from harvesting, artisanal processing and distribution of fishery products.

Fishing in The Gambia seems to be in foreign hands in both the industrial and artisanal sectors. Moreover, women, who represent about 80 percent of fish processors and 50 percent of small-scale fish traders, have little bargaining power over men. Women's access to resources is increasingly difficult. Under these conditions, **fishing in The Gambia is far from being an inclusive sector**. Without corrective measures, Gambian nationals, particularly women, will be increasingly marginalized in their own country by foreign investors and economic operators.

7.1.3 Is the value chain socially sustainable?

It appears that **working conditions** throughout the value chain are perceived as difficult. The vast majority of workers in the value chain do not benefit from social security coverage, which has an impact on the income level, working and living conditions of the actors. With regard to **land and water rights**, most of the Gambia's catches are landed, processed and exported from foreign ports. Some investments, such as fishmeal, are perceived as harmful to local people. With regard to **gender equality**, women, who are the majority in the value chain, have the greatest difficulty in accessing products because of their limited financial resources. With regard to **food and nutritional security**, it was noted that over the past five years, the proportion of people considered food insecure has increased from 5 to 8 per cent, partly due to the fluctuating Bonga fish populations. The establishment of three fishmeal factories in the country is cited as one of the main causes of the lack of fish in Gambian households. With regard to **social capital**, the negotiating capacities of market organizations are rather weak and access to information by actors in the chain is also generally perceived as weak. All these shortcomings have repercussions on the **living conditions** of the actors, which are quite difficult. Thus, we can say that due to a poorly controlled EEZ, uncontrolled fishing authorisations, unsupported national stakeholders, numerous advantages granted to investors without taking into account

the concerns of the local population, **the seafood industry in The Gambia does not yet seem socially viable to meet the expectations of the local population**.

The value chain can be considered sustainable from the perspective of the actors of the production segment as fishers contribute to direct value added as much as their share of net operating surplus they receive. Retailers, medium and large fishmongers have also a relatively small share of net operating profit compared to their contribution to direct value added. The contribution of retailer and large fishmonger to wages is limited. As far the distribution segment is concerned, the value chain can be considered sustainable. The share of total income is dominant for all fish plant exporters particularly for the industrial freezer as it over the combined net operating profit and value added.

7.1.4 Is the value chain environmentally sustainable?

Small pelagic fisheries, artisanal shellfish collection and processing, and the fishmeal industry, are the least inefficient activities in the whole value chain. Industrial fisheries do not benefit from economies of scale, and their impacts are rather higher than those of artisanal landings per t of fish. No literature data is available to benchmark the environment impacts of artisanal processed fish, but it is assumed to also be inefficient, as it is affected by the high inefficiencies of the providing artisanal fisheries and poor processing infrastructure. **The value chain is generally inefficient, and thus it can be said that it is not environmentally sustainable**, especially if the lack of proper stock management, as well as poor MCS, are weighted into the assessment.

7.1.5 Sustainability comparison of Gambian seafood systems

Actors		Resilience	Economic performance	Social performance	Environmental performance *
Artisanal fishers, pelagic	Encircling gillnets	★★★ Abundant resource, high fish demand	★★ Net operating profit very low, target low fish prices oriented to local consumption, fishmeal plant	★★ Ensures the supply of fish to households and is dominated by the Senegalese	★★ Slightly high FUI
	Purse seiners	★★★ Abundant resource, high fish demand	★★ Net operating profit negative, , target low fish prices oriented to local consumption, fishmeal plant	★★ Ensures the supply of fish to households and factories and exclusively used by Senegalese	★★ Slightly high FUI
	Cast nets	★★ Less abundant resource, lower fish demand	★★★ Target valuable fish oriented to export, high net operating profit	★★★ Traditional fishing technique of the natives	★★★ Passive gear
	Subsistence catches	★★★ Abundant resource, high fish demand	N/A	★★★ Traditional fishing technique of the natives	★★★ Passive gear
Artisanal fishers, demersal	Bottom gillnets	★★ Less abundant resource, lower fish demand	★★★ Target valuable fish oriented to export, high net operating profit	★★★ Easier to use gear through which the Gambia learns to fish at sea.	★ High FUI
	Hook and line + long lines	★★ Less abundant resource, lower fish demand	N/A	★★ High-tech fishing gear used mainly by Senegalese	★ High FUI
	Traps and cages	★★ Less abundant resource, lower fish demand	N/A	★★★ Traditional fishing technique of the natives	★★ Slightly high FUI
	Drift nets	★★ Less abundant resource, lower fish demand	N/A	★★★ Traditional fishing technique of the natives	★ High FUI
	Drift nets (shrimp)	★★	N/A	★★	★★★ Passive gear

Artisanal fishers, estuarine		Less abundant resource, lower fish demand		Traditional system of local fishers struggling to meet the demand for fish	
	Stow nets	★★ Less abundant resource, lower fish demand	N/A	★★★ Traditional system of local fishers struggling to meet the demand for fish	★★★ Passive gear
	Shellfish	★★ Less abundant resource, threat by other fisheries and estuary degradation	N/A	★★★ Traditional system of local fishers struggling to meet the demand for fish	★★★ Passive gear, active mangrove preservation
Industrial fishers, demersal	Shrimp trawlers	★★ Less abundant resource	N/A	★ A system that does not benefit Gambians either in product or in use	★ Very high FUI, higher than world mean for trawling
	Demersal trawlers	★★ Less abundant resource, high fuel consumption	N/A	★ A system that does not benefit Gambians either in product or in use	★ Very high FUI, higher than world mean for trawling
Traders	Fishmongers, large	★ High fish demand, risk of low offer during fisheries pauses	★★★ Net operating profit positive, contribute to the value added as much as it generate net operating profit	★★ Essentially Senegalese controlling the market	★ Low transport impact and waste generation
	Fishmongers, medium	★ High fish demand, risk of low offer during fisheries pauses	★★★ Net operating profit positive, contribute to the value added as much as it generate net operating profit	★★ Dominated by men who control the long haul	★ Low transport impact and waste generation
	Fishmongers, retailers	★ High fish demand, risk of low offer during fisheries pauses	★★★ Net operating profit positive, contribute to the value added as much as it generate net operating profit	★★★ Mainly low capital Gambian women	★ Low transport impact and waste generation

