Asia–Africa BlueTech Superhighway

INSIGHT

Implementing small-scale fisheries digital monitoring systems: country challenges and solutions

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Summary

This brief summarises the learnings captured during the Digital Fisheries Monitoring Knowledge Exchange, which was held from 23 to 25 April 2024 in Dili, Timor-Leste, and hosted by the Asia–Africa BlueTech Superhighway (AABS) project under its South-South collaboration.

The workshop brought together more than 60 participants from Kenya, Mozambique, Zanzibar and Timor-Leste to share their experiences on small-scale fisheries (SSF) and the challenges of monitoring them manually and digitally.

The characteristics that make SSF such a diverse sector are also responsible for the difficulties in monitoring them. Some 600 million people worldwide rely on SSF for livelihoods and many more for food and nutrition security, but they are mostly invisible to national planning and policy making processes because of a lack of data on them. As technologies for gathering and communicating information become smaller, cheaper and more rugged, digital tools have begun to offer a solution to this problem.

Through facilitated knowledge exchange, the participants articulated the challenges they face and opportunities to strengthen SSF monitoring in their specific country contexts. They then identified aspects of the Timor-Leste Peskas monitoring system that might provide solutions in these contexts.

Workshop outcomes

Some common challenges were observed, including poor digital literacy and inclusion, disabling conditions (such as no internet), limited capacity and inconsistency of government investment. Correspondingly, participants' solutions revolved around improving enabling conditions and increasing local capacity while using free or low-cost software workflows.

The discussions highlighted unique struggles and shared needs that will enable the Digital Coasts work package of AABS to plan and co-design tailored interventions that respond to and build on each country's existing data, systems, capacity and knowledge.

> *This visit to Timor-Leste is part of South-South collaboration and knowledge exchange to share ideas about digital fisheries monitoring.*
>
> *– Marcos da Cruz, Minister for Agriculture, Livestock, Fisheries, and Forestry, Timor-Leste*

How AABS supports improved SSF monitoring

The Digital Coasts work package (WP1) of AABS works with Kenya, Mozambique and Zanzibar to review and strengthen their digital monitoring systems. This involves three stages of implementation and scaling:

1. Needs assessment to understand what data or systems can be built on
2. Co-design and iterative development of components in response to feedback
3. Integration of remote sensing data layers, oceanographic models and new automated data science approaches.

This supports the overall AABS goal of ensuring all fisheries stakeholders have access to and the capacity to use data to make informed, nature-positive decisions in the future for sustainable SSF.

Learning from the Peskas experience

The workshop showcased the Peskas digital platform that was first piloted in Timor-Leste in 2016. This has since been scaled and adopted as the national fisheries monitoring system. Peskas uses catch data collected by local enumerators and vessel tracking data to show fishing trends over time and space. Peskas is a low-cost system built on open-source software that can be replicated—in whole or part—in other contexts.

> *Timor-Leste is a global example of how to implement and scale and financially sustain a digital monitoring system for fisheries.*
>
> *– Alex Tilley, Senior Research Scientist, WorldFish*

Country perspectives: challenges and opportunities

Representatives from Kenya, Mozambique and Zanzibar presented an overview of their country's fisheries, the state of digitalization in the SSF sector, methods for data analysis and dissemination, and future directions and aspirations.

Kenya

Challenges

- Kenya has 213 landing sites, but limited resources to monitor them all.
- SSF data is collected on paper, so sometimes there are errors when entering data.
- A second pilot test is underway for mobile-based data collection, but project-based funding challenges its continuity.
- Integrating SSF into the data monitoring system is costly unless the government is ready to install tracking devices on small vessels.
- There is a lack of efficient and cost-effective technology to monitor SSF vessels. The current system, THEMIS, only monitors large vessels and is expensive.

Opportunities

- Set up vessel monitoring of small vessels.
- Engage beach management units (BMUs) and fishers to enhance data collection and monitoring efforts.
- Use artificial intelligence (AI) for enhanced data analysis and dissemination.
- Integrate near-real-time validation, analysis and dissemination of data.
- Continue to build the capacity of technical staff and local fishworkers to use digital tools.
- Incorporate citizen-friendly digital tools to enhance data collection by BMUs.
- Secure financial resources to maintain reliable and long-term data storage.
- Secure government support for long-term financing of consumables (e.g. mobile phones, other digital equipment, airtime subscriptions).

> *We are looking for registered technologies that are affordable to fishers so we can pilot and adopt them [in Kenya].*
>
> *– Paul Alex Lukhwenda, Senior Fisheries Officer, Kenya Fisheries Service*

Mozambique

Challenges

- Mozambique's coastline is over 2000 km long, and supports over 80,000 fishers, so scale is the most significant challenge.
- A lack of resources hamper the deployment of effective catch monitoring (training, technology, analysis).
- The PESCART database built in Microsoft Access has been used since 1997. However, it no longer works, as the software needs to be updated, making data processing difficult.
- Low reliability of data due to limited monitoring of numerous fishing gears.
- It is not possible to calculate the effort and catch per unit effort per species in PESCART.

