The Kilwa District Octopus Fishery Comprehensive Electronic Catch Documentation and Traceability (eCDT) Strategy

Octopus Fishers in Kilwa District (Credit: Aqua-Farms Organization)

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SALT
SEAFOOD ALLIANCE FOR LEGALITY & TRACEABILITY

AQUA-FARMS ORGANIZATION
AFO

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- **Ministry of Livestock and Fisheries**
- **Department of Fisheries**
- **Kilwa District Community Members**
- **Co-Design Planning Committee Members**
- **Co-Design Participants**

Co-Design Participants (Credit: Nina Rosen, SALT)

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Acronyms

AFO	Aqua-Farms Organization
BMU	Beach Management Unit
CSO	civil society organization
eCDT	electronic catch documentation and traceability
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FETA	Fisheries Education and Training Agency
IUU	illegal, unreported, and unregulated
LGA	Local Government Authority
MCS	monitoring, control, and surveillance
MEL	monitoring, evaluation, and learning
MLF	Ministry of Livestock and Fisheries
MOU	Memorandum of Understanding
MSC	Marine Stewardship Council
NGO	nongovernmental organization
RFP	request for proposal
ROI	return on investment
SALT	Seafood Alliance for Legality and Traceability
SWOC	strengths, weaknesses, opportunities, and challenges
TAFIRI	Tanzania Fisheries Research Institute
TAWFA	Tanzanian Women Fish Workers Association
TCRA	Tanzania Communications Regulatory Authority
TFDA	Tanzania Food and Drugs Authority
TIFPA	Tanzania Industrial Fishing and Processors Association
TPDC	Tanzania Petroleum Development Corporation
TRA	Tanzania Revenue Authority
USAID	United States Agency for International Development
US—FDA	United States—Food and Drug Administration
UVI	unique vessel identifier
WWF	World Wildlife Fund

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I. Our Approach

Background

The Seafood Alliance for Legality and Traceability (SALT) is a global community of governments, the seafood industry, and nongovernmental organizations working together to share ideas and collaborate on solutions for legal and sustainable seafood, with a focus on traceability — the ability to track the movement of seafood through supply chains. SALT is a public-private partnership between USAID and the Packard, Moore, and Walton Family Foundations. It is implemented by FishWise, a sustainable seafood consultancy.

Governments around the world, including The United Republic of Tanzania[1], henceforth referred to as Tanzania, are increasingly recognizing the importance of more transparent seafood supply chains. One way that governments and the private industry have worked to improve transparency is digitally tracking seafood products as they move throughout the supply chain in real time. The practice of digitally collecting, sharing, and tracking verifiable information about the harvesting, processing, and transportation of seafood products is called electronic catch documentation and traceability (eCDT). Electronically collecting and sharing product information facilitates a quicker exchange of information, minimizes data collection repetition, can ease compliance, and enables broader use and more thorough verification by governments and within supply chains.

Digitizing traceability information is paramount for governments to effectively manage fisheries and industry to make informed sourcing decisions, but where to start is a challenge. SALT consulted with its seafood traceability community from 2020 to 2021, to create Comprehensive Traceability Principles (**Figure 1**), a set of guidelines and best practices to follow when designing an electronic catch documentation program. SALT's Consultative Committee also created a detailed Pathway to implement the Principles, providing descriptive activities and helping the user identify where to start their traceability journey. Tanzania's Ministry of Livestock and Fisheries (MLF) Department of Fisheries consulted on the development of the Principles and Pathway.

[1] This strategy is developed in consultation with The United Republic of Tanzania and not The Revolutionary Government of Zanzibar. In this strategy, The United Republic of Tanzania is synonymous with Tanzania. Although this strategy is created to meet the objectives identified by the octopus fishery in the coastal waters managed by The United Republic of Tanzania, SALT encourages collaboration and sharing of knowledge in order to scale-up electronic catch documentation and traceability of octopus and other seafood products in the region.

Once the Comprehensive Traceability Principles and Pathway were developed, the next step was to apply them in coordination with stakeholders who expressed an interest. Because MLF was involved in the development of the Principles and expressed interest in applying the novel guidance to a regional, artisanal fishery with an export market, Tanzania was selected to test the application of the Principles and the Pathway. The project in Tanzania will demonstrate the process of applying the guidance and will inform others worldwide.

A joint memorandum of understanding was signed between SALT and MLF in 2021 to improve biodiversity conservation and fisheries management in Tanzania by increasing transparency in seafood supply chains through traceability implementation in the octopus fishery in and around the Kilwa District. Aqua-Farms Organization (AFO), a Tanzanian NGO established in 2017, was hired by SALT to implement project activities, in coordination with senior technical advisor Yahya Mgawe. SALT and its collaborators seek to empower youth (35 years of age and younger) and women in the development of the traceability program, starting with the co-design of this comprehensive eCDT strategy.

Figure 1: Comprehensive Traceability Principles

The six Principles represent the best practices that governments in seafood producing countries should consider when embarking on designing, implementing, or improving their electronic traceability programs.

Co-Design

The information presented in this eCDT strategy for the Kilwa District octopus fishery was designed to involve the whole social system. This framework was chosen to be inclusive and collaborative with stakeholders from the start and throughout program implementation. Co-design provided representatives of diverse stakeholder groups with the opportunity to own and shape the future they would like to see in this fishery.

The environmental, economic, governance, and social systems were mapped, which revealed relationships, showing how and where current players work on comprehensive eCDT and with whom they are currently working. It identified stakeholder awareness of power vs. interest in eCDT, as well as champions of eCDT. A key outcome of mapping the entire system was a database of stakeholders involved in the Kilwa District octopus value chain that was used to select a representative range of participants for the co-design event. The database can serve as a resource for future work.

The co-design event, "Co-creating an Electronic Traceability Strategy for Kilwa Octopus Fishery," was held in Dar es Salaam in September 2022. The Honorable Mashimba Mashauri Ndaki, Minister of MLF, opened the event with a keynote address to 135 participants, including fishers; BMU representatives; central, regional, and local government representatives; members of academia and industry; funders; and NGOs. The co-design event moved stakeholders toward a common vision and shared goals for comprehensive eCDT implementation and long-term adoption in the Kilwa District octopus fishery. The information collected through research and co-design serve as the foundation for this strategy.

Figure 2. The Future eCDT for Kilwa District Octopus Fishery

Visualizing the supply chain and the benefits of electronic catch documentation and traceability in the Kilwa octopus fishery. Credit: Tai Plus Tanzania

Why Kilwa District?

Kilwa District's octopus fishery was selected for the application of the Principles and Pathway due to the importance of the fishery to local livelihoods, continued and forecasted growth for the fishery, the role of women and youth, its reliance on an export market, and the opportunities for improved biodiversity conservation and fisheries management through improved data collection **(Figure 2)**. Additionally, groundwork laid over three decades in Kilwa District makes it an ideal location for an eCDT program.

The Fishery

Octopus fisheries are important for coastal communities in Tanzania,[2] but insufficient enforcement, minimal control mechanisms, and growing demand in local and international markets make them vulnerable to overfishing. Kilwa District, the second largest district within the Lindi Region with 1,221 square kilometers of Tanzania's coastal waters, is endowed with valuable marine resources. Octopus fisheries make an immense contribution to local livelihoods, employment, and the economy. The species are targeted for local, national, and international export markets, especially in the European Union. It is estimated that over 7,000 people are directly or indirectly employed along the octopus value chain in the Kilwa District. The Kilwa District octopus fishery is notable for involving a large number of women and accounts for around 30% of octopus fishers in Tanzania.

The fishery is exclusively artisanal, using simple gear such as rods and spears for harvesting. Women and youth use a technique called "gleaning," where they walk along the exposed reefs during low tide and collect octopus using spears. Local fishers harvest at the coral reefs or *miamba,* particularly during low tide, but some men are seen diving in relatively deep water. The three most caught and commercially important species of the fishery are the common octopus (*Octopus vulgaris*), white-spotted octopus (*Callistoctopus macropus*), and big blue octopus (*Octopus cyanea*), with the latter accounting for over 90% of the total catch. Songo Songo Island contributes a large volume of octopus catches compared to other landing sites in Kilwa District. Despite the challenges of obtaining robust data, the octopus production in Kilwa District was estimated to be 61.34 metric tons in the year 2020. More than 90% of the Kilwa District and other Tanzanian octopus catch was sold to large traders and companies, mainly in Dar es Salaam, for export to international markets.[3]

Previous & Ongoing Work in Traceability

Paper-based traceability is used to track the octopus through the cold chain and provides critical information for export. In addition, there has been a significant amount of work already done by the local community, managers, and invested organizations to improve traceability and sustainability of octopus. MLF, Tanzania Fisheries Research Institute (TAFIRI), Marine Stewardship Council (MSC), World Wildlife Fund (WWF), and Blue Ventures have laid the

[2] Steve Rocliffe and Alasdair Harris, *The Status of Octopus Fisheries in the Western Indian Ocean* (London, UK: Blue Ventures, April 2016), https://blueventures.org/wp-content/uploads/2021/03/Status-of-octopus-in-WIO.pdf

[3] Rocliffe and Harris, *The Status of Octopus Fisheries in the Western Indian Ocean.*

groundwork for ongoing seafood traceability efforts through their work on community supported fisheries management measures, electronic data capture system implementation, and knowledge and awareness building around sustainability. Continued consultation with these groups is beneficial for the successful adoption of an eCDT program.

Completed and ongoing work by TAFIRI, MSC, WWF, and Blue Ventures, with the support and dedication of the Kilwa District Council and local Kilwa District communities, is pivotal for the next step toward an eCDT program. TAFIRI developed and pioneered the electronic catch assessment surveys (eCAS) system, a mobile and web-based application to collect data for fisheries along the coastal waters of Tanzania, in 2017. WWF has worked with the octopus fishing communities in Kilwa District, driving the fishery toward sustainability for over a decade. WWF was instrumental in developing a co-management approach and forming local institutions such as the beach management units (BMUs), which were trained on data collection, eco-credit, and monitoring and surveillance. WWF introduced a successful reef closure program at Songo Songo Island,[4] which has inspired other fishing communities. When the reef is open, the program records data on catch, fishing efforts, fishery stock, and economic benefits using the eCAS program. Concurrently, MSC and Blue Ventures have promoted sustainable fisheries, working with the octopus fishery toward MSC certification for over a decade.[5]

[4] Modesta Medard and Zephania Arnold, "Temporary Octopus Closures: A Collaborative Effort for Improved Livelihoods in Songosongo Archipelago, Tanzania," WWF, April 14, 2022, https://wwfafrica.awsassets.panda.org/downloads/temporary_octopus_closures.pdf

[5] SWIOCeph was initiated by the MSC with Blue Ventures, the German Corporation for International Cooperation (GiZ), the African Union Interafrican Bureau for Animal Resources, and WWF-Sweden. The project included the production of a mapping report; five country-level pre-assessments and one regional pre-assessment; and the independent development and implementation of an action plan by stakeholders in southwest Madagascar.

