[VCA4D]
VALUE CHAIN ANALYSIS FOR DEVELOPMENT

Coastal fisheries value chain analysis in Mainland Tanzania

Value chain analyses assist in informing policy dialogue and investment operations. They help the understanding of how agricultural, aquaculture and fisheries development fits within market dynamics. They permit an assessment of the value chains' impact on smallholders, businesses, society, and environment.

The European Commission has developed a standardised methodological framework for analysis (https://europa.eu/capacity4dev/valuechain-analysis-for-development-vca4d-/documents/methodological-brief-eng). It aims at understanding to what extent the value chain allows for inclusive economic growth and whether it is both socially and environmentally sustainable.

The value chain context

Mainland Tanzania (MLT) is part of the United Republic of Tanzania. Its coastline extends for 1,424 km and it is important for both its ecological and economic resources. A quarter of the MLT population (60 million people in 2020) depends on coastal or inland lake resources for their livelihoods. Fishing is an important source of income and nutrition, directly employing nearly 200,000 people as fishermen and supporting more than 4 million people engaged in the value chain (VC) (processing, trade, transport, net making, and boat building). The average annual fish consumption is around 7.6 kg/person. The total fisheries VC contribution to the national Gross Domestic Product (GDP) was estimated at 1.7% in 2020, of which the marine coastal fishery sector represented a minor proportion (10-15% of total fisheries). However, coastal fishery is a significant component of the regional economies and must be considered in the Blue Economy strategy to ensure the sustainable and inclusive management of the natural bio-resources and to anticipate the effects of climate change on coastal communities.

The European Union intervention

The EU is engaged in supporting interventions to contribute to the Tanzania's National Development Plan objectives of creating job opportunities and fostering inclusive and sustainable economic growth. This is in line with the Sustainable Blue Economy Framework, the African Blue Economy Strategy, and the European Green Deal, in which the fisheries sector is recognized as an essential component. The EU Multiannual Indicative Programme (MIP) 2021/2027 identifies three priority areas: Green Deals, Governance, and Human Capital and Employment. The Blue Economy for Sustainable Transformation (BEST) program will support, among others, the development of sustainable fisheries and aquaculture VCs to contribute to food security, nutrition and livelihoods; the sustainable management of coastal ecosystems and the productive use of the marine and coastal ecosystems and targeted inland waters.
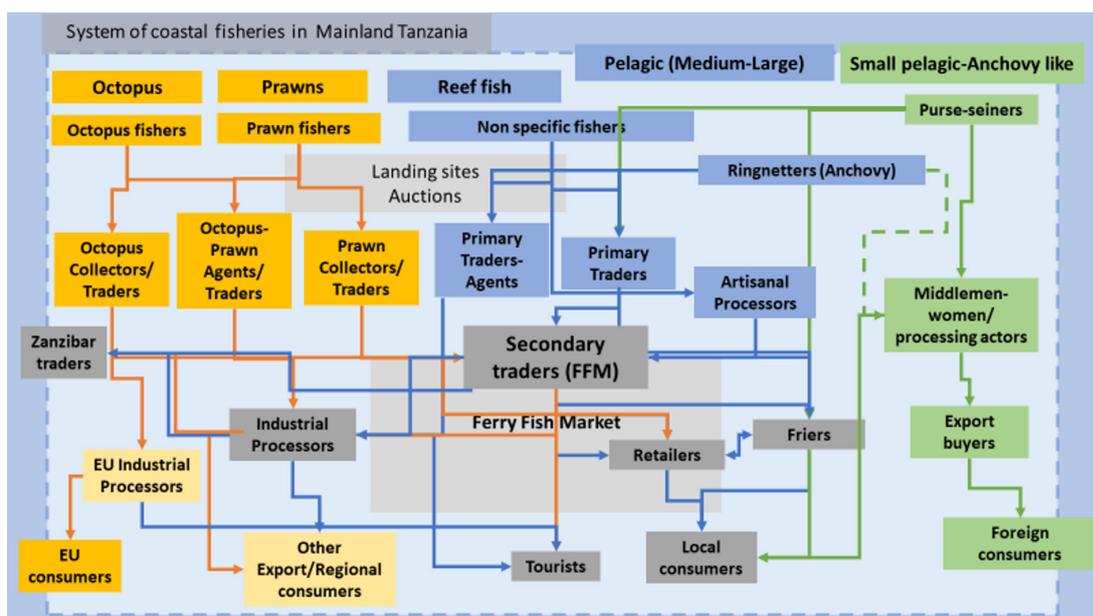