	Factory buyers	★★ Medium fish demand, risk of low supply during fisheries resting periods	N/A	★★ Essentially Senegalese controlling the market	★ Low transport impact and waste generation
	Processed fish wholesalers	★ High fish demand, risk of low offer during fisheries pauses	N/A	★★★ Feeding rural areas and cities in the hinterland	★ Low transport impact and waste generation
	Processed fish retailers	★ High fish demand, risk of low offer during fisheries pauses	N/A	★★★ Women supplying the urban market	★ Low transport impact and waste generation
Artisanal processors	Smokers	★ High fish demand, risk of low offer during fisheries pauses	★ Negative net operating profit	★ Dominated by women working in difficult conditions	★★★ Medium waste generation
	Driers	★ High fish demand, risk of low offer during fisheries pauses	★★★ Net operating profit positive	★ Dominated by women working in difficult conditions	★★★ Medium waste generation
Industrial processors	Freezers	★★ Medium fish demand, risk of low supply during fisheries resting periods	★★★ Net operating profit positive	★★ Employing a predominantly female and temporary workforce	★★ Low waste generation, medium energy consumption
	Smokers	★★ Medium fish demand, risk of low supply during fisheries resting periods	★★★ Net operating profit positive	★★★ A local initiative in the fishery products industry	★★ Low waste generation, medium energy consumption
	Fishmeal producers	★ High fish demand, risk of low offer during fisheries pauses, conflict with local population	★★★ Net operating profit positive	★ Threat to household food security in the Gambia	★★ Standard West African eco-efficiency, low-FUI fish provision

* Performance is here understood as the inverse of environmental impacts intensity. FUI: fuel use intensity (t fish/kg fuel). FUI is lower for passive gear than for active gear (Parker et al., 2018).
The lowest score per category is represented by one star, while the highest is three.

7.2 Recommendations

7.2.1 Improve the attractiveness of the value chain

Gambian fishers are absent in the most valuable fishery activities (sole, cuttlefish) due to the high cost of fishing materials, the size of fishing canoes and the know-how of the fishers. Combined actions like institution of mutual credit services and fishing technics training are required.

Moreover, for a better development of the Gambia in the fisheries sector in compliance with international rules, the Gambian State must work to:

1) ensure the application of regulatory provisions in contracts,
2) regulate working conditions and remuneration in the informal sector,
3) enforce regulations on child labour, prohibit the boarding of children under 15 years of age, and prohibit children's access to fish-smoking areas,
4) ensure compliance with meteorological services' instructions to avoid accidents at sea,
5) provide processors with protective equipment, disseminate new, less polluting smoking techniques,
6) provide landing sites and processing sites with adequate infrastructure and ensure that they are healthy,
7) train nationals in fishing activities and product development, and
8) financially support the national fish wholesalers and to find markets abroad.

Some foreign small-scale fishers (mainly Senegalese) as well industrial trawlers very often find it more remunerative to send their catch in Senegal, where payment is done on receipt. Gambian fish processing companies often delay payments. They lack financial credits, hardly available due to very high interest rates (up to 30%), short-term payment (one month) and collateral requirements despite the number of commercial banks operating in the country. State authorities are expected to encourage development banks to be more integrated to the need of the economy.

In May 2019, the women of the organisations of the African Confederation of Artisanal Fisheries Professional Organisations had formulated a certain number of essential recommendations to their States, the implementation of which would improve gender equality in the value chain.

Box 2. Recommendations by women from the African Confederation of Artisanal Fisheries Professional Organisations

Member States should commit themselves resolutely to a sustainable and transparent management of fishery resources; to give priority access to those who contribute to the food and nutritional security of local populations and to involve both men and women of the artisanal fisheries sector in this management; to take measures to provide women working in the African artisanal fisheries sector with decent working conditions in accordance with human rights; to provide women with affordable access to safe and hygienic public waste removal services, drinking water, energy sources and work sites that meet standards; to work with women for the future of their children by providing childcare facilities and schools close to fishing and fish-processing areas; encourage investment in appropriate infrastructure and organisational structures, as well as capacity building, to enable women in small-scale fisheries to produce and market safe and good quality products for both local and regional markets; to support initiatives aimed at creating value added, based on simple, effective, low-cost, innovative, context-appropriate technologies implemented with constant dialogue with the women who will use these technologies; facilitate access to local, national, regional and international markets for artisanal fisheries products, both fresh and processed, and encourage fair and non-discriminatory trade in these products; Support the establishment of cooperative or mutual savings, credit and insurance systems, with particular attention to ensuring women's access to these services. These services should provide women with financial products and services adapted to their needs, with lighter and more flexible conditions and modalities of access to credit and with good spatial coverage of the maritime area occupied by small-scale fishing. Advisory support for the beneficiaries of the credits set up is also essential to enable good repayment of the credits so that the funds can be reused (CAOAP, 2019).

7.2.2 Improve infrastructure

The lack of cold storage infrastructure for fish trade along the Gambian coastline underlines the importance of fish processing activities, whose relative dependence on sophisticated storage is marginal. Traditional processing activities consequently reduce wastage by absorbing underutilised species particularly in isolated areas. A need of rehabilitation the existing fish landing sites infrastructures (Brufut, Bakau, Tanji, Sanyang, Kartong, etc.) is widely expressed as well as the building of new ones in fishing centres lacking them.

The competitiveness of the Banjul jetty and dockyard to attract fishing vessels to land their catches in the country is subject to the provision of various services (dry-docking, maintenance and repairs, additional investments in the sub-sector). With adequate fish supplies from vessels landing their catches at the jetty, the factories would be able to operate optimally, thereby increasing employment, local consumption, fish sales and foreign exchange earnings. States authorities are expected to restrict all landings of fish products in Banjul to the fishing port (as many fish plants are building private jetties) and provide all facilities for landing, conditioning and storage of fish.

The DoF and all concerned institutions should work in a holistic approach to put the jetty and the dockyard more functional (dry-docking, maintenance and repairs, supplying, and landing, conditioning and storage of fish facilities) in order to attract fishing vessels to land their catches in the country. Local factories would be able to operate optimally, thereby increasing employment, local consumption, fish sales and foreign exchange earnings. Policies to promote exports go through the domestication of the production. Development assistance projects should focus on infrastructure development.

Greater public support for fish marketing would be through facilitation of the equipment of cold-tankers. The expected effects of support would be an increased supply of fish products.

