

Advancing
Full Chain
Traceability
via the
Fishery
Development
Model





About Future Of Fish

Future of Fish is a systems-change non-profit that provides research, design, and strategy services to NGOs, foundations, investors, businesses, and governments working to build a world where fisheries and people thrive together. Our mission is to catalyze innovation, collaboration, and investment to end overfishing while improving economic opportunity and social equity for resource-dependent communities. www.futureoffish.org

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Purpose

This report describes how Future of Fish’s “Fishery Development Model” (FDM) facilitates the adoption of full chain traceability within seafood supply chains. Specifically, we discuss how the FDM can serve as both a framework and a process to help scale traceability within supply chains.

Background

Through research and engagement with fisheries and supply chains around the globe, Future of Fish has identified that robust information capture and sharing systems are critical to sustainable fisheries. Such data-rich fisheries and supply chains are necessary to support more effective fisheries management; the information captured in these systems can provide business intelligence in ways that encourage more responsible practices; and, finally, better data (in combination with better management) can also unlock investment potential, bringing more resources to support sustainable fisheries transformation.

Key to creation of accurate and reliable data-rich fisheries and supply chains is adoption of electronic, full-chain traceability. Unfortunately, the seafood industry lags behind many others when it comes to digitally generating, capturing, and sharing information across supply chain nodes. In order to help accelerate creation of trustworthy, traceable seafood supply chains,

Future of Fish has conducted research for several years to better understand the systemic barriers to and drivers of electronic traceability technology adoption and implementation. This research included a specific study focused on examining drivers of success and failure in existing full-chain traceability pilots (Table 1).

Through multiple interviews and workshops with diverse system stakeholders, including fishers, supply chain companies, technology vendors, and experts in supply chain optimization, environmental policy, and finance, we began to identify key incentives for and challenges associated with implementing robust, electronic, full-chain traceability in seafood supply chains.

Industry Player(s)	3rd Party	Technology Vendor
<ul style="list-style-type: none"> • Importer/Wholesaler • Domestic processor 	<ul style="list-style-type: none"> • Community NGO • Certification organization 	<ul style="list-style-type: none"> • Traceability vendor A
<ul style="list-style-type: none"> • Retailer • Wholesaler 	<ul style="list-style-type: none"> • Research organization 	<ul style="list-style-type: none"> • Traceability vendor A • Traceability vendor B
<ul style="list-style-type: none"> • Retailer • Wholesaler 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Traceability vendor C
<ul style="list-style-type: none"> • Processor 	<ul style="list-style-type: none"> • ENGO 	<ul style="list-style-type: none"> • Traceability vendor D
<ul style="list-style-type: none"> • Retailer 	<ul style="list-style-type: none"> • ENGO 	<ul style="list-style-type: none"> • Traceability vendor B
<ul style="list-style-type: none"> • Retailer 	<ul style="list-style-type: none"> • Certification organization 	<ul style="list-style-type: none"> • Traceability vendor E
<ul style="list-style-type: none"> • Wholesaler 	<ul style="list-style-type: none"> • Government agency • Corporate sponsor 	<ul style="list-style-type: none"> • Traceability vendor B
<ul style="list-style-type: none"> • Trade association 	<ul style="list-style-type: none"> • ENGO 	<ul style="list-style-type: none"> • Traceability vendor F • Traceability vendor G
<ul style="list-style-type: none"> • Wholesaler 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Custom-built

Table 1: List of case studies examined. We aimed for pilots with multi-node, interoperable systems among independent tech systems, but failed to find any that matched this criteria in full.

Findings from this research, along with our team’s in-depth knowledge of best practices (e.g. change management, stakeholder alignment, technical specifications, etc.) and experience implementing technology solutions in complex systems, helped inform creation of the Fishery Development Model (FDM)—an approach to transforming fisheries and seafood supply chains to more sustainable states, including through implementation of robust traceability.

Why is Full Chain Traceability Difficult?

Transformation in complex systems is always difficult. Traceability is about more than the implementation of a new technology—it demands changes in behaviors that impact day to day workflows and habits. And full chain traceability requires alignment amongst several organizations, common language and terms of communication, adaptation of core business processes, and a compelling business case to enable the flow of capital either internally or from external sources. From lack of awareness and expertise to infrastructural limitations, to issues with trust and accountability, the journey to full-chain traceability demands interventions at multiple levels to adequately support fishers and seafood supply chain companies.