Figure 1: Flowchart of the coastal fisheries value chain in Mainland Tanzania (2019)

Functional analysis

Production and sub-chains

The small-scale, marine coastal fisheries production in MLT relies on multiple species. The four main fish categories are: **small pelagic** (anchovies and anchovy-like species); **finfish** (i.e. large pelagic, tuna and tuna-like species, and reef fishes); **octopus**; and **prawns**. Large pelagic and reef fisheries are grouped into the category of finfish because fishers may opt for one type of fishing depending on the season and catch rates. Mostly, artisanal coastal fisheries are performed by sail/paddle-propelled wooden vessels. The number of fiberglass boats and outboard engines is also increasing. Fishing gears are various (Figure 2): hand and long lines, gillnets, traps, ring nets, purse seines, and spears.

Sub-chains	Fishing gears and boats	Main target markets	Production volumes (t)	Production value (MTZS: million Tanzanian Shilling)	Number of Full time equivalent (FTE) fishers
Small Pelagic	Purse seiners, Ring-netters, motorized	Domestic (fresh, fried) and export to regional Africa as dried anchovy ("dagga")	15,000	53,057 MTZS (€20 million)	1,256
Finfish	Ring-netters, gillnetters, handliners or longliners, motorized or sail propelled	Domestic and tourism (fresh, frozen, whole or cut)	45,332	352,755 MTZS (€135 million)	22,231
Octopus	Foot and dive fishers, transport motorized boats	Tourism (fresh, frozen), export market (frozen, EU, African countries)	4,250	65,606 MTZS (€25 million)	3,396
Prawns	Gillnet, motorized and sail boats and just 3 trawlers	Tourism (fresh, frozen), export market (frozen, EU, African countries)	2,300	31,983 MTZS (€12 million)	1,523
Total			**66,882**	**503,401 MTZS (€193 million)**	**28,406**

Figure 2: Characteristics of the sub-chains in MLT

Processing and market channels

Small pelagic fishes (i.e. anchovy and sardine-like), are mostly dried and sold in the local and regional market. Some is sold fried in urban markets. Finfish species are mainly sold fresh/chilled or frozen by means of domestic chest freezers or in industrial facilities. Octopus and prawns are sold fresh/chilled or frozen, mainly targeting the tourism and export markets.

Beach Management Units (BMUs) exist in 63% of the 274 landing sites, where the majority of seafood is sold through auctions. The rest of fish is directly sold from the boats to independent buyers-traders, processors (for small pelagic), and buyers commissioned or formally employed by industrial processors (octopus, prawns, finfish), some of which are certified for export to the EU. The seafood is transported by cycles, trucks, and cars. The **Ferry Fish Market in Dar-es-Salaam acts as a central market node**, capturing more than 10-15 % of the marine seafood. The tourist market is important and is handled by industrial actors, inducing competition between industrial and small-scale traders.
The most important artisanal processing activity is handled by middlemen and women, who sell dried anchovy to export traders for the regional African market.
Market shares by destination are presented in Figure 3.

Technical aspects

Fuel consumption during fishing and artisanal processing activities (fossil fuel and firewood) can be improved given the low energy efficiency of the engines and the equipment used for processing (braziers). Little development of the Cold-Chain System (CCS) and market infrastructures such as landing, auction sites, and seafood storage facilities contribute to high post-harvest losses, especially nutritional and quality losses.

Governance and policies

Coastal fisheries (within the territorial waters) are managed by the Ministry of Livestock and Fisheries and Regional and district agencies. Off-shore fisheries (within the Exclusive Economic Zone, EEZ) are co-managed with the Zanzibar Ministry of Blue Economy and Fisheries, through the Deep-Sea Fishing Authority (DSFA).