The main environmental issues associated with the Gambian fisheries value chains are associated with inefficiencies permeating fisheries, thus efforts should be aimed to improve fuel use intensity (e.g. enhanced engines)

7.2.3 Improve artisanal fish processing

Fish processing caters to the local needs, tastes and cultural characteristics. Artisanal fish processing should not be viewed simply as a peripheral activity. As far food security is concerned, cured fish products play an extremely vital role, making available fish in remote regions at affordable prices besides providing diversified employment opportunities and livelihoods to women, a very vulnerable social category in fishing communities. Furthermore, small-scale processing secure outlet for fishers during periods of overproduction.

Therefore, actions are expected to boost small-scale processing through 1) availability of credit through formal channels to help women to more access to raw materials (fish), 2) investment in processing equipment for communities for the quality of the product and the reduction of the pain of women's work, 3) construction of shelters to reduce infection, spoilage and products loss due to rain and helping women processors to be operational during the rainy season, and 4) develop capacity building for women processors in order to improve product quality and reduce spoilage.

The improvement of the oyster chain value to help women to capture all the potential value added go through some few actions like organisational development, awareness raising on the sustainable management of resources, reforestation of the mangrove, development of oyster farming, reinforcing biological rest periods instituted and development of alternative activities during the closing season (firewood collection, rice farming, fish retailing).

Globally, improved techniques and shelters are strongly required for artisanal fish driers and smokers.

7.2.4 Improve food and nutritional security

In order to ensure the food and nutritional security of the population, the Government of the Gambia will have to:

1) Ensure the availability of food on the market by ensuring timely imports.
2) Expand projects to improve food security and nutrition through food fortification throughout the country.

3) Diversify diets by stimulating local food production.

4) Allow the production of fishmeal plants already established only during periods of high production.

5) Prohibit the establishment of additional fishmeal plants.

6) Introduce a quota to be sold on the local market for all fishing units landing small pelagic fish such as bonga and sardinella.

7.2.5 Other aspects to be improved

Packaging and other material used by Gambian industrial seafood processing plants are mostly imported. These imported products increase the costs of the Gambian fishing industries and therefore reduce their competitiveness as well as resulting in delays.

The value added generated by fishing reaches GMD 2.5 billion. For a contribution of 6.5% to the national gross domestic product, fishing is part of the resources and opportunities available to The Gambia for accelerated growth and diversification of the economy. Such results must be made available to policy makers at all levels through appropriate communication strategies.

To increase social capital from which the value chain would benefit, the government should ensure: train and coach professional organisations in international market access; develop a database on the fisheries sector and make information public and available to the various links in the seafood chain; involve professional organisations in decision-making and take into account the concerns of the various stakeholders.

In order to boost the living conditions of the value chain actors, the Gambian Government and its partners should: Strengthen projects and programmes aimed at improving access to drinking water, household sanitation, building tertiary level hospital infrastructure in other parts of the country and reducing the cost of health services; Opening schools or vocational training centres, including a school for fisheries and aquaculture technicians to train managers in this field; helping professionals in the sector to build their capacity; Encouraging and developing measures to diversify the activities of stakeholders to enable them to find alternative sources of income outside the fish value chain.

7.2.6 Synthesis of recommendations

	Positive impacts			Actors
Recommendation	**Economic**	**Social**	**Environ-mental**	
Engage in combined actions such as institutional of mutual credit services and training in fishing technics to attract Gambian fishers to the most valuable fishery activities (sole, cuttlefish)	X	X		Department of Fisheries (DoF), professional organisations, NGOs, technical and financial partners
Engage in actions to boost small-scale processing	X	X	X	DoF, NGOs, technical and financial partners
Improve the oyster value chain	X	X	X	DoF, NGOs, technical and financial partners
Train in improved techniques and improve facilities for artisanal fish driers and smokers	X	X	X	DoF, NGOs, technical and financial partners
Rehabilitate existing and build new fish landing sites infrastructures	X	X	X	DoF, technical and financial partners
Facilitate the purchase of cold trucks by fishmongers	X	X	X	DoF, Ministry of Finance, Commercial banks
Encourage development banks to support low-interest credit to enable fish processing companies to pay on receipt (as done in neighbouring countries) and thus stimulate fish processing in The Gambia	X	X		DoF, Ministry of Finance and Economics Affairs, Commercial banks
Enable a local packaging and ancillary materials light industry in The Gambia, to reduce imports	X	X		DoF, Ministry of Industry
Restrict all landings of fish products in Banjul to the fishing port (many fish plants are building private jetties) and provide all facilities for landing, conditioning and storage of fish	X			DoF, Banjul fishing port
Improve governance of the fisheries sector	X		X	DoF
Improve the living conditions of the value chain actors	X	X	X	DoF
Improve fuel use intensity (e.g. by facilitating the use of enhanced engines)	X		X	DoF, Ministry of Trade and Industry
Improve grid energy provision to reduce liquid fuels consumption by processing plants			X	DoF, Ministry of Energy and Petroleum
Implement and enforce the existing management plans (sole, oysters), and reinforce MCS activities for enhanced stock protection	X	X	X	DoF, Navy

7.3 Major issues/risks

Among the most pressing issues affecting the Gambian fisheries value chains, the current conditions of landing, storing, processing, and transport infrastructure pose a significant challenge to the further development of these value chains. A combination of adequate funding for infrastructure, its maintenance and management, combined with proper technical and management training at all levels, would be required to improve the performance of these value chains.

Fishmeal plants rely exclusively on small-scale fishery for their supply in raw materials (fish). These factories are in competition with the home market and threat strongly food security in The Gambia. They contribute to only 2.9% of the national growth and community's expectations in terms of jobs creation for young people, and better road connection are not met so far while people are facing environment deterioration and harming of the tourism sector. Priority must be given to meeting the nutritional needs of the Gambian people, sustainability of the tourism sector, and the environment health.

The system of governance that focuses on foreign investors risks undermining the activities of Gambian actors. The latter, through their organisations, should be supported and involved in decision-making. The dependence of the Gambian fishing economy on Senegalese actors does not guarantee food security and sustainable jobs in the country. A licensing system granted to fishers who only supply the local market could be envisaged.

7.4 Relevant issues requiring further in-depth analysis

Fisheries management should be more adequately funded, including MCS activities (surveillance, vessel tracking systems, on-board observer programmes, etc.), stock assessments and management plans.

The idea of introducing licences for fishers willing to supply the local market should be analysed in depth in order to identify the modalities of its application.