Diverse Motivations

Organizations are typically in pursuit of different outcomes when it comes to traceability. During our case study research, we looked to identify why traceability was being pursued, and from where in the system the desire for traceability arose. We then created a “deployment topology”, which indicates the leading motivation, and the node in the supply chain from which the traceability program was initiated (“deal origin”).

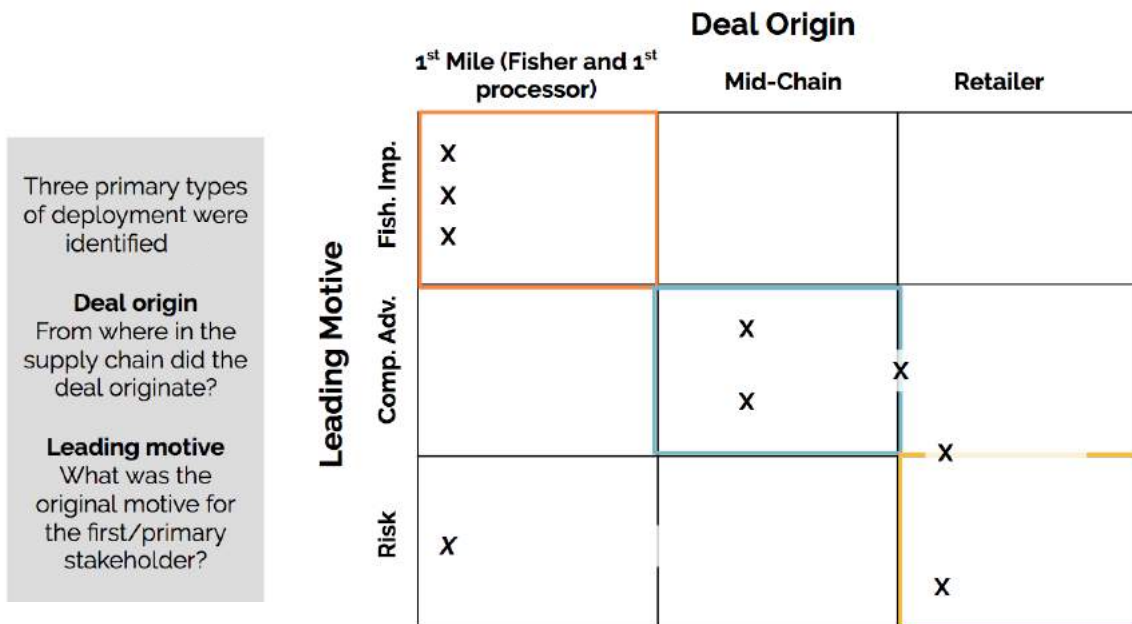


Figure 1: Traceability deployment topology. “X” denotes specific project and the supply chain position of the project lead, as well as the underlying motivation. Note: “Comp. Adv” = competitive advantage; “Fish. Imp.” = Fishery Improvement.

We identified three patterns from this analysis:

1. When traceability was initiated in the first mile, it tended to be for fishery improvement motivations (e.g. to inform better management)
2. When traceability was initiated from the middle of the supply chain, it tended to be for competitive advantage reasons (e.g. securing exclusive supply to a buyer, or setting a wholesaler apart from competitors)
3. When traceability was initiated from the retail end of the supply chain, it tended to be for the purpose of mitigating risk (e.g. more efficient recalls, reduced exposure to fraud and other reputational risks, etc.)

The key takeaway from this analysis is that organizations have different motivations for implementing traceability. Thus, a mid-chain organization may not be compelled by fishery improvements, and retailers may not be compelled by a competitive advantage argument. In order for traceability implementation to work, identification and then alignment of these motivations across the various supply chain actors, was often a critical step.

Pervasive Barriers

Just as the motivations driving traceability can differ among supply chain actors, so too, can the challenges. However, our research has shown that there are several common and pervasive barriers that prevent full chain traceability adoption:

- **Financing:** Seafood organizations often lack capital to purchase a traceability system, and larger organizations were not convinced of the ROI to release an appropriate budget. In addition, grant-based funding for traceability has declined in recent years, as the philanthropic community has become less interested or willing to pay for traceability implementations.
- **Interoperability:** Organizations tend to adopt the system that works best for their own internal needs; these systems typically have not been designed to communicate easily with other systems adopted by trading partners or companies further up or down the supply chain. This results in costly, complicated customizations to enable communication among systems. Beyond technical limitations of systems to communicate with each other, there is also an ongoing debate and overall lack of clarity as to which data elements need to be shared among stakeholders.
- **Alignment:** Per the deployment topology introduced above, many of the supply chains studied did not adequately tailor the value proposition of traceability to the stakeholders from whom buy-in was required. Thus, some stakeholders were eager to adopt while others resisted (or implemented traceability in a superficial way to meet minimum requirements from buyers).