The Fisheries Policy (2015) is under revision while no Blue Economy Policy has been formalized for MLT, yet. Tanzania is a lead country taking forward the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security & Poverty Eradication (SSF guidelines); a National Task Team is in place for effective implementation of the SSF Guidelines, and National Plan of Action for implementation currently has been developed.
Linkages and coordination between and among the diverse entities relevant to various aspects of coastal fisheries governance are weak. There is limited institutional capacity to meet the challenge of implementing effective fisheries co-management regimes, taking note of the complexities involved.
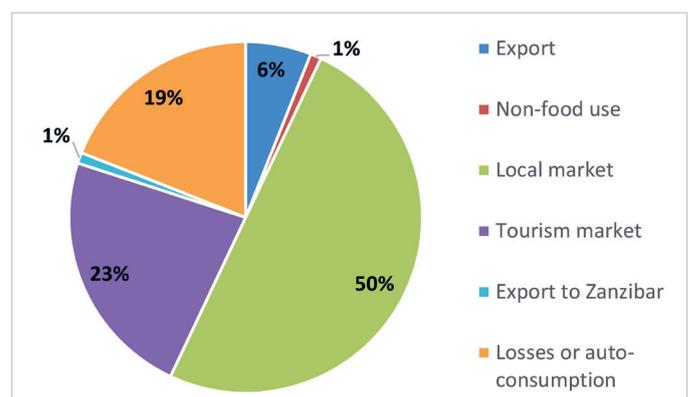

Figure 3: Distribution of seafood by destination market (% of total production in MLT based on Live Weight Equivalent-LWE)

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

Financial viability for the actors

Profitability g reatly v aries b etween a ctors a nd s ub-chains. The Net Operating Profit (NOP) of an individual fisher, varies between 143,000-1,740,000 TZS/month (€55-670/month), depending on the gears and targeted species, the fish landing price and the catch volume. Profitability for ring-netters, fishers using motorized fiberglass boats and purse seiners can become critical in situations of lower prices for landed fish, and lower catching rates.

Monthly income is between 330,000-3,600,000 TZS (€126-1400) for traders and 765,000-114,000,000 TZS (€295-44,000) for processors, depending on the sub-chains and the sub-categories of actors. Transport, electricity, firewood, i ce, handling, and processing labours are the main costs for traders and processors. Returns on turnover (ROT) range from 12 to 39% for traders and processors, with more critical financial viability for small-scale processors and traders in the finfish sub-chain. The **highest ROT** is found in the sub-chains where industrial processors are operating for the export market in Europe (i.e. octopus sub-chain): 22% for the traders, and 39% for the processors.

Impacts on the national economy

The **Total Value Added (VA) (Direct VA + Indirect VA)** for the coastal fisheries value chain in MLT is estimated at **398,450 MTZS (€142 million) in 2020**. For each MTZS of value directly created by VC actors, 0.2 MTZS of indirect VA is created by their suppliers. The rate of integration (79%) indicates that the VA created within the national economy is a high portion of the value of the VC production. The **total contribution of the coastal fisheries VC to the MLT economy (GDP)** is **0.29%** and to the agriculture GDP is **1.07%**. **If reported to five coastal regions (including Dar-Es-Salaam), the total VA estimate is close to 1% of the GDP of the coastal regions in MLT.**

The **public fund balance** (tax income minus subsidies) is positive, as no subsidies were identified while the income tax is around 20,930 MTZS (€8 million).

The **VC balance of trade** is slightly negative, as the import of goods and services by the VC actors (mainly 4,700 MTZS, €2 million) is slightly higher than exports.

Viability in the international economy

The **Nominal Protection Coefficient (NPC)** is around 1, indicating that the value of the VC production is not impacted by subsidies and taxes. The **Domestic Resource Ratio (DRC)** is 0.44, indicating that the coastal fisheries VC in MLT is viable in the international economy.

Comparison of sub-chains

The **finfish sub-chain generates 68% of the total VA**. The small pelagic, octopus and prawn sub-chains represent 11%, 14%, and 7% of the total VA, respectively. From an overall economic growth perspective, all the sub-chains in MLT are playing major and complementary roles. The octopus and prawn sub-chains are in fact positively contributing to the balance of trade through the export earnings of high value products.