References

Adeyeye, S.A.O., Oyewole, O.B., 2016. An Overview of Traditional Fish Smoking In Africa. J. Culin. Sci. Technol. 14, 198–215. https://doi.org/10.1080/15428052.2015.1102785

AfDB, 2009. Projet de développement de la pêche artisanale en gambie, rapport d'évaluation de la proposition visant l'octroi d'un prêt supplémentaire.

Avadí, A., 2020. Screening LCA of French organic amendments and fertilisers. Int. J. Life Cycle Assess. 25, 698–718. https://doi.org/10.1007/s11367-020-01732-w

Avadí, A., 2014. Durabilité de la filière d'anchois du Pérou, de la mer aux rayonnages (Sustainability of the Peruvian anchoveta supply chains from sea to shelf: towards a new strategy for optimal resource use). PhD thesis. Université Montpellier 2, Doctoral School SIBAGHE.

Avadí, A., Fréon, P., 2013. Life cycle assessment of fisheries: A review for fisheries scientists and managers. Fish. Res. 143, 21–38. https://doi.org/10.1016/j.fishres.2013.01.006

Avadí, A., Henriksson, P.J.G., Vázquez-Rowe, I., Ziegler, F., 2018. Towards improved practices in Life Cycle Assessment of seafood and other aquatic products (full issue), International Journal of Life Cycle Assessment. https://doi.org/10.1007/s11367-018-1454-8

Avadí, A., Vázquez-Rowe, I., 2019a. First series of seafood datasets in ecoinvent: setting the pace for future development. Int. J. Life Cycle Assess. https://doi.org/https://doi.org/10.1007/s11367-019-01659-x

Avadí, A., Vázquez-Rowe, I., 2019b. Life Cycle Inventories of Wild Capture and Aquaculture, ecoinvent report (for the SRI project). ecoinvent association, Zürich, Switzerland.

Ba, A., Schmidt, J., Dème, M., Lancker, K., Chaboud, C., Cury, P., Thiao, D., Diouf, M., Brehmer, P., 2017. Profitability and economic drivers of small pelagic fisheries in West Africa: A twenty year perspective. Mar. Policy 76, 152–158. https://doi.org/10.1016/j.marpol.2016.11.008

Baio, A., 2019. Review/Analysis of the contribution of National Policies and Strategies of Fisheries and Aquaculture to the Food and Nutrition Security of Populations in West Africa. Republic of The Gambia. Report of the National Consultation, Food and Nutrition Security Impact, Resilience, Sustainability and Transformation (FIRST). FAO-EU Partnership Programme, Policy Assistance Facility – ECOWAS Commission.

Belhabib, D., Mendy, A., Subah, Y., Broh, N.T., Jueseah, A.S., Nipey, N., Boeh, W.W., Willemse, N., Zeller, D., Pauly, D., 2016. Fisheries catch under-reporting in The Gambia, Liberia and Namibia and the three large marine ecosystems which they represent. Environ. Dev. 17, 157–174. https://doi.org/10.1016/j.envdev.2015.08.004

Belhabib, D., Mendy, A., Zeller, D., 2013. Big Fishing for Small Fishes: Six Decades of Fisheries in The Gambia, "The Smiling Coast of Africa," Working Paper #2013 J 07. Fisheries Centre, The University of British Columbia.

Belhabib, D., Sumaila, U.R., Lam, V.W.Y., Zeller, D., Le Billon, P., Abou Kane, E., Pauly, D., 2015. Euros vs. Yuan: Comparing European and Chinese Fishing Access in West Africa. PLoS One 10, e0118351. https://doi.org/10.1371/journal.pone.0118351

Belleau, H., Cornut St-Pierre, P., 2012. La question du « choix » dans la décision de se marier ou non au Québec. Lien Soc. Polit. 65–89. https://doi.org/10.7202/1008873ar

Béné, C., Barange, M., Subasinghe, R., Pinstrup-Andersen, P., Merino, G., Hemre, G.I., Williams, M., 2015. Feeding 9 billion by 2050 – Putting fish back on the menu. Food Secur. 7, 261–274. https://doi.org/10.1007/s12571-015-0427-z

CAOAP, 2019. Conakry Declaration. African Confederation of Artisanal Fisheries Professional Organizations (CAOAP).

Cloâtre, T., 2018. Methodological report for the French LCI Project on Fisheries. ADEME - Agence de l'Environnement et de la Maîtrise de l'Energie.

CMF, 2019. Fishing for Catastrophe. ChangingMarkets Foundation.

Corten, A., Braham, C.B., Sadegh, A.S., 2017. The development of a fishmeal industry in Mauritania and its impact on the regional stocks of sardinella and other small pelagics in Northwest Africa. Fish. Res. 186, 328–336. https://doi.org/10.1016/j.fishres.2016.10.009

DoF, 2017. Fisheries and Aquaculture Sector Strategy 2017 - 2021.

DoF, 2016. The 2016 Frame Survey Report. Banjul: Department of Fisheries.

EC-JRC, 2012. Characterisation factors of the ILCD Recommended Life Cycle Impact Assessment methods. Luxembourg:

Publications Office of the European Union. https://doi.org/10.2788/60825

EC-JRC, 2010. General guide for Life Cycle Assessment -- Detailed guidance, International Reference Life Cycle Data System (ILCD) Handbook. European Commission - Joint Research Centre - Institute for Environment and Sustainability. https://doi.org/10.2788/38479

EC, 2013. Commission Recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations, Official Journal of the European Union L124. https://doi.org/doi:10.3000/19770677.L_2013.124.eng

FAO, 2019. Report of the FAO Working Group on the Assessment of Small Pelagic Fish off Northwest Africa. Banjul, The Gambia, 26 June - 1 July 2018, FAO Fisheries and Aquaculture Report No. 1247. Rome, Food and Agriculture Organization of the United Nations.

FAO, 2018a. The state of world fisheries and aquaculture 2018. Meeting the Sustainable Development Goals. Rome: Food and Agriculture Organization of the United Nations. https://doi.org/978-92-5-130562-1

FAO, 2018b. Main outcomes of the artisanal fisheries working group. Fish. Comm. Cent. East. Atl. Sci. Sub-Committee, Eighth Sess. Abidjan, Côte d'Ivoire, 23-26 Oct. 2018 19.

FAO, 2018c. Improving food security and nutrition in the Gambia through food fortification, FAO Newsletter. Rome, Food and Agriculture Organization of the United Nations.

FAO, 2017. Fishery and Aquaculture Statistics. Global capture production 1950-2015 (FishstatJ). In: FAO Fisheries and Aquaculture Department [online].

