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Women Shellfishers and Food Security

Empowering Women for Shellfish Management, Food Security and Biodiversity Conservation in Estuarine Ecosystems of West Africa

TOOLKIT

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Cover image: TRY Oyster Women's Association, The Gambia youth learning to use a salinometer. Ernest Chuku (Centre for Coastal Management – Africa Centre of Excellence in Coastal Resilience, University of Cape Coast, Ghana).

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Preface

The world needs problem solvers and creative thinkers to address its most urgent problems, including the degradation of ecosystems and the services they provide. Shellfishers in West Africa, and especially women gleaners of molluscs and bivalves in the estuarine and mangrove ecosystems of the subregion whose livelihoods depend on these ecosystems, can be empowered as leaders of sustainable shellfisheries and ecosystem stewardship.

As champions of coastal resources management in West Africa and around the globe, the University of Cape Coast and the University of Rhode Island are pleased to partner with World Agroforestry, the University of Ghana, the TRY Oyster Women's Association in The Gambia, as well as governments, shellfishing groups, academia, civil society and multilateral organizations on the USAID Women Shellfishers and Food Security project to develop this Toolkit. We hope the Toolkit will inspire and provide a practical guide for stakeholders in this important, but "invisible," undocumented, undervalued, and little recognized fishery to take the initiative to sustainably manage shellfisheries and associated ecosystems.

The potential for the rights-based, ecosystem-based approach to shellfisheries co-management highlighted in this Toolkit to contribute to win-win local, national, West Africa regional, and global biodiversity, food security, livelihoods, resilience, and climate change adaptation and mitigation outcomes is high. Consistent, locally adapted, and gender sensitive support from a portfolio of stakeholders, including academia, can enhance synergies to realize this potential. Academia can play an important role as neutral conveners, knowledge hubs, and outreach centers, integrating local ecological knowledge with scientific knowledge using demand driven and participatory approaches to facilitate development of the shellfisheries co-management model detailed in this Toolkit. We invite shellfishing communities and other stakeholders who can support them to use this Toolkit to act on the opportunity to improve shellfisheries and coastal ecosystem management and to create a community that will continue and build on this process.

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Acknowledgement

The Women Shellfishers and Food Security project partners deeply appreciate the opportunity provided by the United States Agency for International Development (USAID) Bureau for Africa, Office of Sustainable Development, Economic Growth, Environment, and Agriculture Division co-creation process to collaborate on this project and Toolkit. USAID/West Africa supported the USAID/BaNafaa Project in The Gambia and Senegal (2011-2014) and USAID/Ghana the Sustainable Fisheries Management Project (2014-2021) that facilitated the first ever delegation of fisheries use rights by national governments to fisheries associations led by women in Sub-Saharan Africa. This Toolkit builds on the lessons learned of the TRY Oyster Women's Association in The Gambia and the Densu Oyster Picker's Association (DOPA) in Ghana from the shellfishery co-management planning processes conducted with the support of those projects and the Ministry of Fisheries, Water Resources and National Assembly Matters in The Gambia and the Ministry of Fisheries and Aquaculture Development and the Fisheries Commission in Ghana.

Project partners extend a special acknowledgement to Lydia Sasu, Director of Development Action Association (DAA) in Ghana for DAA's dedicated support to DOPA and the Densu Delta Community-Based Fisheries Management Plan. DAA also generously contributed photos for this Toolkit and participated with DOPA in the Toolkit development workshop.