> The coastal fisheries value chain of Mainland Tanzania contributes significantly to the livelihood of coastal communities, despite representing a minor percentage of the fisheries, agriculture and national GDP at the national level. The main contributions to the national economy are represented by the export of octopus and prawns, and by the contribution of industrial players. Crew members, artisanal processors and small-scale traders are the majority of actors of the value chain, and they are the ones with critical financial viability and not benefiting from the new opportunities provided by the expanding export and tourism markets.
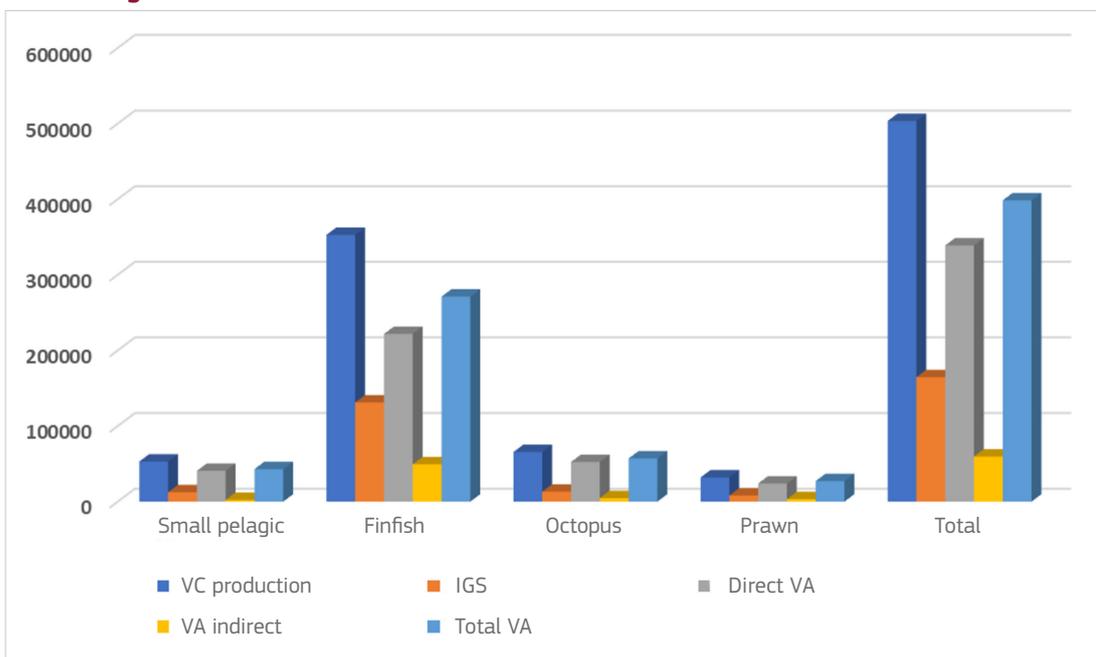

Figure 4: Comparing the sub-chains in the MLT coastal fisheries VC (production, Intermediate Goods and Services and total effects) in million Tanzanian shilling

Is this economic growth inclusive?

Distribution of income among the actors

Overall, **the estimated monthly incomes range from 0.5 to 4 times the reference minimum wage (300,000 TZS–€115/month) rate for all the categories of actors**. The share of the fisher's landing price in the final price ranges from 14% (small pelagic) to 41% (high-value finfish), indicating a **potential higher inequality in some sub-chains**, also confirmed by the estimated **Gini's coefficient (0: perfect equality, 1:total inequality)** ranging from **0.44 (finfish)** to **0.70 (octopus)**. **Fishers appear as a vulnerable group** in most sub-chains (i.e. crews of purse seiners targeting small pelagic) although in some cases, their income can exceed three times or more the minimum wage.

Women's overall participation in the VC is around 26%. Women are getting more involved in downstream activities as primary traders, buyers at auction places, and entrepreneurs although their positioning is still relatively limited.