A Holistic Approach

Barriers to traceability, along with the motivations for it, are many and complex; far more than just technological solutions are required to advance traceability within the seafood sector. Factors such as long-term financing, human behavior and culture, legacy systems and infrastructure, and even political context can all influence the speed and efficacy of traceability adoption. Future of Fish created the Fishery Development Model (FDM) to help fisheries and supply chains consider the full spectrum of needs and requirements that must be satisfied to make material progress on traceability implementation, and to identify key incentives that can help drive and align interests. Importantly, the FDM defines a structured methodology through which progress can be planned and built upon. The result is both a framework and a process that can be used to guide effective traceability adoption and implementation in seafood supply chains.

The FDM Framework

As a framework, the FDM consists of five interdependent streams that reinforce the conditions for successful traceability deployment (Table 2). These five streams help ensure all of the major components of the system are considered when designing a fishery transformation—taking a system lens increases the likelihood that efforts leverage existing resources to full effect and account for direct and indirect threats to successful traceability adoption.

Table 2: *The five streams of the FDM*

Stream	Purpose
Data & Technology	Considerations related to the information needs of the system. For example, what Key Data Elements (KDE's) are required by whom? What technical capabilities and infrastructure are required to support traceability?
Value Chain	Considerations related to the motivations of all stakeholders to adopt traceability. What will compel each actor to participate? What value will traceability generate, for example through efficiency or generation of a price premium?
Governance	Considerations related to management of the fishery. What are the goals for the fishery? What management outcomes will data, value creation, and financing support?
Deal Structuring	Considerations related to the flow of capital to fund traceability adoption. What are the mandates of funders and how does that align to outcomes of traceability? What types of legal and financial structures will satisfy funder/ investor requirements?
Livelihoods	Considerations related to additional resources that will be needed and made available to stakeholders that will see a reduction in catch or supply. How can changes in behavior that lead to reduced income be compensated and supported?

The FDM streams do not operate in isolation; in fact, there are strong interdependencies among the streams when it comes to supporting successful traceability deployment (Table 3). Recognizing and factoring these dependencies into cross-disciplinary planning and coordination is necessary for maximizing success. For example, an organization that is defining the data to be shared across the supply chain should take into consideration what data will be required to inform fishery governance, value creation, investor diligence, and livelihoods needs.

Table 3: Common interdependencies among streams in the service of effective traceability adoption.

	Data & Tech	Value Chain	Governance	Deal Structuring	Livelihoods
Impact of Data & Tech		<ul style="list-style-type: none"> Enables compliance for market access Enables ability to sell the story of the product, achieve certifications Provides insights and automation to achieve efficiency wins 	<ul style="list-style-type: none"> Enables informed management decisions (e.g. setting quota) Allows for better coordination of efforts (e.g. for enforcement) 	<ul style="list-style-type: none"> Enables due diligence (allow investors to assess the fishery for risk) Enables investment management 	<ul style="list-style-type: none"> Provides baseline to understand livelihoods needs
Impact of Value Chain	<ul style="list-style-type: none"> Aligns stakeholders to collaborate on deployment and interoperability of systems 		<ul style="list-style-type: none"> Incentivizes participation in management models (e.g. to perpetuate a price premium) 	<ul style="list-style-type: none"> Makes investment more attractive / less risky by generating new economic value in the fishery 	<ul style="list-style-type: none"> Value creation can ease burden on livelihoods impacts
Impact of Governance	<ul style="list-style-type: none"> Provides clarity on system configuration (e.g. for KDEs) and access needs 	<ul style="list-style-type: none"> Preserve stocks to allow continued access to value chain 		<ul style="list-style-type: none"> Provide confidence that government and others are invested in long-term stock preservation Creates the investment case 	<ul style="list-style-type: none"> Clarifies minimum and maximum expected incomes Impacts access to livelihood support Clarifies need for alternatives
Impact of Deal Structuring	<ul style="list-style-type: none"> Pays for broad adoption of technology 	<ul style="list-style-type: none"> Pays for administrative burden of setting up new value chain 	<ul style="list-style-type: none"> Eases upfront financial burden on governments Pays for some of the operating and administrative costs of management 		<ul style="list-style-type: none"> Funding for broader set of initiatives to create new economic opportunities (e.g. tourism)
Impact of Livelihoods	<ul style="list-style-type: none"> Informs additional KDE requirements 	<ul style="list-style-type: none"> Provides additional value creation opportunities outside of the supply chain 	<ul style="list-style-type: none"> Helps to gain buy-in for new governance models by incentivizing fishers 	<ul style="list-style-type: none"> Provides impact outcomes aligned to funder mandates 	