Partners extend our appreciation to the country focal persons in the 11 coastal West African countries from Senegal to Nigeria who contributed their expertise and networks to the project and Toolkit, and will be future champions for its dissemination and use. They are: Moussa Wélé, Senegal; Dawda Foday Saine, The Gambia; Nua Mancali and Herme Da Fonseca, Guinea Bissau; Camara Soriba and Issa Bangoura, Guinea; Salieu Kabba Sankoh, Sierra Leone; Yevewuo Subah, Liberia; Yaya Soro, Côte d'Ivoire; Isaac Kofi Osei, Ghana; Kossi Ahoedo, Togo; Alphonse Adité, Benin; Emmanuel Dami Omogbemi, Nigeria. We pay tribute to Nua Mancali of Guinea Bissau and Yevewuo Subah of Liberia. News of their passing reached the team as work was on-going. May their souls rest in eternal peace. We also acknowledge Zakari Ali of the MRC Unit The Gambia at the London School of Hygiene & Tropical Medicine for his collaboration. Also a special thanks to internal peer reviewers Tyler Pavlowich, Elin Torell, and Michael Rice.

More than 59 participants from shellfisher associations and groups, government, academia, NGOs, regional and international multilateral institutions contributed to development of this Toolkit at a workshop conducted on March 21, 2022. Special thanks to the United Nations Food and Agriculture Organization (FAO) for their participation and shared perspectives on their current shellfish value chain projects in Senegal and The Gambia.

Finally, Partners thank all the stakeholders engaged in the Women Shellfishers and Food Security project for sharing your expertise and experience on shellfisheries and coastal estuarine and mangrove ecosystems in West Africa, in particular the women and men who practice shellfish livelihoods and ecosystem stewardship daily.

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1. Objectives

This toolkit provides the first practical guide for the design and implementation of women's shellfish co-management in West Africa.

The toolkit aims to:

- Share the evidence base;
- Increase awareness;
- Equip stakeholders to adapt and apply successful approaches to co-management of shellfish by women in West Africa.

Co-management is a process of management in which government shares power with resource users, with each given specific rights and responsibilities relating to information and decision-making [resource use and enforcement] (OECD, 1998)

This toolkit contributes to achievement of the United Nations Sustainable Development Goals (SDGs) (see Annex B), The FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (see Annex C) and USAID's Global Food Security Strategy, Biodiversity Policy, and Gender Equality And Women's Empowerment Policy.

2. Audience

This toolkit is designed for use by diverse groups of local, national, and regional-level stakeholders. It is envisaged that the toolkit will be beneficial to key stakeholders to inspire action and support continued innovation, development, application, documentation, and scaling of improved approaches and practices (see Table 1).

Table 1: Use and Benefits of the Toolkit for Key Stakeholders

Key Stakeholder	Toolkit Use and Benefits
Resource user groups and associations at village, ecosystem, national, and West Africa scales	Organize around common interests and initiate action at the community level to improve resource management, livelihoods, food security, and nutrition. Advocate for use-rights and government facilitation of resource-user-led shellfisheries governance. Empower women as ecosystem stewards and as drivers and beneficiaries of improved shellfisheries value chains.
Governments of West Africa and their agencies responsible for fisheries, forestry, environment, and gender, among other things (at national and local levels)	Adopt and use the toolkit. Achieve cross-sectoral objectives with limited resources and capacity by facilitating resource-user-led, rights-based co-management of shellfisheries. Demonstrate leadership and capacity in application of globally recognized good principles and practices.
Research and academic institutions	Draw inspiration from the toolkit's content to support routine resource-user and government data collection and monitoring systems for management planning and decision-making. Document where little or no documentation exists. Share and disseminate an improved evidence-base. Advance studies for development of the sector through demand-driven, participatory research and outreach.
Local NGOs and regional multilateral fisheries and environment-related bodies	Plan sustainability actions that respond to coastal livelihoods, gender, and climate change challenges and opportunities.
Donors	Develop priority investments for the short and long-term. Identify no-regrets, nature-based solutions for biodiversity, food security, resilience, and climate change adaptation and mitigation investments.