Job creation and employment

Almost all of the jobs in the VC are **unqualified** (>90%). Traders and artisanal processors are **mostly self-employed.** The rate of **formal employment** is significant (30% of workers) only in the **octopus and prawn sub-chains** where industrial processors play a major role. Seasonal, temporary, partial jobs are seen in the seasonal fisheries (octopus, prawns, small pelagic) while in the finfish sub-chains, the activities are practiced throughout the year.

> The coastal fisheries value chain in Mainland Tanzania is quite dynamic in terms of job creation and income, but income inequality is high among some actors and sub-chains. Crew members and many coastal fisheries actors and communities are vulnerable because they are highly dependent on fisheries and have limited capacity to adapt to socio-economic and biophysical stresses.

Is the value chain socially sustainable?

The following table and Figure 5 provide an indication of the main social consequences and context of the VC activities in six key domains.

Working Conditions	• Most workers in coastal fisheries VCs are in informal sector where enforcement of rights, job safety and organization of workers is challenging. • People (including women and youth) are attracted by the VC activities in spite of challenges, but returns vary widely.
Land and Water Rights	• Tanzania is a lead country taking forward the SSF Guidelines and currently especially in MLT. • Fishers "property rights" affected by protected areas, with limited benefits to local people. • Land policy/law implementation often not in accordance with the rules. No recent large-scale acquisitions by private sector coastal fisheries VC actors identified, although other coastal developments are on-going.
Gender Equality	• High involvement by women in coastal fisheries postharvest, but relatively low in production (exception of octopus). • Some women economically empowered through fisheries VC and hold leadership roles, e.g. BMUs. Other women, and men, are vulnerable. • Division of labour is unequal; women are expected to earn and do household work. • Women's participation shaped not just by gender, but also by other factors e.g. assets, education.
Food and Nutrition Security (FNS)	• In coastal communities, fisheries make a direct and indirect (income) contribution to FNS. • Food production in community reported as decreasing. FNS increasingly depends on households' ability to buy food. • Risks of dependency on income from fisheries VC are high for fisher and non-fisher households.
Social Capital	• Coastal fisheries actors belong to a range of formal and informal organisations and are embedded in a complex web of social relations. • Goals, performance and inclusivity of organizations in fisheries VC vary. Many fishers did not feel well represented. • BMUs should enable participation by all local actors in marine resource decisions, but performance is variable. • Formal support service capacity to fishers is generally weak.
Living Conditions	• Improved health facilities attributed to the government, although household spending on health is high. • Increasing and high proportion of houses considered "modern" (i.e. iron sheet roofs); fisheries income contributed. • On MLT, rural primary school net enrolment rate 81%; fisheries income contributed to meeting educational costs.

Figure 5: Social profile of the coastal fisheries VC in Mainland Tanzania
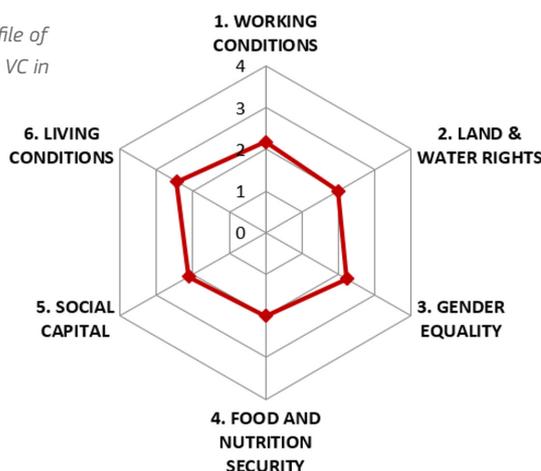
> People are attracted, in spite of challenging working conditions, to these mainly informal value chains. There are concerns regarding coastal resource property and small-scale fishers' rights. Women are increasingly participating in post-harvest activities, but further improvements can be made. Fishing communities are increasingly dependent on purchased food, increasing their vulnerability to changes in fish stocks and food prices. In terms of social capital, many fishers reported limited representation and weak support. Education, housing and health facilities are improving for many and fisheries income is contributing. However, there are other social concerns, e.g. increasing incidence of non-communicable diseases like high blood pressure and diabetes, in coastal areas.

Is the value chain environmentally sustainable?