Figure 3. Select Projects and Programs Supporting Efforts in Kilwa District

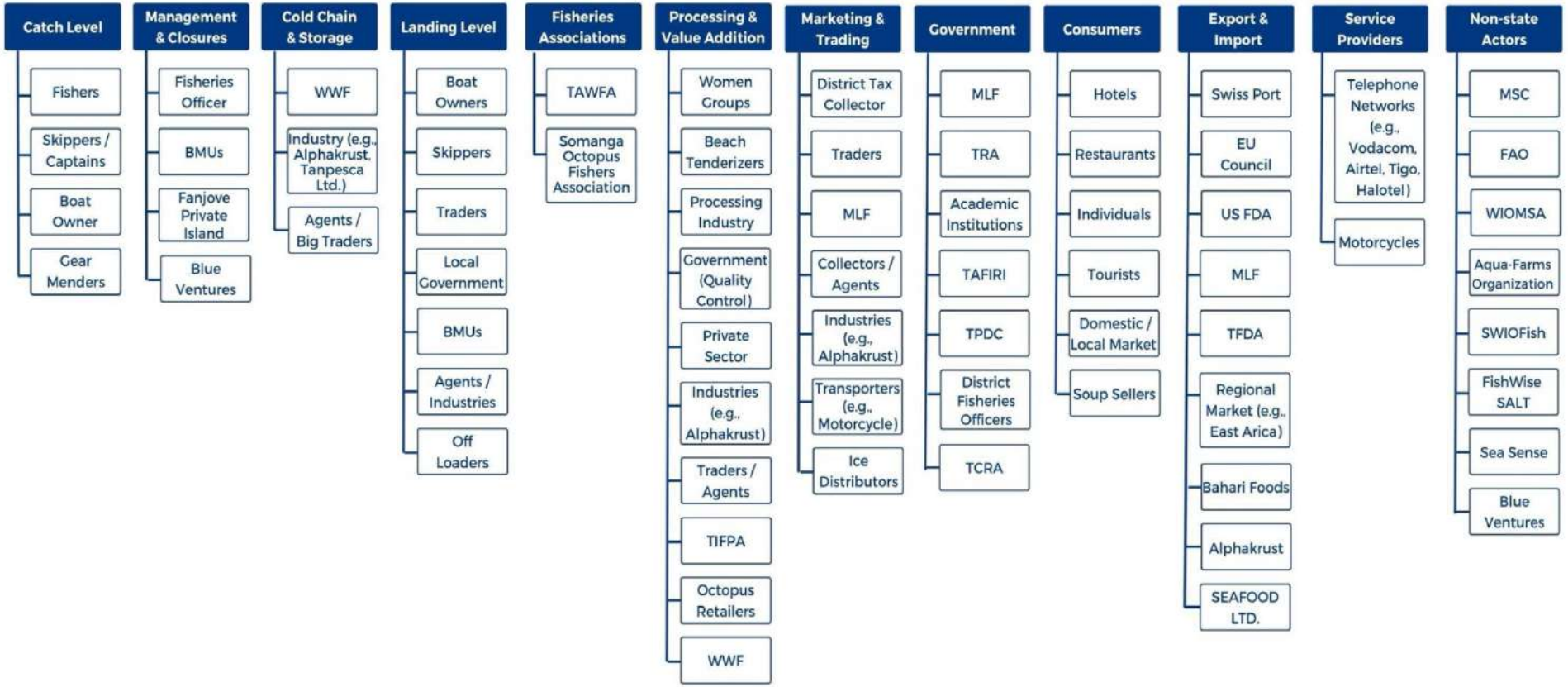
Invested international and regional organizations (e.g., USAID, UNDP, WIOMSA) demonstrate dedication towards building local capacity for resource management and conservation in coastal Tanzania. **Figure 3** highlights some of the projects and supporters that have assisted in laying the groundwork for improved octopus traceability in the Kilwa District. As described in the Pathway to the Principles, it is important to recognize and understand previous research, community engagement, and conservation and traceability efforts to minimize duplicative efforts and include stakeholders that can inform improvements.

II. Current State of Seafood Traceability in Kilwa District

Kilwa District Octopus Fishery Stakeholder Mapping

The initiation phase of the Principles began by defining, identifying, and engaging stakeholders. Mapping the stakeholders was completed through several activities, including a desktop review of published and gray literature, brainstorming sessions, online webinars, interviews, surveys, focus group discussions, and co-design event. The stakeholders of the Kilwa District octopus fishery were categorized into 11 groups, shown in **Figure 4** below.

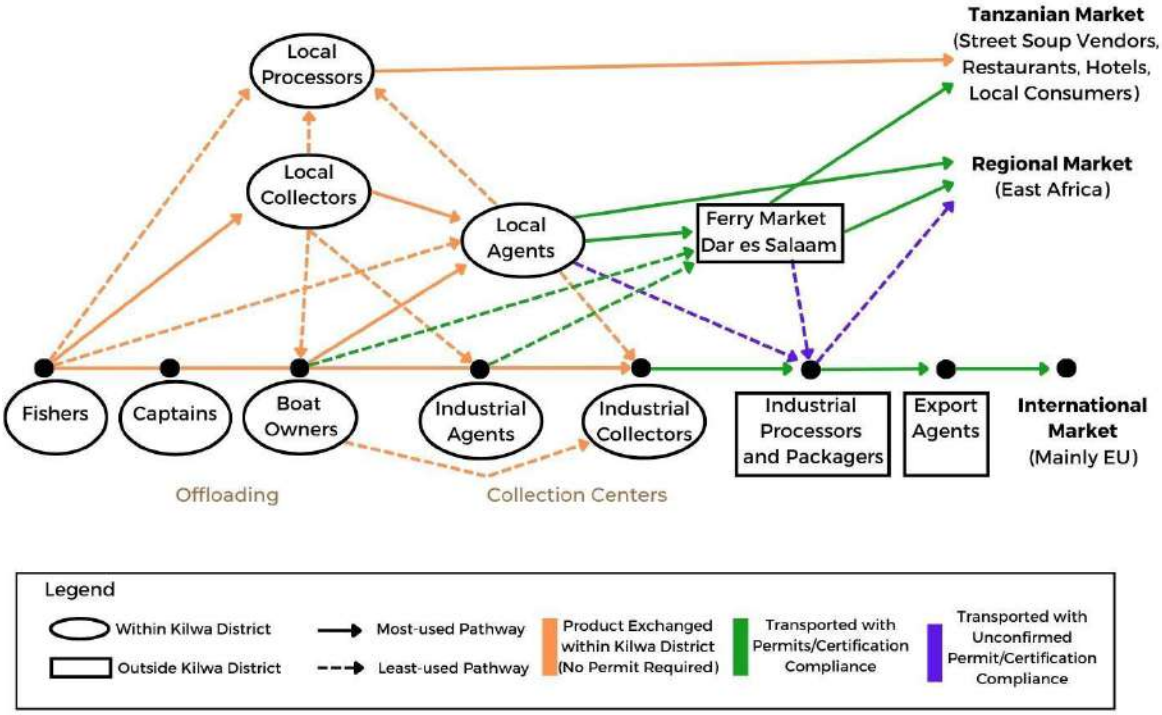
Figure 4. Electronic Traceability Stakeholders in Kilwa District's Octopus Fisher



Kilwa District's Octopus Supply Chain

The Kilwa District octopus supply chain diagram (**Figure 5**) was developed and validated by supply chain stakeholders at the co-design event. The diagram depicts the movement of octopus from Kilwa District fishers to end buyers, the supply chain actors, locations of permits and certificates, and the location of the different supply chain nodes.

Figure 5. Diagram of the Kilwa District Octopus Supply Chain



The typical pathway starts with the fishers who catch octopus from the reefs, using a relatively small vessel under the guidance of a captain. The vessels in Songo Songo leave around six in the morning, and fishing stops before high tide. The boat captain weighs the octopus that each fisher has caught on a scale and records the fisher's name, the number of octopus, and the total weight on a piece of paper. Upon landing, the captain hands the catch and this list to the boat owner. The boat owner uses the figures recorded on the list to pay each fisher and sells the iced catch either to industrial or local agents.

When fishing opens after a reef closure and the collecting plant receives enough octopus from Songo Songo Island, the boat owner may decide to take and sell the catch directly to the collecting plant (i.e., TANPESCA Ltd.) or make arrangements to ship the catch to the Dar es Salaam Ferry Market, around 300 km north of Kilwa District. The catch from the local agent that is not sent to the collecting plant is either shipped to the Ferry Market in Dar es Salaam or,

in some cases, to regional markets in Rwanda and Uganda. At the Ferry Market, the catch is sold to hotels, local street soup vendors, or straight to household consumers.

The octopus reaching the collecting plant is reinspected for quality and food safety, such as acceptable weight (500g and above), color, and smell, before being repackaged with ice and shipped to the processing plant located in Dar es Salaam. The processor reinspects the catch so only high-quality octopus are processed, packed, and shipped, mostly to the international market, mainly the European Union.

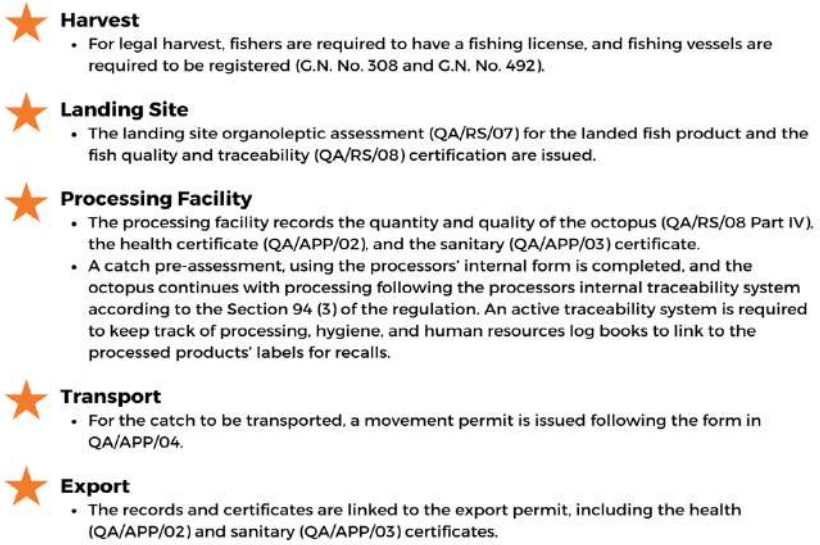
At sites with less productive reefs that do not require a vessel to catch the octopus, collectors buy octopus from individual fishers. When the collectors have enough, they sell to local agents where it is then processed (i.e., tenderized) and consumed locally (e.g., street vendors, hotels, households, etc.).

Laws & Regulations

Along the octopus supply chain, there is information required or used to ensure quality products are delivered to the end consumers and markets. For example, at the landing sites, containers, ice, and vehicles are used to transport the octopus to the processing plant and to local consumers. When processing for export, there are a number of programs, human resources, and pieces of equipment in place to ensure good-quality octopus gets exported to international markets.

Inspections occur throughout the supply chain and certificates are issued. The landing site, processing facilities, transportation, and export all require inspections and certificates. The box below (**Figure 6**) lays out permits for each stop in the process:

Figure 6. Current Permits and Certificates Issued Along the Supply Chain

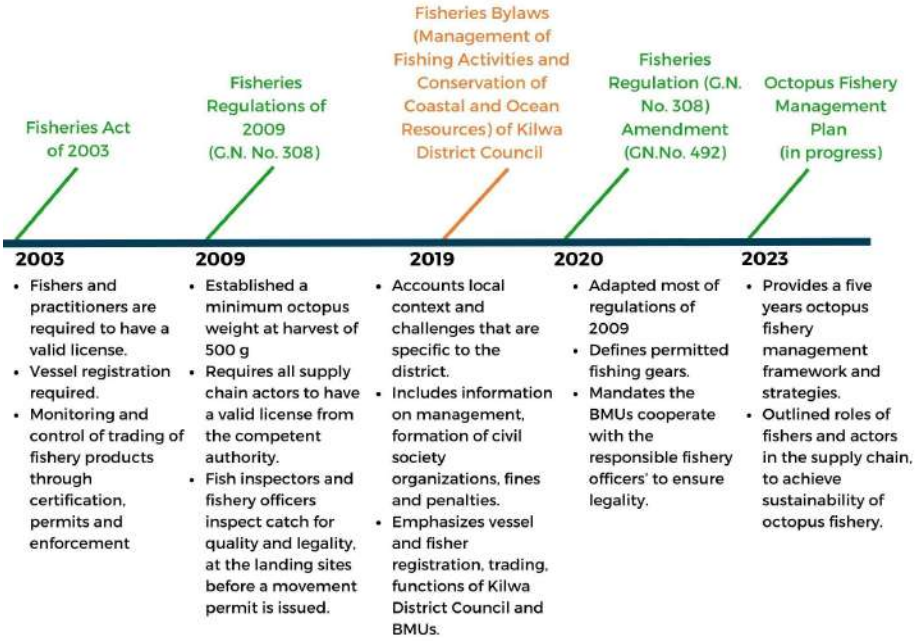


The Fisheries Regulations, 2009, provide the legal basis for labeling, packaging, and tracing of seafood (Article. 94) (URT, 2009). They direct that the management entities of fish and aquaculture establishments shall—for the purpose of traceability from upstream to market—recall and retrieve the fish and fishery products, and develop a traceability program, including a list of required data. The law requires record-keeping and verification programs for the purpose of traceability from upstream fish landing stations, processing establishments, and aquaculture establishments to the export exit points.