FAO, 2009. Déclaration du Sommet mondial sur la sécurité alimentaire. Rome, Food and Agriculture Organization of the United Nations.

FAO and World Fish Center, 2008. Small-scale capture fisheries : A global overview with emphasis on developing countries. Big Numbers Project. Preliminary Report, FAO Rome; WFC, Penang; World Bank, Washington D.C,.

Fréon, P., Avadí, A., Marin Soto, W., Negrón, R., 2014a. Environmentally extended comparison table of large- versus small- and medium-scale fisheries: the case of the Peruvian anchoveta fleet. Can. J. Fish. Aquat. Sci. 71, 1459–1474. https://doi.org/10.1139/cjfas-2013-0542

Fréon, P., Avadí, A., Vinatea, R.A., Iriarte, F., 2014b. Life cycle assessment of the Peruvian industrial anchoveta fleet: boundary setting in life cycle inventory analyses of complex and plural means of production. Int. J. Life Cycle Assess. 19, 1068–1086. https://doi.org/10.1007/s11367-014-0716-3

Fréon, P., Durand, H., Avadí, A., Huaranca, S., Orozco Moreyra, R., 2017. Life cycle assessment of three Peruvian fishmeal plants: Toward a cleaner production. J. Clean. Prod. 145, 50–63. https://doi.org/10.1016/j.jclepro.2017.01.036

GBoS/UNICEF, 2019. The Gambia Multiple Indicator Cluster Survey 2018. Gambia Bureau of Statistics (GBoS) and UNICEF.

GBoS, 2018. The Gambia Labour Force Survey 2018. Gambia Bureau of Statistics (GBoS).

Goedkoop, M., Heijungs, R., De Schryver, A., Struijs, J., van Zelm, R., 2013. ReCiPe 2008. A LCIA method which comprises harmonised category indicators at the midpoint and the endpoint level. Characterisation. https://doi.org/http://www.lcia-recipe.net

Gorez, B., 2018. West Africa: fishmeal, mealy deal, Samudra Report. ICSF International Collective in Support of Fishworkers.

Government of The Gambia, 2018. Labour Act.

Government of The Gambia, 2007. Labour Act.

Greenpeace, 2019. A Waste of Fish – Food security under threat from the fishmeal and fish oil industry in West Africa.

Greer, K., Zeller, D., Woroniak, J., Coulter, A., Winchester, M., Palomares, M.L.D., Pauly, D., 2019. Global trends in carbon dioxide (CO2) emissions from fuel combustion in marine fisheries from 1950 to 2016. Mar. Policy 107, 103382. https://doi.org/10.1016/j.marpol.2018.12.001

Gulbrandsen, O., 1991. Canoes in Ghana, Programme for Integrated Development of Artisanal Fisheries in West Africa (DIPA/IDAF). Benin: FAO.

Hospido, A., Tyedmers, P., 2005. Life cycle environmental impacts of Spanish tuna fisheries. Fish. Res. 76, 174–186. https://doi.org/10.1016/j.fishres.2005.05.016

Huijbregts, M.A.J., Steinmann, Z.J.N., Elshout, P.M.F., Stam, G., Verones, F., Vieira, M., van Zelm, R., 2016. ReCiPe2016 : a harmonized life cycle impact assessment method at midpoint and endpoint level. Report I: Characterisation.

https://doi.org/10.1007/s11367-016-1246-y

ICSF, 2002. Report of the Study on Problems and Prospects of Artisanal Fish Trade in West Africa. International Collective in Support of Fishworkers (ICSF).

IFFO, 2018. IFFO Annual Report 2018. The Marine Ingredients Organisation. https://doi.org/10.3934/math.2019.1.166

ISO, 2006. ISO 14040 Environmental management — Life cycle assessment — Principles and framework. The International Standards Organisation. https://doi.org/10.1136/bmj.332.7550.1107

Keus, A.B., Medley, P., Sieben, C., Kent, K., 2015. The Gambian artisanal fishery for Senegalese tonguesole (Cynoglossus senegalensis) & Guinean sole (Dagetichthys cadenati): pre-assessment report, Marine Stewardship Council (MSC) Pre-Assessment Report The.

Koch, P., Salou, T., 2016. AGRIBALYSE ® : Rapport Méthodologique - Version 1.3. ART, INRA, ADEME.

Laë, R., Ecoutin, J.-M., Mendy, A., Raffray, J., Weigel, J.-Y., Sadio, O., Djobe, O., 2004. Effects of a targeted shrimp (Penaeus notialis) exploitation on fish catches in the Gambia estuary. Aquat. Living Resour. 17, 75–85. https://doi.org/10.1051/alr

MacFadyen, G., Caillart, B., Defaux, V., 2018. Ex ante evaluation study of a Sustainable Fisheries Partnership Agreement between the European Union and the Republic of The Gambia. Final Report, Framework contract for Better Regulation related activities on the international dimension of the Common Fisheries Policy for the Directorate-General for Maritime Affairs and Fisheries - MARE/2015/23 Specific Contract n° 6. Luxembourg: Publications Office of the European Union.

Mbye, E.M., 2005. Shrimp Fishery of the Gambia: a Case Study of Shrimp Fishing Gears, UNU – Fisheries Training Programme. The United Nations University.

Mendy, A.N., 2009. An Overview of The Gambia Fisheries Sector. Banjul: Department of Fisheries.

Mendy, A.N., 2005. The Gambia Country Study Report: Trade, Fisheries and the Environment, Programme on Fishing, Trade and Environment in West Africa (FTEWA). Banjul: Department of Fisheries.

MoBSE/MoHERST, 2017. Education Sector Strategic Plan 2016 - 2030. Accessible, Equitable and Inclusive Quality Education for sustainable Development. The Gambia: Ministries of Basic and Secondary Education and Higher Education Research Science and Technology Education.

MoFWR, 2012. Fishery Co-Management Plan For The Gambia Sole Complex. Ministry of Fisheries, Water Resources and National Assembly Matters, The Gambia.

MoFWR, 2011. Cockle and Oyster Fishery Co-Management Plan for the Tanbi Special Management Area. Ministry of Fisheries, Water Resources and National Assembly Matters, The Gambia.

Moore, A.B.M., Séret, B., Armstrong, R., 2019. Risks to biodiversity and coastal livelihoods from artisanal elasmobranch fisheries in a Least Developed Country: The Gambia (West Africa). Biodivers. Conserv. 28, 1431–1450. https://doi.org/10.1007/s10531-019-01732-9

MRAG, 2010. ESTIMATION OF THE COST OF ILLEGAL FISHING IN WEST AFRICA. FINAL REPORT. West Africa Reg. Fish. Proj.