The environmental impacts of the coastal fisheries VC in MLT have been measured through the Life Cycle Assessment (LCA) methodology, considering three areas of protection: **Human Health, Resource Depletion**, and **Ecosystem Quality**. LCA results also show the VC's impact on **Climate Change**. Besides, the risks for **biodiversity** are presented.

The most important stages defining the environmental performance of the VC are the fishing and the processing phases. The transport stage refers mainly to exported seafood.

Impact on areas of protection

Among the three areas of protection, **Human Health** is the most impacted by the VC activities. The fishing activities by motorized vessels characterized by the highest FUI (Fuel Use Intensity: the amount of fuel per ton of landed seafood) lead to the greatest potential damage to Human Health (Figure 6). Similarly, frying process using firewood and vegetable cooking oil (Figure 7) damages human health due to the release of CO_2, other greenhouse gasses (GHGs) and particulate matter. Firewood-related emissions are higher than Liquefied Petroleum Gas (LPG) ones. Production of vegetable oil requires land transformation and habitat loss, the use of fertilizers and fossil fuels for planting, harvesting, and processing, affecting both human health and ecosystem quality. For **Resource Depletion**, fuel used during fishing activities and LPG used for frying are the main contributors to the impact as they involve the extraction of fossil resources. The freezing processing, which makes use of electricity and polyethylene materials for packaging, also brings potential damages. Indirectly, also the use of cooking oil contributes to abiotic resource depletion because of its manufacturing. Concerning **Ecosystem Quality** the use of fuel for engine operation and of cooking oil for processing are again the main drivers of the damage contributing to the ecotoxicity and eutrophication of terrestrial and aquatic ecosystems. This damages Ecosystem Quality because of fuel-derived emissions and chemical pollution of soil and water, land transformation, and habitat loss connected with oil manufacturing. The firewood used during processing could be either actively cut in the forests or harvested from the ground and impacts Ecosystem Quality.

The impact of the VC activities on **Climate Change** is mainly driven by GHGs emissions, because of firewood combustion in processing stage and fuel consumption in the fishing activities.

Biodiversity

Despite the weak reporting of landed products and the absence of up-to-date stock assessments, most of the fish stocks of MLT artisanal fisheries are classified as fully or overexploited. This information is corroborated by the perception of many fishers. This may be caused by the combination of: increased numbers of fishermen resulting in decreased Catch per Unit Effort; use of destructive fishing systems or practices; climate change that causes species to migrate.

From the environmental point of view, the coastal fisheries value chain in Mainland Tanzania could be improved in both the fishing and processing stages. The main drivers of the environmental impacts are the use of fuels for fishing operations (especially the high-Fuel Use Intensity sub-chains, i.e., octopus and finfish) and the use and combustion of firewood and cooking oil for processing activities. The overall inefficiency of the machinery used along the value chain (i.e. outdated engines, braziers, poor Cold Chain System) should also be considered. Almost all stocks are threatened by full and over-exploitation. The regular reporting of landed fish products and a well-functioning data flow system is crucial for the evaluation of the effects of value chain activities on biodiversity.
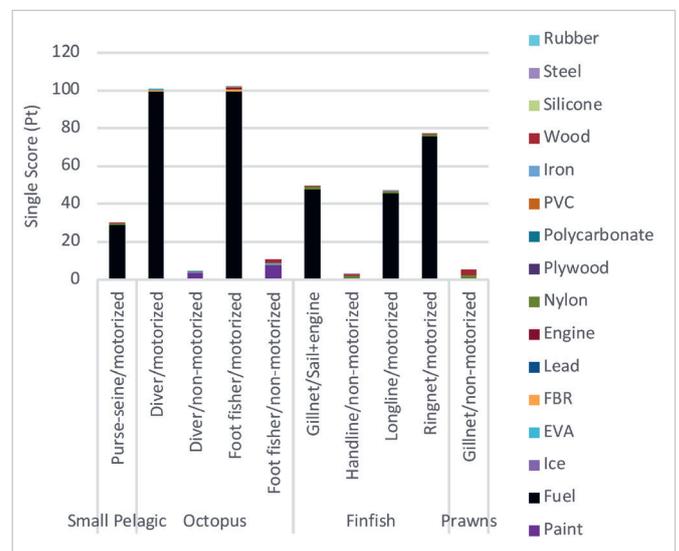