Fishers and those described in the supply chain comply with the law by making sure they have a valid license to stay in compliance (G.N. No. 308 and G.N. No. 492). The regulations extend to fishing vessels, because all vessels are required by law to be registered with the local government. The regulations also describe permitted fishing gear and mandate that BMUs cooperate with the responsible fishery office to ensure the legality of the catch and the overall sustainability of fishery resources.

The law requires fish inspectors, in coordination with the fishery officer, to inspect the catch for quality and legality at the landing site before a movement permit is issued. Specific vehicle, transport, packing, hygiene, processing, storage, organoleptic, parasitological, chemical, and microbiological criteria are stated in these regulations (**Figure 7**).

Figure 7. Laws and Regulations Relevant to Kilwa District Octopus Fishery



Name of the relevant national laws are in green while local law is orange. Brief description and respective year of the law is below the horizontal line.

To ensure compliance, government authorities conduct regular checks and inspections of establishments, equipment, vessels, vehicles, and landing stations. They ensure compliance with the standards and traceability requirements provided in the law and the fisheries regulations. Any establishment or person who violates these regulations is subject to suspensions and/or penalties.

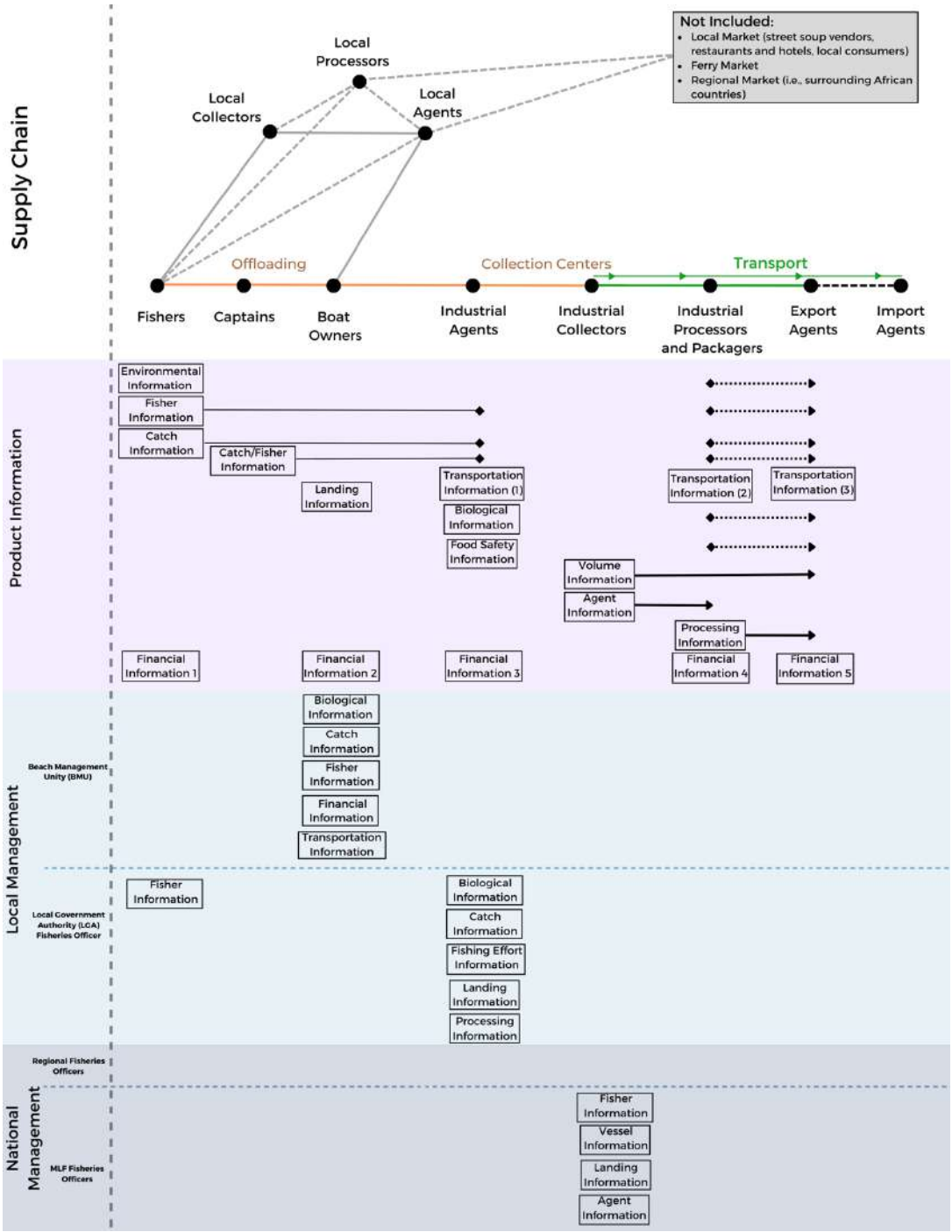
The fisheries policy recognizes that fisheries resource management is hampered due to limited human capacity, funding, technology, and information, as well as insufficient involvement of the community in fisheries resources management. There is also an overdependence on fisheries resources. The policy has outlined statements on priority areas for addressing the gaps. It includes an urgent need for designing and implementing a mechanism for gathering information on fisheries resources management and the establishment of monitoring, control, and surveillance programs. Objectives include ensuring effective management and sustainability of fisheries resources and the aquatic environment, and promoting the utilization, processing, and marketing of fishery products. It includes value addition and eco-labelling of fish and fishery products for domestic and international markets.

Kilwa District's Current Traceability Program

Tanzania's national traceability program for fish and fishery products is paper-based, with few digital interventions. In Kilwa District, both paper and electronic programs are used for fishery data collection. The BMUs record data 10 days per month on paper, then enter that data into an electronic program called the eCAS. Processors have their own data collection program for trading purposes, using electronic (Excel files) and paper-based accounting in order to monitor the quality of exported octopus products. The current paper-based traceability program has reached success in meeting requirements and ensuring the protection of the health of consumers and markets.

Based on AFO's gap analysis and knowledge shared by the co-design participants, we know that there is already a lot of information being collected throughout Kilwa District's octopus supply chain. However, sharing information between steps in the value chain and between stakeholders is not happening effectively or efficiently. Critical pieces of information related to octopus origin (i.e., catch information) are known by fishers, but this information is not kept with the product and transferred with confidence (see **Figure 8**).

Figure 8. Information Collection and Flow



Different types of information currently collected (boxes) and shared (lines) for supply chain management are detailed in Product Information (purple) and fishery management by the Local and National Management (light and dark blue, respectively). Information that is shared through different supply chain nodes is noted with a line and arrow (⟶). When information stops, the line ends with a diamond (⟶). When the same type of information is created, but new data is generated, it is denoted with numbers (e.g., Financial Information (1) versus Financial Information (2). Information that management entities have access to are noted in their respective rows. There are current information gaps (e.g., Regional Fisheries Officers) that still need to be validated.

Fishers, boat owners, agents, processors, and exporters have information on their purchases and sales, but it is assumed to be in different formats and amounts as the product moves, and it is not necessarily shared among supply chain parties. Financial information (i.e., price) is assumed to be paired with volume data, relative to the transaction of the seafood product. Pairing this information helps to assess the value of the product as it moves through the supply chain.

The dotted lines in **Figure 8** shows that not all product information is shared seamlessly along the supply chain and there are gaps that could lead to inaccurate data collection. This finding aligns with the current traceability barriers and challenges participants identified during the co-design event: lack of quality data, timeliness of data sharing, and infrastructure to share information (**Table 1**). Assessing barriers and identifying and confirming information gaps (such as what information the regional fisheries officer currently has) can help the proposed eCDT program more seamlessly share product information as the octopus moves through the supply chain.

Table 1. Current Barriers & Challenges Expressed in Co-Design Event

Top 10 Perceived Barriers & Challenges

Barriers	Description
Infrastructure	Various infrastructure barriers exist: reliable network, available technology, fishing equipment (vessel and gear), information storage space, and program maintenance.
Time	Current traceability is time consuming and information is not accessible in a timely manner.
Awareness	There is a current lack of eCDT and sustainability awareness among octopus stakeholders. Education needs to build skills, understanding about sustainability, and address fears of new eCDT system.
Transparency	Traceability information is only accessible to a select few and participants lack access to market information for pricing decisions.
Information Loss	With the current traceability effort, it is easy to loose information because of inefficient information sharing and printed information fading on the paper.
IUU Activities	Participants expressed that illegal fishing, sales fraud, unreported catch and bycatch undermine management and collection of accurate traceability information.
Cost	Participants expressed that there is cost associated with data collection and costs for different tools used for traceability.
Market	Barrier to an economically viable fishery is the challenge of an uncertain market, impacted by climate change, shifts in demand, and population growth.
Data Quality	There is a lack of trust in the data between supply chain actors, verification practices in place, and quantifiable measures to assess the quality of product.
Privacy	Documents do not feel secure and there is a fear that data is not confidential and information systems can be hacked.

During the co-design event, stakeholder groups (**Annex II**) shared what information they collect as well as what information they want for the future. Six of the seven stakeholder groups in the co-design event noted the need for accessing real-time information. Some groups highlighted their desire for technology to help with data collection and sharing.

III. The Future of Traceability: Comprehensive eCDT Program

The introduction of eCDT will make the traceability efforts in Kilwa District more efficient and effective by capitalizing on modern information technology. The ability to track data may unlock new markets and solidify existing ones. The increasing demand for octopus in local and international markets presents an opportunity to generate income among those in the value chain. However, increasing demand generally stimulates increased pressure on fishery resources through overcapacity, overfishing, illegal and unreported fishing, and environmental degradation. These problems, coupled with an open-access regime, are harmful to the sustainability of resources and livelihoods. When used appropriately, eCDT is a tool that will enable Tanzania to respond to the urgent need for effective management and be an efficient way to collect and track fisheries and product information.

Vision for Kilwa District

At the co-design event, supply chain actors and stakeholders imagined the ideal future state of the Kilwa District octopus fishery. Ten years from now, they imagined a fishery with increased income for the community, improved market access, and increased employment. This was followed closely by improved fisheries management, including sustainable growth and safety for fishers. To support their vision, they imagined reef closures in place, affordable loans for fishers, and education to support fishers and the community.

The ideal vision for the Kilwa District octopus fishery also included advancement in fishery tools, harvest techniques, and improved infrastructure, including funding for safety equipment and availability of value-add processes for octopus and their byproducts. Supply chain actors and stakeholders advocated for conservation of the octopus fishery and prioritized sustainability through fishing laws and regulations. A monitoring program, with data needs and transparency established by users to support the community's future goals and fisher safety, was also desired.

Within the eCDT program, supply chain actors expected data transparency from the program. The community would like to see an eCDT program supported by amended policies and adopted strategies, such as the strategy presented in this paper. Training in the community was perceived as pivotal to sustaining progress toward the ideal future state. Co-design participants recommended a range of training topics including ecology, fishing, marketing, protection of marine resources, and electronic traceability.

The Role of eCDT in Achieving Kilwa District's Vision

The enabling environment for an eCDT program in the Kilwa District octopus fishery is composed of individuals from the district and beyond; local, regional, and international markets; and governance institutions including decision-making and supporting policies and regulations. The successful design of the program will depend on developing a deep understanding of the motivations, obligations, and limitations of this enabling environment, and that work has already been started.

An eCDT system is simply a collection of technologies and information systems that capture and share data (**Annex I**). So the direct benefits of an eCDT program are limited to improved data quality, access, and greater timeliness or efficiency in the movement of data. These systems cannot generate most benefits without the support of an enabling environment that ensures the data is collected, accessible, and used by the stakeholders with authority to verify and analyze the information, use it to inform management decisions, and establish and enforce policies to redistribute benefits.