The FDM framework can be used to perform a comprehensive evaluation of system barriers to traceability implementation; as well as the resources or “assets” that can be leveraged to progress the fishery and supply chain to a more sustainable, traceable state. Upon initial engagement, Future of Fish evaluates the readiness or “maturity” of each stream to understand the capacity to adopt solutions such as traceability. Where maturity is high, the system shows an overall readiness in that stream. These can indicate areas to generate early support. Where maturity is low, risk should be noted and effort should be invested into raising the maturity to ensure greater likelihood of adoption.

Table 4: Example attributes assessed within each of the five streams of the FDM to determine overall “maturity” of each stream and the system as a whole.

FDM Stream	Example Considerations
Data & Technology	<ul style="list-style-type: none"> • What is the technical proficiency of the stakeholders? • Is there sufficient infrastructure (Internet, electricity, etc.) for digital technologies? • Are traceability stakeholders process-driven?
Value Chain	<ul style="list-style-type: none"> • Is the value chain aligned in its desire to adopt traceability? • Will traceability generate better value for each actor? Has this been credibly demonstrated to each actor?
Governance	<ul style="list-style-type: none"> • Are there policies that incentivize traceability (e.g. providing or restricting access to market)? • Are required data elements documented and socialized?
Deal Structuring	<ul style="list-style-type: none"> • Is there a structure through which traceability projects can be financed? • Can investors capture a return on investment by funding organizations without the working capital to self-fund traceability? • What types of funders are aligned to the outcomes of traceability implementation? What kind of staging of types of capital can be applied?
Livelihoods	<ul style="list-style-type: none"> • Will the adoption of traceability negatively impact fisher livelihoods (e.g. through reduced legal harvests)? • If so, what is being done to support fishers in securing alternative forms of livelihood?

Designing for Scale

In addition to a framework, the FDM offers a complementary process through which scalable solutions can be built, from pilot development through large scale deployment (Figure 2). Our case study research into full-chain traceability deployments revealed that, to date, there are almost no examples of successful, multi-node, electronic traceability in seafood supply chains. Vertically integrated supply chains, as well as several that all use a single cloud-based software to track select product within their inventory, are the exceptions.

In the absence of successful reference models for full-chain traceability adoption across multiple trading partners in a supply chain (especially those using different software systems), it is necessary to include pilot deployments and testing before scaling solutions. This approach is standard within the broader technology system implementation universe, allowing organizations to quickly learn what works and what does not, and iterate towards solutions that gain stakeholder buy-in and resolve the unique technical challenges of each implementation. This approach also allows for effective co-design of interventions, increasing buy-in and effective design by continually seeking feedback from the users of the systems. The FDM therefore embeds a rapid prototyping and iterative pilot development process within a focused approach to identify pathways to scale.