Figure 6: Contribution of fishing activities by sub-chain to the overall potential damage (for 1 t of landed seafood)
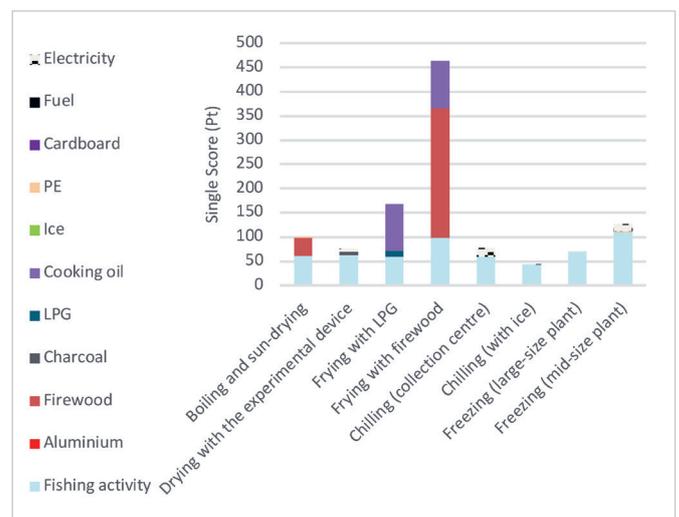

Figure 7: Impact of the processing activities in Mainland Tanzania on the overall environmental damage (for 1 t of processed seafood)

Main findings and recommendations

Main risks and findings

The coastal fisheries VC in Mainland Tanzania has a **significant contribution to the economy of coastal regions and livelihoods in local fishing communities**. The small pelagic sub-chain is growing in importance for the local economy and food security but a strong data collection system is needed to clearly assess its sustainability. The finfish sub-chain provides a major contribution to economic growth and food security, but attention should be paid to the sustainable management of the resources. Concerning these sub-chains, there could be a challenge in managing the stocks shared with the semi-autonomous State of Zanzibar. The octopus and prawn sub-chains play an important role in growth and industrial development. The dynamics of these sub-chains are linked to the export market, which may lead to positive or negative impacts on coastal fisheries and local communities. Potential threats to coastal fisheries are related to the weak management of fish stocks, overexploitation risks, climate change, ecosystem degradations, degraded food quality and sanitary situations. Many coastal fisheries actors and communities are vulnerable because they are highly dependent on fisheries and have limited capacity to adapt to socio-economic and biophysical changes. There is a **challenge in the future Blue Economy policy implementation to minimise the trade-offs in order to achieve fair outcomes between the coastal fisheries sector and the other Blue Economy sectors identified**, such as marine conservation measures, tourism expansion, and oil/gas extraction activities.

Main recommendations

Data and information system

➜ Strengthen capacities (including technical and financial support) for data collection on actual catches and potential yields, improve the information flow and the collaboration among stakeholders.

Environmental issues

➜ Co-design ways of reducing the amount of fuel required per trip at sea, improving the efficiency of the kilns used for processing (as well as the choice of the fuel used for processing, i.e. LPG).
➜ Improve hygienic conditions and modernize infrastructure to reduce post-harvest losses
➜ Decrease fishing efforts and create space for alternative income-generating activities, such as sustainable aquaculture.

Social issues

➜ Improve the alignment with the principles of the SSF guidelines.
➜ Strengthen understanding of the relationship between food and nutrition security and fisheries in coastal communities and nationally.
➜ Support multi-stakeholder co-management initiatives, in ways that fairly distribute both costs and benefits.

Coastal fisheries in the context of Blue Economy

➜ Develop an integrated planning framework for all aspects of the Blue Economy and appropriate institutional arrangements.processing, i.e. LPG).
➜ Develop actions in relation to the Blue Economy with all donors joined together in an organised group.
➜ Support responsible investments, i.e., through the application of principles of sustainable Blue Economy Finance.

Coastal fisheries issues in the context of Agroecology

➜ Explore how agroecology practices and principles can contribute to the economic, environmental and social sustainability of coastal fisheries systems.