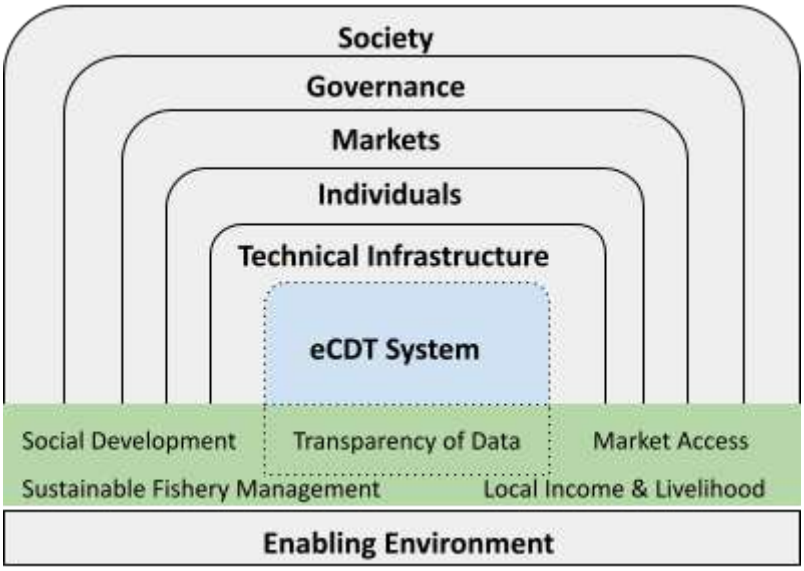
Co-design participants shared five desired outcomes they would like to see from an eCDT program in Kilwa District:

1. **Improved Income and Livelihoods**
2. **Market Access and Growth**
3. **Sustainable Fishery Management:** increase the number of octopus and access premium markets with an ecolabel.
4. **Social Development:** provide education in the fishing community and improve health outcomes.
5. **Transparency of Data:** see information from different supply chain nodes with national electronic traceability program in place, and use this data for decision-making.

Of these desired outcomes, fishers and agents valued improved income and livelihoods and market access outcomes most highly. Government participants at the co-design event skewed most heavily toward sustainable fisheries management. The other stakeholder groups, including BMU/community members and people from industry and NGO/tech/academia, were more balanced across all five outcomes (see **Annex III**).

Of the five desired benefits shown in the green box in **Figure 9,** Transparency of Data is the only outcome that can be directly supplied by the eCDT system. Three of the other desired outcomes (i.e., Improved Income and Livelihoods, Sustainable Fisheries Management, and Social Development) could result if the implementers of the eCDT program within the Tanzanian government leverage the information flowing within the eCDT system to inform changes to policy. Ultimately, realizing the desired benefit of Market Access will depend on the market utility of the data flowing within the eCDT system, the supporting actions taken by government and others in the supply chain, and the demand for traceable octopus products.

Figure 9. The Enabling Environment in Achieving Kilwa District's Vision



The eCDT system (i.e., traceability technologies) is at the center in blue. The desired benefits from the eCDT program are in green. The enabling environment (gray) are the factors outside of the eCDT technology that are required to achieve the benefits desired by the co-design participants, such as: the presence of a technical infrastructure (cellular network, electricity, etc.), individual motivation and training, market demand, conducive policy and governance, and supportive societal norms.

eCDT Program: Data Needs, Access, and Ownership

With quality data collection and appropriate data sharing, stakeholders can make informed decisions. However, a traceability program is only as good as the data it collects. If information is not accurate, up to date, or comprehensive it is not going to yield useful management decisions. For this reason, establishing avenues for verification (i.e., tracebacks and audits), monitoring, and oversight of the eCDT program will improve data quality. The recommendations provided for traceability information need to be reviewed by stakeholders and it is essential that data security and data access protocols are designed and discussed before implementation.

The seven co-design stakeholder groups provided information about what they currently collect as well as what they want for the future traceability program. To supplement this data collection, AFO conducted an analysis of the information documented at different parts of the supply chain. Based on the findings from the co-design event, information documented at different parts of the supply chain, and best practice provided from FishWise, recommendations for the type of information that should be collected in a traceability program, and by whom, is outlined in **Table 2** on the next page.

Table 2. Traceability Information Recommended for eCDT Program

Traceability Information	Fishers	Boat Captains	Boat Owners	Local/ Industrial Agents	Transporters	Industrial Processing & Packaging	Export Agent	Beach Management Unit	Local Government Authority	Ministry of Livestock and Fisheries
Fisher Information										
Fisher License	✓	✓	✓	✓*	✓*	✓*		✓	✓	✓
Biological Information *(e.g., sex)*								✓	✓	✓
Environmental Information *(e.g., weather data, in-situ data)*								✓	✓*	✓*
Seasonal Information *(i.e., open vs. closed)*	✓	✓	✓	✓				✓	✓	✓
Catch Information										
Date	✓	✓	✓	✓	✓	✓		✓	✓	✓
Time fishing *(beginning & end)*	✓	✓						✓		✓*
Quantity (number of octopus)	✓	✓	✓	✓				✓		✓
Harvest Volume (per fisher)	✓	✓						✓	✓	✓*
Vessel Harvest Volume	✓	✓	✓	✓				✓		✓
Size (e.g., length)	✓	✓						✓	✓	✓*
Fishing Gear (e.g., spear, pot)	✓				✓	✓	✓	✓	✓	✓
Harvest Method (e.g., vessel, foot)	✓							✓		✓
Catch Area(s)	✓	✓		✓	✓	✓	✓	✓	✓	✓
Species	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vessel Information										
Vessel Name		✓	✓						✓	✓
Unique Vessel Identifiers (UVI)		✓	✓	✓*	✓*	✓*	✓	✓	✓	✓
Vessel License		✓	✓						✓	✓
Effort Information										
Fleet Size								✓		✓
Count of Active Fishers		✓	✓	✓				✓		✓*
Captain Information										
Captain License		✓	✓	✓				✓		✓
Worker Safety Information *(e.g., injuries and/or deaths)*		✓	✓					✓		✓
Agent Information										
Agent License				✓	✓*	✓				✓
Landing Information										
Landing Location					✓	✓	✓			✓
Transportation Information										
Total Weight Transported					✓	✓	✓			✓
Source ID and Destination ID					✓	✓				✓
Transporter License					✓	✓				
Tag/Container ID					✓	✓	✓			✓
Transportation Date					✓	✓				✓
Proof of Delivery					✓	✓				✓
Transportation Method					✓	✓				✓
Vehicle ID					✓	✓				
Traceability Code Identifier				✓	✓	✓	✓	✓	✓	✓
Food Safety Information *(e.g., temperature)*					✓	✓	✓			✓
Inspector ID					✓		✓			✓
Processing Information										
Product Format				✓		✓	✓			✓
Mass Balance						✓	✓			✓
Processing Date and Time						✓	✓			✓
Processing Location						✓	✓			✓*
Processing ID and Certifications *(e.g., food safety)*						✓	✓			✓*
Financial Information										
Price paid to Fisher (1)	✓	✓	✓							✓
Price paid to Boat Owners (2)				✓						✓
Price paid to Agent (3)				✓		✓				✓
Price paid to Processor (4)						✓	✓			✓
Price paid to Export Agent (5)							✓			✓
Current Tax Rate	✓		✓	✓		✓		✓		✓
Current Market Price	✓	✓	✓	✓		✓		✓		✓
Transaction Date				✓		✓				✓
Volume Purchased				✓		✓				✓
Transportation Fee						✓				
Value *(volume x price)*					✓	✓				✓

Information recommendations (check marks) identified with an asterisk (*) should be collected when applicable. For example, industrial agents, transporters, processors, and exporters should have access to information about the harvest identity. If the octopus was harvested from shore (foot fishers), those procuring the octopus would require a fishing license. However, if the octopus was harvested from a vessel, the unique vessel identifier (UVI) and fishing license would be required. Asterisks noted within the management entities (BMU, LGA, and MLF) identify data that is collected periodically as designed and agreed upon for data-informed decision-making and stock management.

There are four key comprehensive traceability **characteristics** presented in the Principles that are important to keep in mind when designing and implementing data collection for an eCDT program:

Data Verification: It is best practice to have at least three sources of overlapping information to enable cross-checks of product or company-level information. Having multiple sources of information can help ensure it will be captured correctly. Triangulation of data helps assess legitimacy of the information and prevent fraud. This explains the redundant information collected and shared in **Table 2**.

- Identify and prioritize verifiable data that can help mitigate high risks (e.g., IUU fishing[6]). For example, not every piece of information needs to be verifiable (e.g., gender).
- There are different ways to verify data, so it can be helpful to have a mixture of methods (e.g., automated systems, audit, and spot checks). Those in charge must establish roles and frequency of verification and be transparent with stakeholders about those expectations.
- BMUs are crucial for data collection and sharing between the supply chain actors and management entities. For fishing villages that do not have active BMU representatives, there will be minimal confidence and difficulty in verification of certain traceability information: biological and environmental information, time fishing, quantity, vessel harvest, worker safety.

Transparency: Transparency can be thought of as a continuum of information accessibility from full, public data sharing (highly transparent) to limited, permission-based sharing with specific users (less transparent). Some information is not sensitive, so it can be shared freely. It is essential that the traceability program clearly defines who has access to each kind of data and for what purpose, with special considerations around sensitive information and worker privacy.

- As a best practice, managing bodies (i.e., BMU, LGA, MLF) should seek to be as transparent as possible with information needed for decision-making along the value chain.

[6] Illegal, unreported, and unregulated (IUU) fishing activities undermine the work towards comprehensive benefits and goals identified by the co-design participants. Illegal activities have negative implications for ecological sustainability, stock management efforts, worker safety, and the economic value of legal products.

    - Transactional price information can sometimes be considered sensitive, but cumulative data about price trends (i.e., market price and tax rates) is critical for the functioning of open markets.
    - Transparent authorized vessel lists and/or authorized fisher rosters allow agents and other buyers to ensure they are purchasing from legally registered vessels and fishers and minimize the risk of illegal harvest entering the market.
    - In co-design, fishers expressed their desire to have environmental information—specifically weather forecasts—which could help them make informed decisions about safety at sea and timing of the tides.
- With appropriate capacity, BMUs are well positioned to share information directly with the fishing community. Sharing information such as environmental information (e.g., weather and ocean conditions) and reported injuries to and deaths of fishers can inform safe working conditions.

Standardization & Interoperability: Having clearly defined data protocols helps to ensure information is valid and collected correctly (e.g., a fisher permit should have a certain # of digits; if it's entered with fewer it's invalid). It is a best practice to have an agreed-upon format for data collection and data-sharing protocol. Standardization improves interoperability, or the ability for data systems to share information, by encouraging data to be read automatically and consistently throughout the supply chain. Data sharing, as defined by the *Traceability Glossary,* is most efficient when information is collected using standardized semantics, in a standardized format, using standard exchange protocols.[7]

- Food safety information is sometimes described as data collected in the supply chain that could be qualitative and/or subject to human bias (color, smell, etc.). FishWise recommends ensuring that food safety data be standardized and quantifiable (e.g., temperature measurements) for any necessary tracebacks.
- Catch areas can be defined and annotated in different ways. For local management purposes, local reef names are useful. However, traceability data for export usually includes a more generalized ocean area, such as "FAO subarea." It is important that catch areas are standardized so that management entities and market actors can understand the information. Depending on the available technology, GPS coordinates

[7] Global Trace Protocol, *Traceability Glossary* (New York: ELEVATE Limited, April 2022), https://d2k3i21nvum9ap.cloudfront.net/wp-content/uploads/pdf/GTP+Glossary+v3.pdf

should be recorded as the catch area. This kind of data can be reported and used for both regional management and international market purposes.

Adaptability: Traceability programs should anticipate the need for future changes to allow for ongoing monitoring and improvement, with input by users.

- For instance, the product information export agents need to have on record may change based on import regulations in their target markets, so eCDT program data requirements may have to be adapted in response.

Based on the current and desired future state of seafood traceability in the Kilwa District octopus fishery, the traceability information presented above should be considered as recommendations and will need to be validated by the stakeholders as design and implementation of the eCDT program continues.

IV. Work Plan Priorities

The following work plan activities are intended to guide the next 12 months of the development of an eCDT program for the Kilwa District octopus fishery. The recommendations reflect all the data collected via research and co-design, and the expert guidance embodied in the Comprehensive Traceability Principles. Work plan priorities are organized with descriptive activities. Each activity identifies responsible parties, the time needed for the activity, and the associated Comprehensive Traceability Principle(s).

The three-phase eCDT Pathway process—initiate, design, and implement—has already begun, and a great deal of constituency-building for an eCDT program has taken place through various platforms. The eCDT program should continue its current momentum.

The Principles and Pathway website offers more resources if guidance is required.

Priority I: Establish a custodian of the eCDT program through a national eCDT task force.