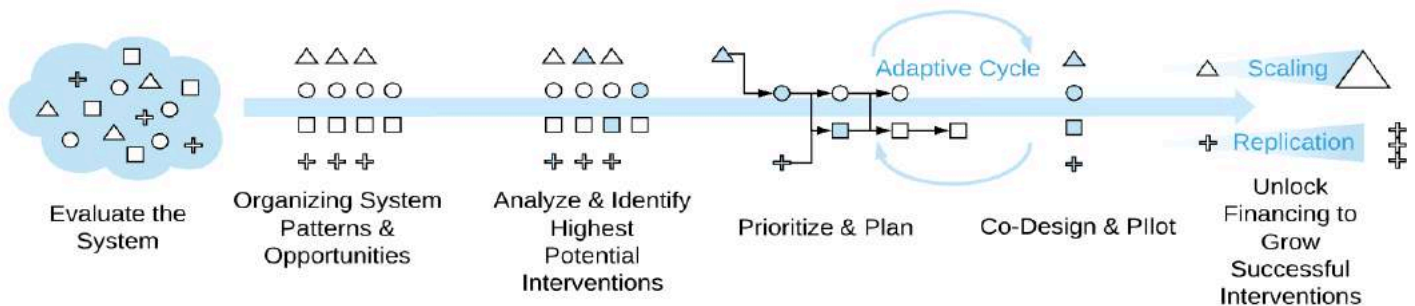


Figure 2: Fishery development process. Insights from a system-level evaluation inform development of multiple interventions, including projects that both directly and indirectly support traceability implementation. These interventions are trialed, refined, and then moved forward to scale.

System Evaluation

Fisheries and the associated supply chains are complex systems, with multiple forces at play that reinforce the status quo and perpetuate overfishing, IUU, and fraud. Like any complex system, there is no silver bullet or single solution to transforming fisheries; instead, multiple interventions are needed to progress the system to a more sustainable state. While full-chain traceability is key to unlocking transformation, fishery and supply chains are often not capable of immediately adopting traceability technology or processes. Other components of the system also must be shifted in order to achieve effective traceability implementation and create the feedback loops where better data can inform better fisheries management and lead to better business.

The FDM process deploys several types of analyses in order to effectively map and understand the varied drivers and dynamics of the system:

- Business analysis to determine the financial requirements and value proposition of traceability.
- Ethnographic research to understand the context into which traceability is being deployed and identify the human-centered design principles that will ensure successful deployment of traceability systems
- Value Chain analysis to map the relationships and understand the power dynamics, product flows, and data needs across multiple nodes of the supply chain.

The analyses help to identify major barriers to traceability, as well as where progress has been made and can be built upon. System evaluation can reveal champions around which traceability can be promoted, and design constraints which must be factored into a functional solution.

Organizing Patterns & Opportunities

Observations are distilled into the FDM streams, and opportunities to either leverage current progress or build capacity where maturity is lacking are identified. Importantly, dependencies among opportunities both within and across streams, are articulated.

Identify High Potential Interventions

Interventions are ranked and prioritized based on interdependence and impact.

Prioritize & Plan

A plan is created and socialized. Feedback from key stakeholders is collected and opportunity areas subsequently refined. Based on this feedback, a revised plan is then developed. The plan can be used to attract initial funds for the traceability implementation, and specifies agreed-to milestones to which each member of the implementing group of stakeholders will be held accountable.

Co-Design & Pilot

Design requirements are captured from one or more implementing organizations. Typically, the pilot may focus first on implementing traceability internally within two organizations, and subsequently sharing data between them. Future of Fish recommends the use of a Request for Proposal (RFP) process through which vendors can compete to be selected as the traceability system of choice for a given node in the supply chain (Figure 3). When executed well, the RFP process increases efficiency of match-making between seafood companies and traceability technology vendors by providing a template for specifying requirements and current capacity in a standardized format. It also evens the playing field, allowing new and smaller technology companies to compete and encouraging joint proposals from multiple vendors who have specialized products and services that can work together—thus, promoting interoperability from the start.

Funding for traceability is an explicit consideration of the system evaluation (Deal Structure stream) and ideas for securing capital to support both short term (adoption) and long-term (implementation) of traceability must be discussed and evaluated prior to release of the RFP. Once funding capacity is understood and a plan created, seafood companies or groups of trading partners, at the discretion of the implementing organization, can share funding amounts with prospective vendors to help them better tailor their proposals.