Njai, S.E., 2000. Traditional fish processing and marketing in The Gambia, United Nations University Fisheries Training Programme, Iceland [final project]. Banjul: Department of Fisheries.

Njie, M., Tall, A., 2001. Artisanal processing of sea snails in The Gambia. INFOFISH Intemational 48–52.

Notten, P., Althaus, H., Jayaram, N., Läderach, A., Town, C., 2018. Life Cycle Inventories of Road Freight - India and South Africa, ecoinvent report (for the SRI project). ecoinvent Association, Zürich, Switzerland.

Oceana, 2018. 2018 Integrated Report. Oceana Group.

Parker, R.W.R., Blanchard, J.L., Gardner, C., Green, B.S., Hartmann, K., Tyedmers, P.H., Watson, R.A., 2018. Fuel use and greenhouse gas emissions of world fisheries. Nat. Clim. Chang. 8, 333–337. https://doi.org/10.1038/s41558-018-0117-x

Parker, R.W.R., Tyedmers, P.H., 2014. Fuel consumption of global fishing fleets: current understanding and knowledge gaps. Fish Fish. n/a-n/a. https://doi.org/10.1111/faf.12087

Rice, M.A., Darboe, F., Drammeh, O., Babanding, K., 2012. Aquaculture in The Gambia. World Aquac. 71, 29–34.

Saidyleigh, M., 2016. Evaluation of the status of tilapia (Oreochromis niloticus) farming in The Gambia (Central River Region): a case study. United Nations Univ. Fish. Train. Program. Icel. [final Proj. 47.

Seafish, 2018. Fishmeal and fish oil figures. Seafish 30.

Siles, J., Prebble, M., Wen, J., Hart, C., Schuttenberg, H., 2019. Advancing Gender in the Environment: Gender in Fisheries—a Sea of Opportunities. IUCN and USAID. Washington, USA: USAID.

Tacon, A.G.J., Metian, M., 2018. Food Matters: Fish, Income, and Food Supply—A Comparative Analysis. Rev. Fish. Sci. Aquac. 26, 15–28. https://doi.org/10.1080/23308249.2017.1328659

Tarbiya, L.M.O., Mouhamédou, F.O., 2011. Etude diagnostique de la filière de la farine et de l'huile de poisson en Mauritanie et au niveau et international. Laboratoire des Etudes Sociales et Economiques.

The Gambia CO, 2018. Republic of The Gambia Zero Hunger Strategic Review 2018. A National Guide to Achieving Sustainable Development Goal 2 by 2030. Banjul.

TRY, 2010. Try Oyster Women's Association Business Plan.

UN, 2018. United Nations Human Rights Report 2018. United Nations Human Rights Office.

UNCTAD, 2014. The fisheries sector in the Gambia: trade, value addition and social inclusiveness, with a focus on women, UNCTAD/DITC/2013/4. United Nations Publication.

UNDP, 2013. TRY Oyster Women's Association, The Gambia, Equator Initiative Case Studies Local sustainable development solutions for people, nature, and resilient communities.

UNEP, 2014. Cost-benefit Analysis of the most profitable fishing practices from a societal perspective in The Gambia.

USAID, 2014. Gambia-Senegal Sustainable Fisheries Project. Final Report, BaNafaa Project. United States Agency for International Development / West Africa and Department of Fisheries, Ministry of Fisheries and Water Resources, The Gambia.

Vázquez-Rowe, I., Moreira, M.T., Feijoo, G., 2012. Environmental assessment of frozen common octopus (Octopus vulgaris) captured by Spanish fishing vessels in the Mauritanian EEZ. Mar. Policy 36, 180–188. https://doi.org/10.1016/j.marpol.2011.05.002

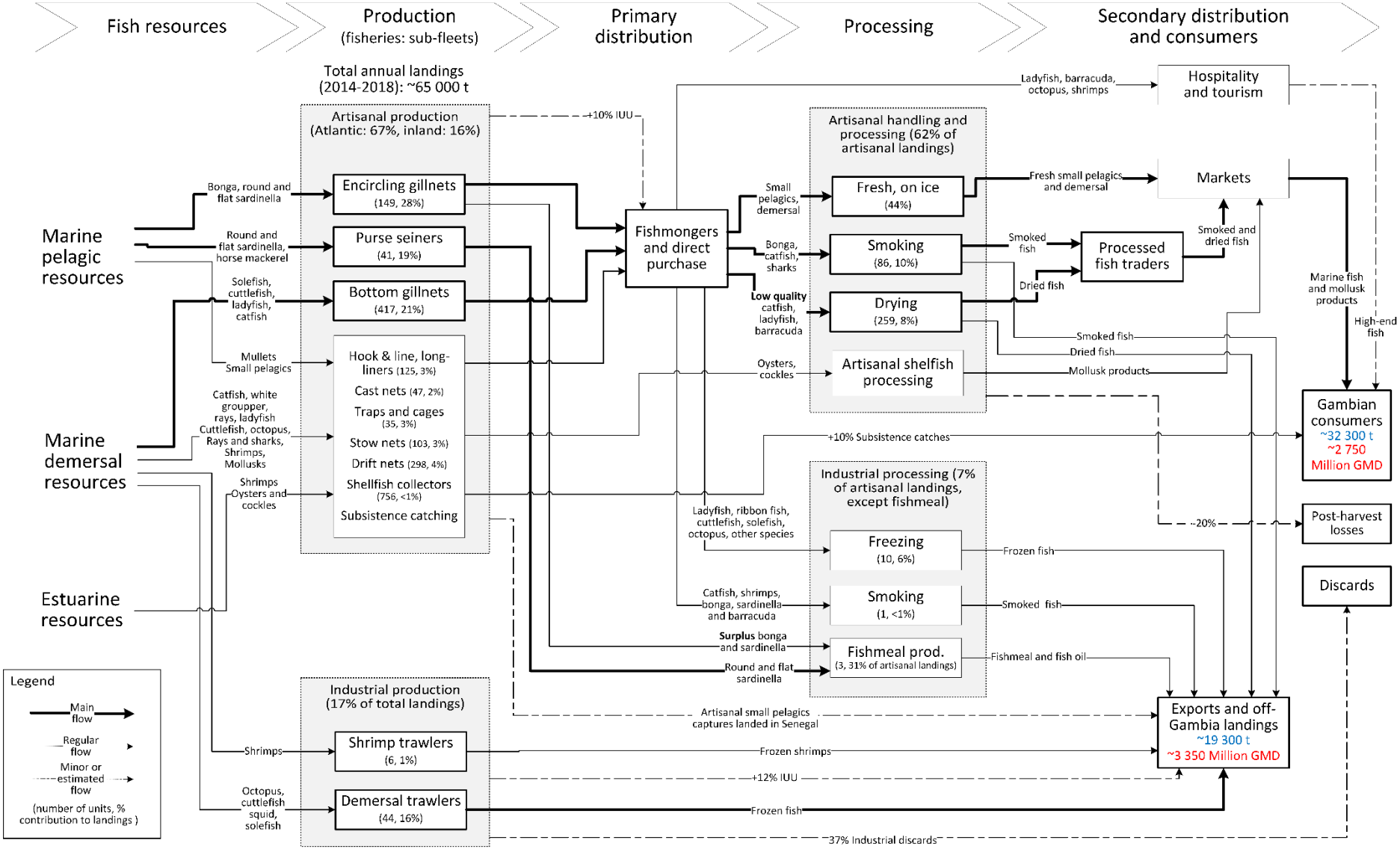
Vázquez-Rowe, I., Tyedmers, P., 2013. Identifying the importance of the "skipper effect" within sources of measured inefficiency in fisheries through data envelopment analysis (DEA). Mar. Policy 38, 387–396. https://doi.org/10.1016/j.marpol.2012.06.018