The formation of a national eCDT task force will require expanding the current network of government institutions involved in the eCDT mapping and co-design process to include regulatory, workplace safety, and labor rights agencies.

Principle	Activities	Responsible	Time Frame
	Assess and identify Tanzanian national agencies that should be involved in regulatory and data program decision-making. This will help identify support for enforcement and political will. Assess exposures and risks if an agency identified as important to the implementation and eCDT management does not participate in the national task force.	MLF	1 month
	Consult regulatory authorities tasked with workplace safety and labor rights during the design and implementation phases of the eCDT program to (1) identify how worker welfare will be monitored and supported and (2) implement safeguards to mitigate negative impacts of data collection on worker rights and privacy. Interagency cooperation is critical, to create a comprehensive program able to address the challenges and reap the benefits identified during the co-design event.	MLF	1 month
	Establish a national task force, chaired by the selected government office, to drive the eCDT process and ensure all activities are accomplished. Initial tasks of the task force include: • Selecting task force members, striving for an inclusive base. • Developing a robust work plan and timeline based on this strategy. This includes selecting meeting frequency (e.g., biannually) to assess progress and implementation. • Developing a monitoring, evaluation, and learning (MEL) plan (examples in **Annex VI**), to establish key results and metrics to ensure adaptive management and success of the program.	MLF	3 months

Priority I: eCDT Program Tips

Management

Establishing and maintaining management measures and clear responsibilities for the implementation of an eCDT program is essential. Lack of authority and jurisdictional clarity can create confusion between agencies and hinder effective oversight. Lack of jurisdictional clarity can result from overlapping or shifting responsibilities, especially when new agencies are created that hold redundant responsibilities, distributing already limited resources across multiple agencies.[8] Solutions for interagency cooperation include: (1) setting clear objectives, authority, and accountability, (2) ensuring the ownership of the process, results, and outputs, and (3) instituting procedures for collaboration and information-sharing.

Adaptability

Traceability programs should be adaptable and anticipate the need for ongoing improvement, particularly by the entities providing oversight with input by users. As best practices for data collection and user needs change over time, the technology and procedures should be capable of meeting new requirements.

Scalability

During design and implementation, note differences between the pilot and other areas for future implementation. Outline desires, scope, and objective for scaling up. Assess objectives and resources for expansion: are the funds, staff, infrastructure, and resource commitments still present and appropriate for the scope? Once the scope of the program has been agreed on, communicate it clearly and often to stakeholders to facilitate effective implementation.

To support the sustainability of the program, the national task force should identify long-term champions, including the users of the eCDT technology. They can do this by formalizing collaboration and information-sharing mechanisms with the users and supporters implementing the technology.

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[8] SALT and Virgil Group Summary Report presents the challenges and importance of overcoming institutional barriers. See *Overplan Institutional Barriers to Implementing Digital Traceability* (September 2022), https://media.salttraceability.org/wp-content/uploads/2022/09/29084522/Summary-Virgil-Group-Report-FINAL.pdf

Priority II: Create an advisory committee for the eCDT program.

Establish an inclusive, multi-stakeholder working group to work on the practical implementation of the eCDT program based on the standing octopus fishery management plan.

Principle	Activities	Responsible	Time Frame
	Develop an advisory committee to the implementing agency, with representatives from all main stakeholders, to support the development and communication of the eCDT program.	National task force	3 months
	Identify the terms and expectations of the advisory committee (example in **Annex IV**).	National task force	3 months

Priority II: eCDT Program Tips

Stakeholder Inclusivity

Collaborate early and often with those who will use the traceability program and those affected by it. Identify advocates from key stakeholder groups to improve program uptake and oversight. Consultation with stakeholders will take time and effort, but it will result in longer-term success for the program. As the program continues to be designed and implemented, working groups or communities of practice around different components of the eCDT program should be formed (e.g., capacity building working group for fishers and agents; data collection/technology working group, etc.). Leverage the co-design planning committee; solicit recommendations for participating key parties (e.g., cold storage facilities). Consider non-fishery community representation to advise how implementation of the strategy may affect local communities, as well as how to involve and engage communities in the implementation process and establish a culture around traceability. Invite representatives from each stakeholder group, from fishers to traders to processors and exporters. Reference Priority IV in this work plan under "Audience Mapping" and the AFO stakeholder mapping report to ensure all stakeholders are reached in the octopus supply chain and broader enabling environment (e.g., network providers, fishery experts, community members, etc.). Additionally, the advisory committee should establish communication channels with neighboring countries to improve shared stock management and mitigate the risk of illegal cross-border octopus trade.

Define Roles & Responsibilities

Based on the mapping analysis, the central government, in collaboration with Kilwa District Council under the Local Government Authority (LGA), are the potential owners of the eCDT program. Relevant government agencies, together with non-state actors under public-private partnership arrangements, were identified as supporting the development and implementation of an eCDT program. Potential entity-specific roles and responsibilities for the eCDT program include:

Entity	Potential Roles & Responsibilities
National Agency - MLF	Policy and leadership
Kilwa District LGA	Practical implementation
TAFIRI	Technology
Civil society organizations (CSOs)	Constituency building
Fisheries Education and Training Agency (FETA)	Sustainable capacity-building
BMUs*	Practical implementation and constituency building
Fishers	Informing program design and implementation
Fish processing companies	Collaboration in providing information
Consumers	Providing information

*A special note about the importance of BMUs:

- As representatives of the fishers, BMUs interact with fishers and can gather feedback in a personalized way. They can also help analyze the feedback and identify areas for improvement. Additionally, they can use the feedback to inform development.
- The eCDT program would benefit from improved BMU capacity and strengthening their presence on smaller islands to make sure data is being collected and shared from each fishing village within Kilwa District. There are some small islands that, without BMUs collecting data, are grouped with larger wards and increase the risk of mislabeling within the supply chain.
- Cooperation between BMU and quality control officers would be beneficial for data standardization and monitoring. While BMUs currently monitor size and quality officers look at the quality of octopus, BMUs can receive training on quality data collection and help to encourage efficient data sharing.
- Implementation of this strategy requires including BMU representatives in Kilwa District villages that prioritize fisheries and understand the importance of traceability. Reviewing the national guidelines for BMUs to facilitate the appropriate representation of those with common interests (e.g., octopus fishery) will assist in the implementation and longevity of the eCDT program.

Priority III: Identify funding for the implementation of the traceability program.

The eCDT program should continue its current momentum, which requires secured funding for program implementation.

Principle	Activities	Responsible	Time Frame
	In the short term, identify internal funding and resources from the national government. The national task force should identify personnel to assist in implementing the strategy.	National task force	1 month
	Identify stakeholders and/or personnel dedicated to fundraising and finding necessary funds, from government or with philanthropic partners, to implement the program.	Advisory committee	6 months
	Identify plans for long-term sustainable funding of the program for maintenance and monitoring, expansion, MEL, etc.	National task force/ advisory committee	12 months

Priority III: eCDT Program Tips

Sustainability

The likelihood the eCDT program will be financially sustainable is improved when it is integrated into policy and there are consistent, national funds allocated to it. Identify potential challenges to the longevity of the program early on. Consider: is the budget for the program secure? Where is political support strongest and weakest? Are funds, staff, infrastructure, and resource commitments still present and appropriate for the scope?

Priority IV: Address critical gaps.

Throughout the development of this strategy, MLF, AFO, FishWise, technical advisors, and co-design participants have been referencing the Comprehensive Traceability Principles and Pathway to guide activities. There are remaining knowledge gaps and research needs that have been identified that should be addressed.

Principle	Activities	Responsible	Time Frame
	Learn from existing programs (e.g., other case studies and technology solutions) used in small-scale fisheries in other countries (TrazApp, ABALOBI, etc.).	Advisory committee	3 months
	Validate data needs and constraints along the full supply chain, consulting with more stakeholders, including Regional Fisheries Office, Fisheries Marketing and Quality Control, Tanzania Revenue Authority, Monitoring Control and Surveillance, Occupational Safety and Health Authority, and the Labour, Youth Employment and Persons with Disability offices (see **Figure 7** for template).	National task force	6 months
	Characterize the supply chain reaching Tanzanian markets (including ferry markets) and surrounding regional markets with more information.[9] A complete national octopus traceability program should encompass local, regional, and international markets.	Advisory committee	6 months
	Clarify and validate the type of information to be collected and shared in the eCDT program as well as the extent of the electronic data collection (i.e., fully electronic or mixed paper and electronic traceability).	Advisory committee	6 months
	Review international (e.g., World Trade Organization) and African regional trade agreements to avoid creating trade barriers.	National task force	6 months

[9] Regional markets mainly include octopus exported out of Tanzania to East and Central African countries like Kenya, Uganda, Rwanda, Mozambique, Malawi, Congo, etc.

	Conduct an economic impact assessment of the eCDT program to better understand the costs and benefits of different scenarios and minimize costs where possible.	Advisory committee	9 months
	Publish a registry of all licensed vessels approved for octopus harvest. See the Fisheries Transparency Initiative's standard as a resource when thinking about expectations for governmental transparency.[10]	National task force	12 months
	Revise the Fisheries Regulation, 2009, in order to provide for eCDT. Include eCDT in the Octopus Fishery Management Plan being revised now.	National task force	12 months

Priority IV: eCDT Program Tips

Stakeholder Inclusivity for Accuracy

Collaborate early and often with those who act in the supply chain. The more supply chain actors are encouraged and enabled to make meaningful contributions to the eCDT program, the more successfully the critical gaps will be addressed. Inclusion of program users, those affected by it, and advocates of both groups shall improve program uptake and oversight. As the program continues to be designed and implemented, working groups or communities of practice around different components of the eCDT program can provide technical guidance.

Maximize Comprehensive Benefits

Leverage the work up to this point and lessons learned from other efforts to implement an eCDT program that yields comprehensive benefits, including data for benefits like improved fisheries management (ecological), reduced risk of human rights and labor abuses in seafood supply chains (social), and efficiencies and compliance with seafood import requirements (economic).

[10] The Fisheries Transparency Initiative (website), https://www.fiti.global/

Priority V: Lay the groundwork for an electronic program.

The current traceability program is paper-based, which means that information can be hard to read once it reaches the next step in the supply chain and information can get lost between steps, making full supply chain traceability difficult. An electronic-based program will help to address this potential loss and help with near real-time data sharing. Addressing the infrastructure needed to implement an electronic program is critical for the successful implementation of eCDT program.

Principle	Activities	Responsible	Time Frame
	Identify and invest in infrastructure improvements needed during the first mile of the octopus' journey to efficiently run an electronic traceability program. Of key importance is the availability of cellular or satellite networks, a technology partner to design and implement an eCDT platform, and training for all implementers.	National task force	9 months
	Distribute an expression of interest or request for proposals (RFP) to identify technology partners (a sample RFP with criteria for technology partner selection may be useful).	National task force	6–9 months
	Select technology for a traceability program that aligns with comprehensive goals and objectives with stakeholder input. Identify the first implementers and include them in the review process. Formalize partnerships with those who will be the first implementers of the technology and implement a mechanism to receive feedback from them.	National task force + advisory committee	9–12 months
	Train all implementers, seeking their input. Plan for follow-up training throughout the eCDT program and beyond.	Advisory committee	12 months
	Develop a feedback mechanism with the technology vendor and set 2–3 official rounds of input for improving the technology and its application.	Advisory committee	12 months

Priority V: eCDT Program Tips

Human-Centered Design

When designing the eCDT program, it is best practice to use a "human-centered design" approach. This requires using technologies and designing interfaces in a way that is sensitive to the needs of users. For example, the literacy of users needs to be taken into consideration, and the data collection interface may need to leverage graphics. Pay special attention to certain types of numerical data (e.g., price) that may be difficult to collect for those with literacy barriers. Learn from existing systems that have proven to be effective (see first activity in Priority IV). To test the design, use prototypes with user feedback, which will improve functionality and long-term implementation. Advanced, user-friendly technology will help ensure the information needed is collected about each CTE.

Establish feedback mechanisms that are appropriate to reach users and sensitive to their needs. Feedback mechanisms can include surveys, interviews, and regular meetings. Surveys can be hosted on a website, mobile application, and/or distributed online with email or social media. Interviews can be conducted in person, both individually or in group settings. Monitoring social media activity can be a source of feedback through hashtags, comments, and use case stories to track user response to the program.