Opportunities

- Complete the development of the Integrated Information System for the Sea, Inland Waters, and Fisheries (SIMAIP) and Open Artfish database.
- Adopt smart platforms to collect fisheries data as there are now various cheap and open source solutions that make monitoring more financially sustainable.
- Invest in mobile apps for quota management and catch reporting.
- Adopt regulations and resolutions for the sustainable management of fishery resources to improve statistical data.

> *There is an opportunity [for Mozambique] to adopt smart platforms to collect fisheries data as there are many cheap initiatives in the region."*
>
> *– Pedro Pires, Head of Fisheries Monitoring Department, National Fisheries Administration, Mozambique*

Zanzibar

Challenges

- SSF management is hampered by limited data.
- There is limited knowledge, skills, human resources and budget.
- Lack of equipment hinders data collection.

Opportunities

- Strengthen fisheries data collection and training.
- Strengthen participatory monitoring.
- Empower fishers to participate in and own digital monitoring.
- Provide training and raise awareness on better methods for fishers.

> *Some of the enumerators have low knowledge, so it needs more energy to train them until they know how to collect the data.*
>
> *– Bishara Ali Juma, Fisheries Researcher, Zanzibar Fisheries and Marine Resources Research Institute, Tanzania*

Reflecting on barriers and solutions

All participants were asked to reflect on their country's SSF monitoring system and share their views on the critical challenges around sustainable fisheries, relating to data, capacity, knowledge and systems. Following this, participants suggested possible solutions.

> *We are all experiencing similar experiences and challenges in monitoring fisheries.*
>
> *– Dr Gladys Okemwa, Principal Research Scientist, Kenya Marine and Fisheries Research Institute*

	Challenges	Solutions
Data	• Poor data quality • Not enough data (to answer specific management questions or inform management) • No information on data (what data, where it is, who collected it, etc.) • Limited access and sharing • Limited specific data, e.g. spatial and weather data (no addresses).	• Open access • Working/good statistics office • Data security • Better coordination.
Capacity	• Limited capacity across skills, e.g. statistics, IT, etc. • No facilities • High costs and limited ongoing funding support • Data collectors have limited capacity • Limited knowledge to interpret data • Limited data analysis skills.	• Training in local languages • General capacity development • Data collection initiatives • Appointment of new recruits and enumerators • Provision of facilities • Improvement of citizen science.
Knowledge	• Limited knowledge of marine protected areas, training courses, etc. • Limited local knowledge • Poor education.	• Improved knowledge of marine protected areas and other management approaches • Education • Improved information sharing • Local mentorship.
Systems	• Poor government and policy systems, including enforcement • Poor data validation and management systems • Poor decision-making systems • Poor internet • Low use of AI • Limited open access and affordable systems • Poor storage and processing systems.	• Better use of AI • Improved government and implementation systems • Make sure tools and data are open source • Development of easy to use systems (intuitive systems) • Development of a centralized data center • Consistent funding • Improved monitoring and evaluation • Improved internet.
Other	• Limited market information (or market development) • High turnover of staff • Limited (if any) sustainability • Limited cross-sector integration.	• Better market information and development • Better government communications.

Table 1. Summary of participant responses on challenges and solutions to ensure sustainable fisheries.

Country visions: adopting Peskas elements

Reflecting on each country's challenges, participants broke into three groups to identify and discuss which Peskas modules could be most beneficial to adapt and apply.

Kenya: Peskas data validation and flagging components, based on Kenya's data and collection system, could be incorporated into the country's digital monitoring system as it transitions from a paper-based collection system. This would overcome data entry errors and management challenges and provide BMUs with insights they currently lack.

Mozambique: The country is modernising its Microsoft Access database, built in 1997 and no longer working, to a cloud-based database. Incorporating Peskas analytics and dashboard functions could provide rapid insights for decision-making.

Zanzibar: Vessel monitoring can be integrated into marine spatial planning and habitat mapping projects and processes. Building on nutrition models can increase understanding of fisheries potential for local nutrition security, in collaboration with the Ministry of Health.

Next steps

The knowledge exchange laid the foundations for an East Africa Digital Fisheries Community of Practice, where regional fisheries stakeholders can share progress and lessons in digital and data approaches to advance toward mutual goals.

The AABS Digital Coasts work package will map existing data and workflows in the three country contexts through dialogue with fisheries stakeholders and institutions to establish platforms on which to build. This will be done through a co-design and iterative process at three scales: local fisheries units, counties/provinces and the national government.

A digital training and engagement plan will be developed based on each country's needs and context, including in-person workshops, digital training modules and mentoring support.

About WorldFish
WorldFish is a leading international research organization working to improve food security, nutrition, and livelihoods through aquatic food systems that are sustainable, equitable and inclusive. It collaborates with international, regional and national partners to enable the delivery of transformative innovations, tools, and practices to advance aquatic food systems through its cuttingedge research, evidence for policymaking, and knowledge co-creation. With a global presence in 27 countries across Asia, Africa, and the Pacific and growing, WorldFish has established itself as a global leader in research and innovation in the realm of sustainable aquaculture and fisheries. www.worldfishcenter.org

About AABS
Asia–Africa BlueTech Superhighway (AABS) is a seven-year project (2023–2030) implemented by WorldFish with a host of partners to transform aquatic food systems in Asia and Africa. Funded by UK International Development under the Blue Planet Fund, AABS aims to leverage South–South collaboration to deliver a triple win for nature, people and climate.

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