WFP, 2018. WFP The Gambia Country Brief. World Food Programme.

WFP, 2016. The Gambia Comprehensive and Vulnerability Analysis Report July 2016. World Food Programme.

Ziegler, F., Eichelsheim, J.L., Emanuelsson, A., Flysjö, A., Ndiaye, V., Thrane, M., 2009. Life cycle assessment of southern pink shrimp products from Senegal. An environmental comparison between artisanal fisheries in the Casamance region and a trawl fishery based in Dakar, FAO Fisheries and Aquaculture Circular No. 1044. Rome: Food and Agriculture Organization of the United Nations.

Annex A: Mapping of the main actors and major material and economic flows in the value chain (simplified)



Annex B: Detailed LCA results

FISHERIES: ReCiPe 2016 Endpoint (H) V1.03 / World (2010) H/A

AoP	Unit	Small pelagic fish. capture by artisanal encircling gillnets and landing whole. fresh	Small pelagic fish. capture by artisanal purse seines and landing whole. fresh	Small pelagic fish. capture by artisanal cast nets and landing whole. fresh	Demersal fish. capture by artisanal bottom gillnets and landing whole. fresh	Demersal fish. capture by artisanal lines and landing whole. fresh	Cephalopods. capture by artisanal traps and cages and landing whole. fresh	Demersal fish. capture by artisanal driftnets and landing whole. fresh	Shrimp. capture by artisanal stow nets and landing whole. fresh	Average artisanal-caught pelagic fish	Average artisanal-caught demersal fish	Shrimp. capture by industrial trawler and landed whole. frozen	Cephalopods and demersal fish. capture by industrial trawler and landed whole. frozen
Total	Pt	45.7	30.4	0.03	114.3	190.0	13.7	190.8	0.9	39.4	121.6	1 047.6	632.3
Human health	Pt	42.41389	28.26369	2.40E-02	106.1542	176.3752	1.27E+01	176.6544	0.665308	36.61231	112.8733	973.7442	587.7157
Ecosystems	Pt	2.754829	1.831341	1.81E-03	6.886686	11.50603	8.57E-01	11.97736	0.270969	2.376199	7.403611	62.38274	37.64586
Resources	Pt	0.50065	0.334368	6.32E-04	1.252588	2.080297	1.50E-01	2.157509	1.19E-02	0.432474	1.342046	11.4335	6.900916

FISHERIES: ILCD 2011 Midpoint+ corrected CO2 short term V1.10 / EC-JRC Global. equal weighting (expressed as impact categories endpoints)

Impact category	Unit	Small pelagic fish. capture by artisanal encircling gillnets and landing whole. fresh	Small pelagic fish. capture by artisanal purse seines and landing whole. fresh	Small pelagic fish. capture by artisanal cast nets and landing whole. fresh	Demersal fish. capture by artisanal bottom gillnets and landing whole. fresh	Demersal fish. capture by artisanal lines and landing whole. fresh	Cephalopods. capture by artisanal traps and cages and landing whole. fresh	Demersal fish. capture by artisanal driftnets and landing whole. fresh	Shrimp. capture by artisanal stow nets and landing whole. fresh	Average artisanal-caught pelagic fish	Average artisanal-caught demersal fish	Shrimp. capture by industrial trawler and landed whole. frozen	Cephalopods and demersal fish. capture by industrial trawler and landed whole. frozen
Total	Pt	1.14E-01	7.69E-02	9.17E-04	2.81E-01	4.72E-01	3.82E-02	7.05E-01	1.81E-02	9.86E-02	3.33E-01	2.40E+00	1.44E+00
Climate change	Pt	4.44E-03	2.97E-03	7.47E-06	1.11E-02	1.85E-02	1.35E-03	1.97E-02	2.20E-04	3.84E-03	1.20E-02	1.01E-01	6.08E-02
Ozone depletion	Pt	4.69E-04	3.12E-04	2.58E-08	1.18E-03	1.96E-03	1.41E-04	1.91E-03	4.60E-06	4.05E-04	1.24E-03	1.08E-02	6.52E-03
Human toxicity. non-cancer effects	Pt	7.40E-03	4.98E-03	7.67E-05	1.83E-02	3.14E-02	2.93E-03	5.50E-02	3.67E-03	6.40E-03	2.30E-02	1.69E-01	9.76E-02
Human toxicity. cancer effects	Pt	1.88E-02	1.22E-02	1.30E-04	4.63E-02	8.32E-02	9.27E-03	1.47E-01	4.26E-03	1.61E-02	6.00E-02	3.33E-01	2.01E-01
Particulate matter	Pt	7.22E-03	4.81E-03	4.70E-06	1.81E-02	3.01E-02	2.21E-03	3.08E-02	4.08E-04	6.23E-03	1.93E-02	1.64E-01	9.93E-02