Electronic Data Collection

Best practice is to digitize early in the supply chain, with all pre-fishery activities (e.g., permitting and licensing) having a digital record. Seafood information to tracking a product throughout the supply chain is recorded, stored, shared, and accessed via electronic means as opposed to using a paper-based system (e.g., computerized databases, enterprise resource planning (ERP), barcodes, etc.).

Capacity Building

As the octopus eCDT program is designed and implemented, co-design participants noted the importance of continued stakeholder engagement and education. Especially as new technology and infrastructure are introduced into this fishery, it is critical that there is training for users (i.e., fishers, captains, agents, etc.) and established avenues for feedback. Co-design participants said that there will be some fear felt by some stakeholders, and it is critical that implementers address stakeholder fears about a new traceability program to move forward effectively. Capacity-building activities should include these practices:

- Practice design and implementation with all stakeholders.
- Address any fears and uncertainties about new policies and technologies through communication and education.
- Host training and workshops throughout the supply chain, including processors and fisheries officers.

Priority VI: Communication, awareness raising & capacity building.

Throughout the process, continue to keep stakeholders apprised of key decisions, progress, and status of the program. Be cognizant of the message and target audience. Different styles of communication are needed depending on the target audience.

Principle	Activities	Responsible	Time Frame
	Develop messaging for the eCDT program and harmonize messages across all stakeholders to ensure there is no conflicting messaging.	Advisory committee	1 month
	Host community events to share progress, reaffirm commitments from local stakeholders, address concerns and questions.	National task force	1–12 months
	Establish quarterly meetings to share milestones for the project.	National task force	Every 3 months
	Raise awareness about the eCDT program during the Sabasaba festival season, using a public booth at the MLF booth.	Advisory committee	1–12 months
	Campaign for traceability through two approaches: (1) hosting a segment on Radio Mashujaa where a fisheries officer and an AFO person talk about eCDT on Kuchele session and (2) holding a mwenye mji session that is highly listened to by women.	Advisory committee	1–12 months
	Share and vet MEL key indicators with users to ensure alignment on what success looks like.	Advisory committee	6 months

Priority 1V: eCDT Program Tips

Awareness Raising

In the AFO collaboration mapping analysis (**Annex V**), two aspects of adopting an electronic traceability program in the Kilwa District octopus fishery were considered: communication and stakeholder engagement. The level of awareness about electronic traceability was found to be satisfying among stakeholders such as MLF, TAFIRI, BMU, LGA, district fisheries officers, and traders or agents, indicating the need for increased awareness of electronic traceability programs, as well as of the Principles and Pathway. Fishers demonstrated the least awareness about the electronic traceability program as well as the least willingness to adopt the technology. Alphakrust, MLF, TAFIRI, and BMU are key players in electronic traceability engagement who should be prioritized for collaboration in this area. When designing outreach material and strategies to raise awareness, it is important to be sensitive to the needs of each stakeholder group.

Transparency

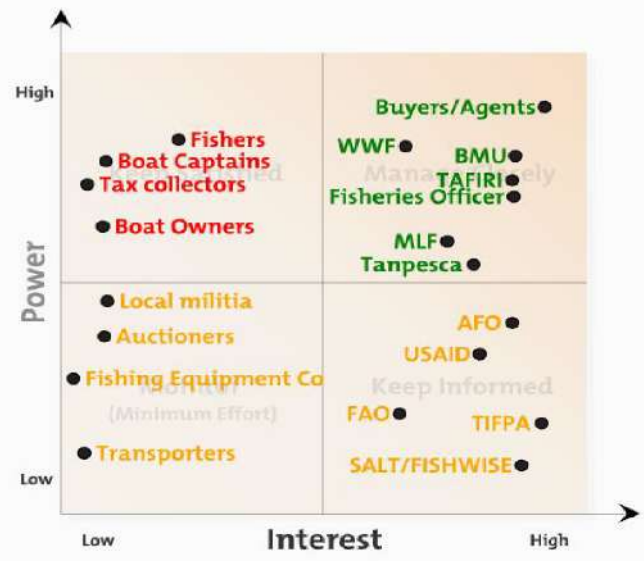
Implementation needs to be transparent. As progress continues and new information becomes available, implementers need to be communicating with stakeholders. A current perceived barrier to implementation is the lack of a clearly understood and validated octopus supply chain.

Audience Mapping

Of the stakeholders identified, BMUs, MLF, TAFIRI, fisheries officers, agents, WWF and Tanpesca are high-influence/high-interest players and need to be engaged closely in the design and implementation of an eCDT program.

The high-power but low-interest players in the matrix shown in **Figure 10**, including fishers, boat captains, tax collectors, and boat owners, should be kept satisfied throughout eCDT program implementation. Training and awareness campaigns may help to increase their interest in the program. The high-interest/low-power players include the NGOs AFO and FishWise, TIFPA, and funders such as USAID. The local military, auctioneers, fishing equipment companies, and transporters have low power and interest but should be kept informed of the eCDT design and implementation to ensure community buy-in.

Figure 10. Power vs. Interest Matrix for Kilwa Octopus Fishery Stakeholders



V. Tanzania eCDT Pathway

This strategy is grounded in the Comprehensive eCDT Principles and Pathway. The Pathway has three phases: initiate, design, and implement **(Figure 11**). **Table 3**, Tanzania's eCDT Pathway Application, provides a road map of what has been completed, what is in progress, and future steps for the eCDT program.

Figure 11. Pathway Phases for Seafood Traceability

A majority of the work done to inform the strategy (February 2022–March 2023) has been in the initiate phase, defining goals and objectives of the program and prioritizing inclusive and collaborative stakeholder engagement. As the eCDT program progresses, the national task force and advisory committee can use the Pathway shown in **Figure 11** to guide their implementation through the design and implementation phases. The Pathway is not meant to be a linear process, so strategy implementers will notice that even if a Pathway step is green (because this step has been incorporated fully to this point), there are still follow-up actions required to continue to realize the Principle.

Table 3. Tanzania's eCDT Pathway Application

Initiate: Research and Engage			
Principle	**Pathway Activity**	**Application of the Pathway Step to Date**[11]	**Future Steps**
Inclusive and collaborative	Define goals and scale of eCDT program	Goals of the eCDT program were discussed in the co-design event during activities about desired benefits and future state	Recommendation to validate the desired future state based on what is described in the strategy in the Vision for Kilwa section.
Data informed decision-making	Learn from existing programs	AFO Gap Analysis Strategy presents current traceability system in Tanzania Traceability information recommendations take into consideration current standards (e.g., GDST)	Learn from existing programs (e.g., other case studies and technology solutions) used in small-scale fisheries **in other countries** (TrazApp, ABALOBI, etc.).
Data informed decision-making	Conduct research, assessment, or gap analyses on the existing programs and enabling environment to identify supporting regulatory frameworks, enforcement, and political will	AFO Gap Analysis included assessment of current efforts in Kilwa octopus fishery by other NGOs (i.e., WWF, Blue Ventures) Octopus management plan is under development	Data information collection needs further validation with more stakeholders: fisheries marketing and quality control, Tanzania Revenue Authority, technology providers, human and labor rights agencies, etc. Assess and identify Tanzanian national agencies that need to be involved for regulatory and data program decision-making, which will complete analysis of the enabling eCDT environment to identify supporting enforcement and political will.

[11] **Darker colored** cells indicate Pathway activities that have been fully implemented to date. **Gray** cells indicate Pathway activities that have been incorporated partially and are in progress. **Light colored** cells indicate Pathway activities that have not been incorporated to date. To date, effort has focused on the Initiate Phase and beginning of Design Phase, which is why more light colored and gray cells are visible than in the Implement Phase.

Data informed decision-making	Characterize the supply chain	AFO Stakeholder Mapping exercise Validated supply chain from co-design event resulting in supply chain graphic in strategy		More information is needed to understand the supply chain reaching Tanzanian markets (including ferry markets) and surrounding regional markets. A complete national octopus traceability program should encompass local, regional, and international markets.
Data informed decision-making	Assess existing exposures and risks	Current challenges and weaknesses of the traceability system were discussed during the Strengths, Weaknesses, Opportunities, and Challenges (SWOC) activity at the co-design event		Note the risk of an agency opting out of being included in implementation and eCDT management. Assess data sources and their association with risks (i.e., IUU fishing, data privacy, leakages, labor abuses). Be aware of the difference between theory and actuality. Build a traceability program to fit actuality. Recognize and mitigate known issues.
Maximize comprehensive benefits	Gather economic data to prepare for cost-benefit analysis	Some octopus price data shared by the collectors at Kilwa and can be used		Conduct an economic impact assessment of eCDT implementation to better understand cost-benefit of different scenarios and minimize costs where possible. First, clarify and validate what information will be collected and shared in the eCDT program as well as the extent of the electronic data collection (i.e., fully electronic or mixed paper and electronic traceability).
Inclusive and collaborative	Be inclusive in identifying stakeholders	AFO Stakeholder Mapping exercise to identify key stakeholders (e.g., Power vs. Interest Matrix and Collaboration Mapping)		Continue to engage stakeholders and re-evaluate participation as necessary. Note when a stakeholder group is not as involved.

		Creation of multi-stakeholder co-design Planning Committee Co-design event hosted with different stakeholder groups from management, industry, community members, technology experts, and NGOs Special consideration to include women and youth in the project		Develop key messaging for the eCDT program and harmonize across stakeholders. Leverage different communication and outreach styles appropriate for different stakeholders (e.g., sabasaba festival, radio mashujaa, quarterly meetings).
Inclusive and collaborative	Communicate incentives/benefits to foster stakeholder participation	Personal and stakeholder group benefits were expressed at the co-design event AFO communication plan specific to different stakeholder groups		
Inclusive and collaborative	Consult stakeholders early, repeatedly and with sensitivity to their needs	AFO Stakeholder Mapping and key informant interviews for Gap Analysis AFO communication/outreach plan specific to different stakeholder groups		
Inclusive and collaborative	In consultation with stakeholders, clearly define objectives (ecological, social, and economic) of the comprehensive eCDT program	Aspirations for an eCDT program were discussed in the co-design event during activities about desired benefits and future state.		Establish a national task force with representation from a diverse group of agencies to ensure comprehensive programming. Establish a multi-stakeholder advisory committee to act as a committed working group for design and implementation of the program.

				Clearly define terms and expectations of both groups and clearly define comprehensive objectives of eCDT program.

Design: Infrastructure, Coordination, & Technology			
Principle	**Pathway Activity**	**Application of the Pathway Step to Date**	**Action**
Verification across fisheries supply chains	Map data needs and constraints along full supply chain	Verified supply chain during co-design presented in the strategy Collected description of participants' roles and their connections along the supply chain Stakeholder groups identified what information they collect now and what they want in the future to reap desired benefits	Current data information collection needs further validation with more stakeholders: fisheries marketing and quality control, Tanzania Revenue Authority, technology providers, human and labor rights agencies, etc.
Verification across fisheries supply chains	Design eCDT program with verification needs and challenges in mind	Challenges of current traceability were presented at the co-design event during the SWOC analysis activity	As traceability information is refined and updated, keep the table up to date to be able to identify matching information for cross checking (verification & validation). Discuss expectations of verification and barriers (e.g., data availability, personnel capacity). Identify who is responsible for verification activities.