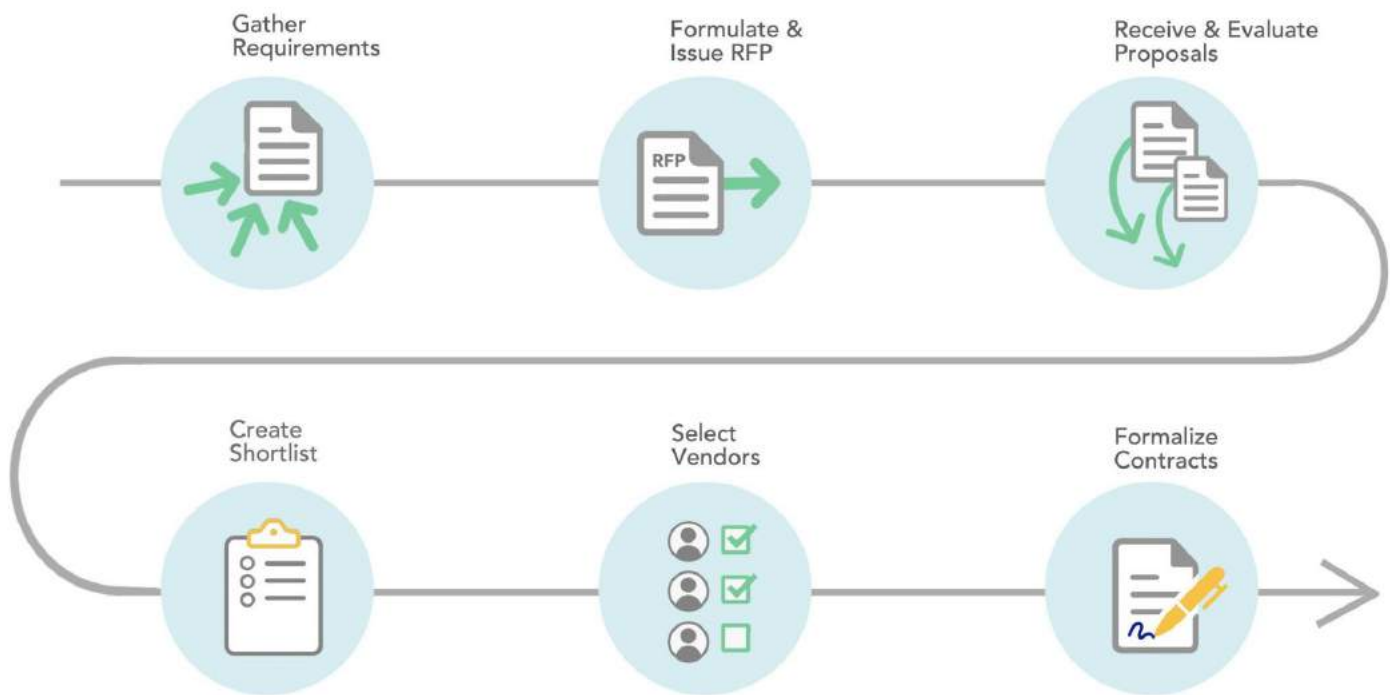


Figure 3: The six steps of Future of Fish's RFP process for traceability. See Future of Fish's [Industry Traceability Toolkit](#) online for links to templates and instructions for executing a successful RFP.

Unlock Financing for Growth

From the pilot stage, there are two mechanisms through which the traceability pilot can be expanded: replication and scale. In the replication scenario, other supply chains with a similar composition are approached and equipped with the templates, insights, and case studies of the first implementation. By sharing lessons learned and progress made, new seafood supply chains, perhaps sourcing from the same or similar fishery, can more quickly and effectively progress through their own traceability adoption and implementation process.

An alternative approach to growth is scaling. In this scenario, a natural path for growth is through companies with multiple trading partners in the supply "web," who can onboard additional smaller suppliers and/or buyers.

The Role of Standardization

As a framework and a process, the FDM offers a method with which to approach, analyze, and design solutions that can advance more sustainable, traceable, investable fisheries around the globe. However, when it comes to scaling improvements, especially traceability, it is important to consider the development of standards in order to avoid redundant effort designing protocols, templates, and processes. Thus, Future of Fish has created resources that can be used with the FDM to help accelerate traceability adoption. These include:

- **RFP template:** Future of Fish has designed an RFP template which can be adapted by implementing organizations to expedite the matchmaking process between seafood companies and traceability providers. The template and process have been socialized with a number of traceability vendors via the Trade Association for Seafood Traceability Technologies (TAST-T) and was successfully implemented by a fisher cooperative in Belize. The template, along with instructions for execution—including how to engage in a third-party evaluation process—are available [*online for free*](#).
- **Return on Investment (ROI) model:** Future of Fish has created a detailed excel-based model for predicting potential return on investment of specific traceability products and services. This model can help seafood companies better plan for up-front and long-term costs of their traceability initiatives; the tool can also be adopted by technology vendors to help aid in their sales process, working with potential clients to better map expected costs. The [*model and instructions*](#) for use are available online for free.
- **Mapping of Key Data Elements:** Future of Fish has drafted a list of Key Data Elements (KDE) that are required by various certifications (e.g. Fair Trade, MSC) and regulations (e.g. EU import compliance). The document provides a taxonomy to organize types of KDE, and specifies at which node(s) each KDE is captured, transmitted and received. For more on the KDE mapping, please contact us at [*info@futureoffish.org*](mailto:info@futureoffish.org)