Ionizing radiation HH	Pt	8.62E-03	5.73E-03	5.82E-07	2.18E-02	3.64E-02	2.73E-03	3.55E-02	2.13E-04	7.44E-03	2.31E-02	1.98E-01	1.19E-01
Ionizing radiation E (interim)	Pt	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Photochemical ozone formation	Pt	1.60E-02	1.07E-02	3.78E-06	4.01E-02	6.67E-02	4.78E-03	6.54E-02	1.35E-04	1.38E-02	4.25E-02	3.69E-01	2.23E-01
Acidification	Pt	1.55E-02	1.03E-02	4.41E-06	3.87E-02	6.43E-02	4.61E-03	6.31E-02	1.13E-04	1.33E-02	4.10E-02	3.56E-01	2.15E-01
Terrestrial eutrophication	Pt	1.74E-02	1.16E-02	3.05E-06	4.36E-02	7.24E-02	5.18E-03	7.07E-02	1.11E-04	1.50E-02	4.61E-02	4.02E-01	2.42E-01
Freshwater eutrophication	Pt	9.67E-05	6.42E-05	5.57E-07	2.45E-04	4.22E-04	3.96E-05	6.06E-04	3.05E-05	8.33E-05	2.90E-04	1.96E-03	1.18E-03
Marine eutrophication	Pt	8.58E-03	5.71E-03	1.62E-06	2.15E-02	3.57E-02	2.55E-03	3.48E-02	5.52E-05	7.40E-03	2.27E-02	1.98E-01	1.19E-01
Freshwater ecotoxicity	Pt	4.39E-03	2.94E-03	4.72E-05	1.09E-02	1.90E-02	1.87E-03	3.38E-02	1.48E-03	3.80E-03	1.39E-02	8.27E-02	4.98E-02
Land use	Pt	1.58E-05	1.04E-05	8.25E-10	3.94E-05	6.73E-05	5.57E-06	7.59E-05	5.62E-06	1.36E-05	4.36E-05	3.42E-04	2.07E-04
Water resource depletion	Pt	5.37E-05	4.07E-05	7.27E-07	1.39E-04	1.94E-04	-3.27E-07	1.39E-04	-1.44E-05	4.84E-05	0.00013	0.001398	0.000865
Mineral. fossil & ren resource depletion	Pt	0.004663	0.004625	0.000636	0.009316	0.011638	4.88E-04	0.146217	0.007356	0.004647	0.027804	0.008204	0.004837

PROCESSING: ReCiPe 2016 Endpoint (H) V1.03 / World (2010) H/A

AoP	Unit	Dried fish (artisanal)	Smoked fish (artisanal)	Smoked fish (industrial)	Frozen fish (industrial)	Fishmeal. 63-65% protein. from small pelagics. West Africa	Shellfish collecting and braising
Total	Pt	383.1	308.4	274.4	204.8	185.9	64.0
Human health	Pt	356.2885	282.8535	252.0222	190.3825	172.7446	20.98592
Ecosystems	Pt	22.80971	22.22605	19.52125	12.39539	11.2884	42.53628
Resources	Pt	4.044829	3.270682	2.823663	2.021304	1.847215	0.448303

PROCESSING: ILCD 2011 Midpoint+ corrected CO2 short term V1.10 / EC-JRC Global. equal weighting (expressed as impact categories endpoints)

Impact category	Unit	Dried fish (artisanal)	Smoked fish (artisanal)	Smoked fish (industrial)	Frozen fish (industrial)	Fishmeal. 63-65% protein. from small pelagics. West Africa	Shellfish collecting and braising
Total	Pt	1.615237	1.23917	1.900169	1.898895	0.702739	0.289851
Climate change	Pt	0.038127	0.030695	0.044409	0.028281	0.022299	0.006817

Ozone depletion	Pt	0.003795	0.003037	0.015211	0.0019	0.001671	0.00041
Human toxicity. non-cancer effects	Pt	0.242423	0.166123	0.296253	0.348159	0.098185	0.054863
Human toxicity. cancer effects	Pt	0.269082	0.163935	0.472579	0.333117	0.206654	0.130702
Particulate matter	Pt	0.059296	0.046843	0.039918	0.029257	0.037626	0.0118
Ionizing radiation HH	Pt	0.073812	0.056365	0.1941	0.09739	0.034806	0.011973
Ionizing radiation E (interim)	Pt	0	0	0	0	0	0
Photochemical ozone formation	Pt	0.128866	0.103086	0.07961	0.057773	0.057074	0.006292
Acidification	Pt	0.124737	0.099196	0.078197	0.057624	0.058982	0.003806
Terrestrial eutrophication	Pt	0.139855	0.11161	0.084349	0.063561	0.061591	0.004841
Freshwater eutrophication	Pt	0.002053	0.000832	0.009113	0.013826	0.002635	0.000979
Marine eutrophication	Pt	0.069213	0.055294	0.04986	0.055146	0.030398	0.002392
Freshwater ecotoxicity	Pt	0.429617	0.340915	0.510057	0.797238	0.069818	0.044937
Land use	Pt	0.000132	0.000183	0.000144	6.29E-05	6.13E-05	0.000842
Water resource depletion	Pt	-0.00279	0.00029	0.000406	-3.15E-05	0.000263	-0.00078
Mineral. fossil & ren resource depletion	Pt	0.037021	0.060767	0.025964	0.01559	0.020677	0.009979

TRANSPORT: ReCiPe 2016 Endpoint (H) V1.03 / World (2010) H/A

AoP	Unit	Transport. freight. light commercial vehicle {GLO}| market group for transport. freight. light commercial vehicle | Cut-off. S	Transport. freight. lorry 3.5-7.5 metric ton. euro3 {RoW}| market for transport. freight. lorry 3.5-7.5 metric ton. EURO3 | Cut-off. S	Transport. freight. lorry 16-32 metric ton. euro3 {RER}| market for transport. freight. lorry 16-32 metric ton. EURO3 | Cut-off. S	Transport. freight. lorry with refrigeration machine. cooling {GLO}| market for | Cut-off. S	Transport. freight. lorry with reefer. cooling {GLO}| market for | Cut-off. S	Transport. freight. lorry. unspecified {GLO}| market group for transport. freight. lorry. unspecified | Cut-off. S
Total	Pt	0.09	0.02	0.01	0.02	0.00	0.01
Human health	Pt	0.079252	0.018908	0.006068	0.014202	0.004409	0.004535
Ecosystems	Pt	0.004891	0.001392	0.000475	0.001112	0.000349	0.000363
Resources	Pt	0.001875	0.000529	0.00018	0.000421	0.000135	0.000143