Verification across fisheries supply chains	Ensure data security and data access protocols			Clearly define who has access to the data and for what purpose, with special considerations to worker privacy.
Lasting and scalable program	Identify potential pilot sites	Early conversations between SALT, MLF, and USAID identified Kilwa District as a pilot site due to the role of women and youth, and access to international markets AFO Gap Analysis characterized Kilwa District octopus fishery adding justification for this pilot site and use case for eCDT strategy		Identify first implementers at the pilot sites.
Maximize comprehensive benefits	Design eCDT program to fit within larger fisheries management program	Traceability has already been codified in the legal framework The Octopus Fishery Management Plan is being developed AFO Gap Analysis identified eCAS as a potential program that can be adapted and improved to meet the needs of eCDT Managing entities attended co-design event (MLF, LGA, TAFIRI)		Revise the Fisheries Regulation, 2009, and the Octopus Fishery Management Plan to include eCDT. Align data collection with stock assessment and/or integrate with existing fisheries management plans to ensure sustainable fishery management and promote biodiversity conservation.
Maximize comprehensive benefits	Identify how work welfare will be monitored and supported			In addition to MCS office, engage directly with Occupational Safety and Health Authority, and the Labour, Youth Employment and Persons with

				Disability offices during the design and invite them to the national task force. Identify indicators. Identify any other governing agencies with jurisdiction over data related to worker welfare and data security issues.
Maximize comprehensive benefits	Implement safeguards to mitigate negative impacts of data collection to worker rights and privacy			Consult existing data privacy laws, and identify processes, accountability mechanisms or new schemes for responding to privacy considerations and stakeholder/user concerns as needed.
Electronic, interoperable and data secure	Seek to minimize costs			Conduct an economic impact assessment of eCDT implementation to better understand cost-benefit of different scenarios and minimize costs where possible. First, clarify and validate what information will be collected and shared in the eCDT program as well as the extent of the electronic data collection (i.e., fully electronic or mixed paper and electronic traceability).
Electronic, interoperable and data secure	Avoid creating trade barriers	Supply chain mapping exercise to understand product flow and identify different markets Tanzania participates in regional coordination to aid in standardization.		Review international (e.g., World Trade Organization) and African regional trade agreements to avoid creating trade barriers. More information is needed to understand the supply chain reaching Tanzanian markets (including ferry markets) and surrounding regional markets.

				A complete national octopus traceability program should encompass local, regional, and international markets.
Inclusive and collaborative	Clarify roles, responsibilities and needs by stakeholder	During co-design, participants self-reported their roles as it relates to the octopus fishery Co-design participants made commitments demonstrating their perceived responsibilities to further eCDT design and implementation MOU between SALT and MLF (2021–2023)		Clearly define terms and expectations of national task force and advisory committee members. Formalize partnerships with the users and supporters who will be the first implementers of the technology and establish a mechanism to receive feedback from the first implementers.
Inclusive and collaborative	As needed, formulate agreements between agencies for the sharing of information and responsibilities			
Inclusive and collaborative	Ensure stakeholders from relevant supply chains formally agree to support the eCDT program			
Electronic, interoperable and data secure	Identify eCDT technologies to fulfill data collection and analysis needs	AFO Gap Analysis identified current data collection programs and noted the value of adapting eCAS		Distribute an expression of interest or request for proposals to identify technology partners
Electronic, interoperable and data secure	Develop eCDT programs and technologies with "human-centered design" approaches	Leverage co-design principles and methodology (SCALE +, Whole System in a Room)		Develop a feedback mechanism with the technology vendor and set 2–3 official rounds of input for improving the technology and its application. Identify the first implementers to test the prototype and provide feedback.

Electronic, interoperable and data secure	Prioritize interoperability with existing traceability programs and data	Traceability information recommendations in the strategy are informed by current standards (e.g., GDST)		As traceability information is further defined, use standardized data formats (i.e., key data elements). Consider alignment with industry data standards (e.g., GDST) and import data requirements of market states.
Lasting and scalable program	Encourage the adoption of these Principles into policy	Traceability has already been codified in the legal framework The Octopus Fishery Management Plan is being developed		Revise the Fisheries Regulation, 2009, and the Octopus Fishery Management Plan to include eCDT. Further revision to include reference to the Principles, or how they are applied with key policy practices (i.e., MEL).
Lasting and scalable program	Estimate funding needs and responsibilities to fund the program sustainably			Identify critical infrastructure (e.g., cellular/satellite network) and capacity (e.g., personnel, coordination, and monitoring) needs to efficiently run an electronic traceability program and associated costs.
Data informed decision-making	Plan to adaptively manage the eCDT program			Build in designated time periods for monitoring and adaptation. Design the program with a forward-thinking mindset by enabling possible use of modern and emerging technology in data analytics.

Implement: Training, Uptake, Scale & Adaptive Management				
Principle	**Pathway Activity**	**Application of the Pathway Step to Date**		**Action**
Build a lasting and scalable program	Pilot test the eCDT program			Formalize partnership with the users and supporters who will be the first implementers of

				the technology. Implement a mechanism to receive feedback from the first implementers.
Inclusive and collaborative	Provide user assistance, technical support, and capacity-building as needed			As new technology and infrastructure is introduced into the fishery, train users (i.e., fishers, captains, agents, etc.) and establish avenues for feedback. Address any fears and uncertainties about new policies and technologies through communication and education.
Maximize comprehensive benefits	Monitor and evaluate the efficacy of the eCDT program by analyzing data to determine if objectives (ecological, social, and economic) are being met			Develop a monitoring, evaluation, and learning (MEL) plan to establish key results and metrics to ensure adaptive management and overall success of the program.
Maximize comprehensive benefits	Document the costs of the eCDT program implementation and project costs of long-term operation			Identify stakeholders and/or personnel dedicated to fundraising and finding necessary funds (either from government or philanthropic sources) to implement the eCDT program. Identify and address critical infrastructure needs to efficiently run an electronic traceability program (e.g., cellular/satellite network). Conduct cost–benefit analysis and/or a return-on-investment (ROI) study using the collected baseline economic data.

Maximize comprehensive benefits	Assess the benefits, limitations, and challenges of the program in relation to equity and worker welfare	Completed a SWOC analysis of *current* traceability program		Analyze worker participation in the creation and implementation of the eCDT program. Track and resolve concerns raised by workers regarding the program's efficacy and privacy.
Maximize comprehensive benefits	Evaluate whether data is accessed timely and analyzed usefully for fisheries management			Ensure necessary agencies have clear data flows for more efficient fisheries management.
Data informed decision-making	Use monitoring and evaluation tools to assess eCDT program performance and identify opportunities for adaptive management			Develop MEL plan for the eCDT program. Confirm that the data verification plan and access protocols are maintained and supported.
Lasting and scalable program	Outline scope and objective for expansion			Use lessons learned from the Kilwa District octopus fishery eCDT program implementation process to inform scaling-up priorities.
Lasting and scalable program	Identify differences between the pilot and other areas for implementation			Assess objectives and resources for expansion: are the funds, staff, infrastructure, and resource commitments still present and appropriate for the scope?

Thank you to our partners for your dedication to the success of electronic seafood traceability in Tanzania.

Boats in Kilwa District (Credit: Aqua-Farms Organization)

SALT
SEAFOOD ALLIANCE FOR LEGALITY & TRACEABILITY

AQUA-FARMS ORGANIZATION
AFO
Development and Food Security Through Blue Economy

USAID FROM THE AMERICAN PEOPLE
WALTON FAMILY FOUNDATION
the David & Lucile Packard FOUNDATION
GORDON AND BETTY MOORE FOUNDATION
FISH WISE

The Kilwa District Octopus Fishery Comprehensive Electronic Catch Documentation and Traceability (eCDT) Strategy

Adobe Stock #342577634, Artist: EMMEFFCEE

Annexes

April 2023

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GORDON AND BETTY MOORE FOUNDATION

FISH WISE

eCDT Strategy Annexes

Annex I. Glossary

Co-design[1]**:** Co-design is a participatory process in which all critical stakeholders, from experts to end users, are encouraged to participate throughout the process of defining issues, designing outcomes, and developing and testing solutions.

Comprehensive: A comprehensive approach is when data captured from eCDT systems is used to support ecological, social, and economic objectives.

Critical Tracking Events (CTE) [2]: The specific and actual points, locations, or processes along a supply chain where data elements need to be captured. These events include receiving, processing, packing, shipping, or transporting.

Enabling Environment: Describes the social, political, technical, and environmental factors within which an eCDT program operates. The combination of these factors can facilitate or hamper the program's creation, performance, and/or sustainability.

End-to-End Traceability : Data is collected and shared along the entire supply chain from the point of harvest to the final end-buyer or consumer, also referred to as "full supply chain"

Fishery[3]**:** A unit determined by an authority or other entity that is engaged in raising and/or harvesting fish. Typically, the unit is defined in terms of some or all of the following: people involved, species or type of fish, area of water or seabed, method of fishing, class of boats, purpose of the activities.

Interoperable: Interoperability refers to the ability of different information technology systems or software programs to communicate seamlessly for the purpose of exchanging and using data

IUU Fishing[4]**:** Illegal, unreported, and unregulated fishing activities violate both national and international fishing regulations. IUU fishing is a global problem that threatens ocean ecosystems and sustainable fisheries. It also threatens our economic security and the natural resources that are critical to global food security, and it puts law-abiding fishermen and seafood producers at a disadvantage.

Key Data Element (KDE): Selected pieces of information that captures the who, what, where, and when of a product as it moves through the supply chain. KDEs can include items such as dates, specifics about the commodity or good, sustainability information, or information collected about labor conditions at worksites.

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[1] NCOSS. *Principles of Co-design.* 2017 2017https://www.ncoss.org.au/wp-content/uploads/2017/06/Codesign-principles.pdf

[2] GS1. "Global GS1 Global Traceability Standard." 2017, p. 16

[3] Marine Stewardship Council. *What is a fishery?* https://www.msc.org/en-au/what-we-are-doing/our-collective-impact/what-is-a-fishery#:~:text=A%20basic%20definition%20of%20a,species%20of%20fish%20 or%20 shellfish.

[4]FAO. Illegal, Unreported and Unregulated (IUU) fishing. https://www.fao.org/iuu-fishing/background/what-is-iuu-fishing/en/.

Mass Balance[5]**:** As assets move through the supply chain, an exact account is kept about volume and weight ratios at these different tiers or supply chain locations.

Monitoring, Evaluation, and Learning (MEL) [6]**:** A monitoring, evaluation, and learning system or framework is customized to address specific needs or goals. Monitoring, evaluating and learning should be conducted simultaneously to track progress, deliver evidence of achievements, and adaptively manage .

Stakeholder[5]**:** A person or group directly or indirectly affected by, or otherwise having an interest in, an organization's policies and/ or actions. The term stakeholder is widely used in government, business, and civil society organizations; it is not limited to social compliance. This definition includes individuals and communities that are affected by a business's operations and practices, such as intermediaries that are not part of the company's formal supply chain.

Supply Chain[5]**:** The chain or network comprising all organizations and individuals involved in producing, processing, trading, transporting and/or distributing a product or commodity from its point of origin to the company and/or to the final retailer.

Traceability[5]**:** The ability to identify and trace the history, distribution, location and application of products, parts, and materials, to ensure the reliability of sustainability claims, in the areas of human rights, labor (including health and safety), the environment and anti-corruption.

Traceability Program: All the elements (e.g., policies, technologies, trainings, processes) that are needed to effectively track products, reap comprehensive benefits, and make informed decisions.

Traceability System: A network of technologies (i.e., hardware and software) that (when implemented by the private sector) have the potential to improve operational efficiency and responsiveness of supply chains, identify sources of risk, and streamline reporting and compliance processes for participating companies.

Trade Barrier[7]**:** Government restraints (e.g., policies, tariffs, restrictions) that inhibit the flow of international trade by making it more difficult or expensive.

Transparency: A continuum of information accessibility from full, public data-sharing (highly transparent) to limited, permission-based sharing with specific users (less transparent). Accessible, accurate information about practices, processes, policies and other factors that may be used for compliance or risk management purposes. Both governments and supply chain actors have transparency expectations.

Verification[8]**:** The capacity to cross-check product, company-level, and/or supply/value chain information at any point using data supplied by stakeholders or vetted by third parties.

Youth: In Tanzania, youth are people 35 years of age and younger.

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[5] Global Trace Protocol, *Traceability Glossary* (ELEVATE Limited), April 2022
https://d2k3i21nvum9ap.cloudfront.net/wp-content/uploads/pdf/GTP+Glossary+v3.pdf

[6] USAID, *How to work with USAID: Monitoring, Evaluation, and Learning,*
https://www.usaid.gov/work-usaid/get-grant-or-contract/trainings-how-work-usaid/monitoring-evaluation-learning

[7] Definition of trade barrier from the *Cambridge Business English Dictionary (Cambridge University Press)*
https://dictionary.cambridge.org/dictionary/english/trade-barrier

[8] Future of Fish, FishWise, Global Food Traceability Center. *Seafood Traceability Glossary.*
https://futureoffish.org/sites/default/files/docs/resources/Seafood%20Traceability%20Glossary_download.pdf

Annex II: Stakeholder Information Collection

There were several activities during the co-design event in September 2022 that required stakeholder groups to sit together. Seven broad groups were designed that would allow similar stakeholders to work together that have similar lived experiences, motivations, and expectations.