In addition, Future of Fish has contributed to efforts to develop additional resources, including:

- **Traceability architecture:** Future of Fish was a key contributor to the Catch Documentation & Traceability Architecture, published by USAID to set a common approach for organizations to share data with each other via a web services protocol
- **Key Data Elements:** As more traceability implementations progress, it is expected that common sets of KDE's (e.g. to achieve compliance with export requirements, to fulfill certification needs, etc.) will become standardized and potentially embedded into traceability software, simplifying the mapping exercise that is typically required between organizations
- **Trade Association:** Future of Fish facilitated the establishment of a pre-competitive trade association for seafood traceability technology vendors (*TAST-T*), as a forum to create awareness for seafood traceability, and establish common protocols, templates and standards.

Looking Ahead

The need for improvements in the seafood industry—to prevent IUU, eliminate human rights abuse, and incentivize better, more responsible business practices across the board—has never been stronger. While traceability and accurate, reliable data is key to sustainable fisheries development, it is ultimately a tool to achieve progress, not progress itself. Effective deployment of traceability requires that fisheries and their associated supply chains are aligned and supported across multiple dimensions; so that the data generated by new electronic capture and sharing systems is utilized to full effect.

Future of Fish's FDM offers a holistic, system-level approach to designing solutions that drive sustainable, investable, traceable fisheries. By deploying the FDM framework and applying the FDM process, we believe we can more accurately identify the challenges preventing progress and design interventions that effectively accelerate adoption of robust, full-chain traceability systems in service of more sustainable fisheries. By considering the full spectrum of drivers in the system, the FDM can create the enabling conditions and incentives necessary for traceability implementation by rewarding improved data collection mechanisms, better management, and responsible practices on and off the water.

Appendix

Future of Fish, together with geography-specific partners, is currently implementing the Fishery Development Model in support of full chain traceability in three fisheries. Profiles of these implementations have been provided below.

BELIZE

Fishery	Queen Conch & Spiny Lobster
Stage of Development	Co-Design & Pilot (nearing completion)
Activities Completed	<ul style="list-style-type: none"> • System evaluation completed, including maturity assessment to inform traceability needs of a large, local cooperative • RFP issued and traceability vendor selected • Traceability system implementation underway
Future of Fish Role	<ul style="list-style-type: none"> • Design RFP template and process • Gather and document requirements • Perform market and business analysis • Facilitate conversations with prospective buyers
Next Steps	<ul style="list-style-type: none"> • Value creation has been identified as a critical requirement - supporting interventions are underway to optimize and align supply chains, leveraging status of traceable product and taking advantage of improved record keeping to achieve efficiency gains • Funder needs profiled and being used to inform subsequent activities to attract additional capital to progress traceability activities in the fishery

Chile

Fishery	Common Hake
Stage of Development	Co-Design & Pilot (initiated)

Activities Completed	<ul style="list-style-type: none"> • System evaluation completed • Data workshop conducted with government and other stakeholders to gain clarity on architecture and KDE needs to support traceability plans • Blueprint has been developed, describing value generation opportunities in the fishery and the role of traceability in unlocking them
Future of Fish Role	<ul style="list-style-type: none"> • Conduct field research and secondary desk research • Facilitate workshops and co-design sessions • Analyze data and develop recommendations • Socialize findings and facilitate design process
Next Steps	<ul style="list-style-type: none"> • Co-Design workshops to be held in four caletas to identify solutions that can improve value for fishers while bringing greater transparency to supply chains • Funders currently being profiled to understand alignment to outcomes that traceable supply chain can generate

Peru

Fishery	Mahi Mahi & Giant Squid
Stage of Development	System Evaluation
Activities Completed	<ul style="list-style-type: none"> • System evaluation underway with multiple industry, government and NGO stakeholders • System patterns being distilled and documented across five streams
Future of Fish Role	<ul style="list-style-type: none"> • Conduct field research and secondary desk research • Facilitate workshops and co-design sessions • Analyze data and develop recommendations
Next Steps	<ul style="list-style-type: none"> • Identify priority opportunities in each stream • Establish a co-design and pilot plan to incentivize data sharing between vessels, terminals and government agencies



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