Co-Design Stakeholder Group	Example of participants
1 NGO/Tech/Academia	NGO staff, researchers from academic institutions, TAFIRI, private technology providers (e.g., Airtel Sim Network), public technology providers (e.g., CAS, TCRA)
2 Industry	Staff from factory processing, packaging, collecting plants, and importers.
3 Agents	Tax collectors, industrial agents, local agents, local collectors, transporters, local end-buyers, regional market representatives, export agents
4 BMU/Community Members	BMU members, religious leaders, established community members
5 National Government	MCS officers, Quality Control and Inspectors officers, representatives from MLF (e.g., Fisheries Officer) and TRA
6 Local Government	Fisheries District Officers, Regional Fisheries Officers
7 Fishers	Boat owners, boat captains, fishers

Annex III: Desired Benefits by Stakeholder Group

Outcomes Desired by Stakeholder Groups - Supply Chain Actor Individual Reflection at the Co-design event September 2022

Outcome	Agents	BMU/Community Members	Fishers	Government	Industry	NGO/Tech/ Academia
Local Income & Livelihoods	2	6	8	13	3	4
Market Access	4	3	3	7	6	2
Social Development		4	2	9	1	3
Sustainable Fisheries Management		7	1	22	3	8
Transparency of Data		7	1	5	2	4

Annex IV. Example of Advisory Committee Terms of Reference

Advisory Committee
Terms of Reference
Date

BACKGROUND

Why is the Advisory Committee being formed?

COMMITTEE COMPOSITION & PURPOSE:

Composition

Advisory Committee includes strategic thinkers and implementers from government, industry, civil society, academia, fishers, donors and other sectors with various perspectives on issues related to seafood traceability, seafood legality, and fishery management.

Committee members can participate freely, as such participation will not be seen as an official endorsement …

Purpose

Members of the Committee are convened by _____ to provide advice and guidance, such as identifying and recruiting influential participants to contribute. The involvement of multiple stakeholders will increase the quality of solutions developed through the initiative and the likelihood that these solutions will ultimately be widely adopted.

Members are expected to engage industry, civil society, governments, and others to leverage their expertise, relationships, and resources in achieving the objectives. Committee meetings and other discussions may cover information that cannot be shared beyond the Committee. Committee members agree to maintain this confidentiality when requested to do so.

COMMUNICATIONS PROTOCOLS & PUBLICITY:

_____ will publicly acknowledge the Advisory Committee members by name, title, and organization, but note that their role is advisory in nature and does not equate to an endorsement. Committee members are free to express their own personal or organizational opinions at any time as long as they make it clear they are not speaking on behalf of _____.. Committee members may also opt to not be publicly acknowledged.

DECISION-MAKING AUTHORITY:

The Advisory Committee provides advice and guidance. The Advisory Committee is not a governing body.

TERM OF SERVICE:
The Advisory Committee members will commence participation upon the date of signing of these Terms and ending XXXX. Members may voluntarily leave the Committee at any time. _____ reserves the right to remove any member before his or her full term of service is completed.

EXPECTATIONS OF PARTICIPATION:
Advisory Committee members are expected to participate in meetings via phone or video conference during their service. While the Committee organizers understand that members may not be able to join every call due to scheduling conflicts, members should strive to participate as frequently as possible. In the event that a member is unable to join a meeting, proxies will not be allowed.

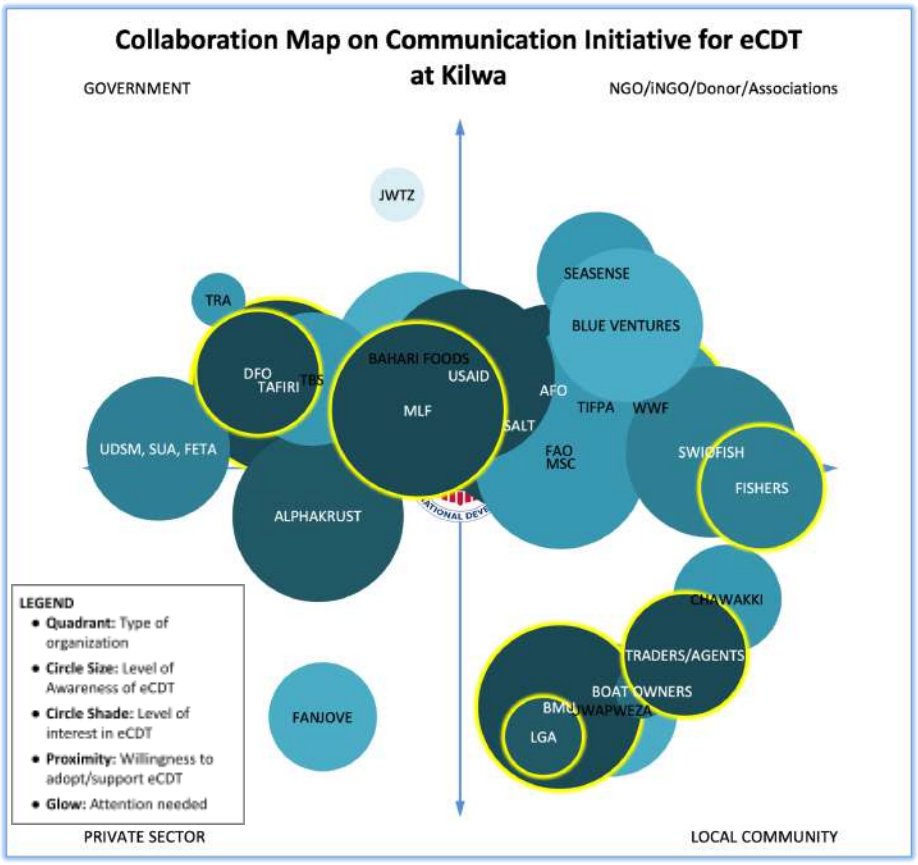
Members will also have the opportunity to attend in-person convenings (dates and locations TBD). During the term of service, they may also be asked to provide feedback within a reasonable amount of time on documents and other content.

EXPENSES:
Committee members will be responsible for their own expenses unless otherwise noted.

ACKNOWLEDGMENT:
By participating in the Advisory Committee, participants do thereby acknowledge and agree to abide by these Terms of Reference.

Annex V. Collaboration Mapping

The collaboration map below shows the highlights of collaboration in communicating and raising awareness of eCDT in Kilwa District and the country at large. Awareness of eCDT was high at institutions like FishWise, MLF, Alphakrust and BMU. The future eCDT work on awareness should therefore leverage on these actors as entry points for outreach to raise awareness of locals in the Kilwa District and partners. At the time of the mapping (May 2022), fishers were the least aware group of eCDT, but also had lowest interest and willingness to adopt. The main reason may be at that time the fishers were not aware of the benefits of the eCDT, and most of them have limited education and less involvement in use of technology. Therefore, the future eCDT should focus more on training fishers and local folks to ensure proper execution of the technology, to enhance transparency, and sustainability of octopus fishery.

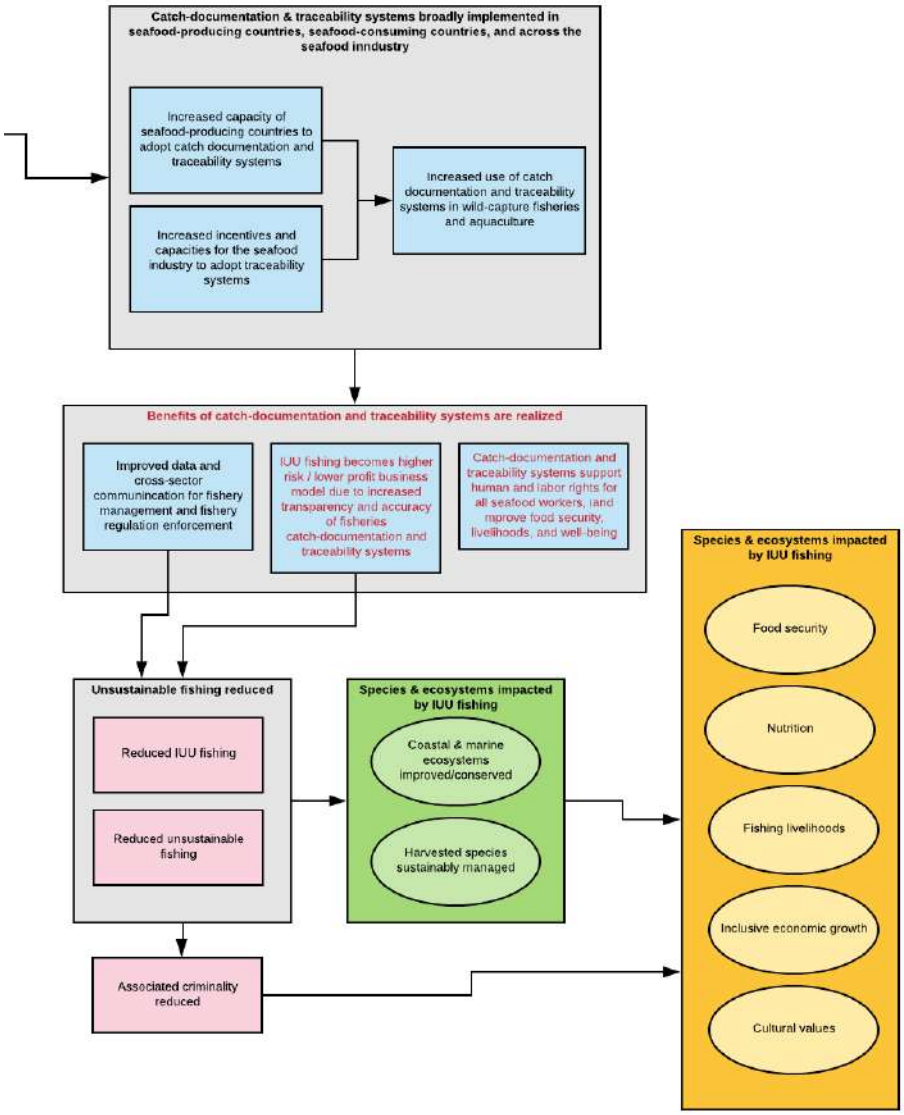


The size of the circle indicates the level of awareness of actors on eCDT. Larger circles represent a higher level of awareness. The darkness/shade indicates the extent of interest in eCDT. The darker the shade, the more interest in eCDT. Those closer to the center (proximity) are more willing to adopt eCDT. Yellow glowing around the circle identifies priority stakeholders for collaboration based on the strength of current interaction, resource-based influence, and non-resource-based influence. Therefore, a continuous engagement and attention should be given to those with yellow glow at all stages of eCDT implementation for success. It can be seen that MLF were most aware, had highest interest in eCDT, and were readily willing to adopt. On the other hand, the fishers were the least aware, lower interest on eCDT, and less willing to adopt.

Annex VI: Monitoring, Evaluation and Learning

Monitoring, evaluation, and learning (MEL) helps organizations clarify intentions, collect crucial data to assess effectiveness toward impact goals, and monitor levers for change. MEL provides tools to help groups evaluate and improve programs. At the core, MEL is a program or cycle with all three components, monitoring, evaluation, and learning, working in tandem from early design through implementation and completion. MEL encompasses adaptable frameworks with processes unique to programs to monitor and assess program achievements. When considering scaling a program, data from MEL programs will help improve upon processes and practices from the pilot site to ensure that the program is most effective.

A monitoring plan is framed around tracking the achievement of the key results identified in its results chain. For each key result, measurable outcomes are explicitly stated and indicators needed to track progress towards outcomes achievement are identified. Key results and their associated outcome statement(s), indicator(s), and indicator disaggregates are important. Here is an example of a results chain:



Example of results, outcomes, and indicators.

Key Result	Outcome	Indicator(s)
Key Result 5: Principles for developing comprehensive eCDT programs are created	Outcome 5. By September 2020, principles for best practices for comprehensive eCDT will have been produced	Principles on comprehensive eCDT developed

Implementers must measure and review indicators to effectively communicate program results, learn from program activities, and apply evidence-based adaptive management. Impact can be measured quantitatively and qualitatively.