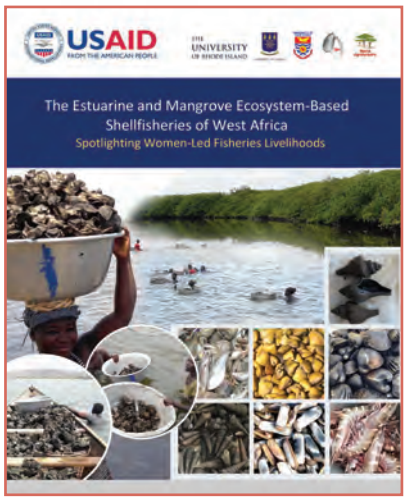
3. Rationale

This toolkit responds to an urgent need to facilitate locally driven and locally based livelihoods that enhance rather than degrade natural resources management, benefit women, and engage them in decision making. Coastal estuarine and mangrove areas of West Africa are endowed with a rich biodiversity that serves various ecosystem functions. These include climate change adaptation and mitigation, as well as food security, via the harvest of many estuarine species. Shellfish species comprise a significant portion of the food resources harvested from these ecosystems. As a result, the livelihoods of many coastal inhabitants, particularly women, are closely associated with these systems. Bivalve shellfisheries, primarily cockles and oysters, are the most important to women in West Africa. These livelihoods largely fall within the small-scale fisheries sector, but often go unnoticed in official fisheries statistics, both in volume and value of these harvests. The USAID Women Shellfishers and Food Security project has provided, for the first time, a regional perspective of estuarine and mangrove ecosystem-based shellfisheries in a report titled, "The Estuarine and Mangrove Ecosystem-Based Shellfisheries of West Africa: Spotlighting Women-Led Fisheries Livelihoods" (Chuku, et. al., 2021). Findings are summarized below.

An urgent need to facilitate locally driven and locally based livelihoods that enhance rather than degrade natural resources management, benefit women, and engage them in decision making

Figure 1: West Africa Shellfisheries

This summary regional report is based on individual country assessments of 11 coastal West African countries: Senegal, The Gambia, Guinea-Bissau, Guinea, Sierra Leone, Liberia, Côte d'Ivoire, Ghana, Togo, Benin, and Nigeria (see Annex J for individual country reports).



Findings show that the sector represents a unique win-win opportunity across the sub-region on several fronts; for improved food and nutritional security, livelihoods, sustainable natural resource management (fisheries and estuarine and mangrove ecosystems), climate change resilience and mitigation. All 11 coastal West African countries were found to have active shellfisheries interspersed along their combined 4,472 km coastline. For each country, there were at least four major sites practicing shellfish harvesting and trade. More than 30 women shellfisher groups organized at the community, ecosystem, and national level were identified across nine of the countries (see Annex H). This indicates the potential for future efforts to scale up through direct investments, research, and capacity building, as well as the development of value chains within this industry. The description of shellfisheries reveals the intensity of shellfishery livelihoods across the West African coast. The shellfisheries sector presents an opportunity to scale up the enhancement of livelihood opportunities, especially for women, who account for approximately 79 percent of shellfish harvesters. More than 480,000 hectares of coastal ecosystems with shellfisheries in 9 of the 11 countries assessed are already prioritized nationally and internationally for conservation and sustainable use under the Ramsar Convention on Wetlands of International Importance (see Annex I). In addition, the 2019 Global Assessment by the Inter-Governmental Science-Policy Platform for Biodiversity and Ecosystem Services put the value of mangrove coastal protection and carbon sequestration at more than $4,500/km^2/year in the West Africa region (IPBES, 2019), but effective management remains a challenge.

In this toolkit, the Women Shellfishers and Food Security Project highlights a model focused on women shellfish harvesters that provides opportunities to contribute to biodiversity conservation, food security, and nutrition (Figure 2). The model aligns with efforts to enhance resilience through nature-based climate change adaptation and mitigation approaches. It integrates findings from the participatory regional assessment, site-based research in The Gambia and Ghana, and past experience in the co-management of shellfish in West Africa.

A unique win-win opportunity for improved food and nutritional security, livelihoods, sustainable fisheries and mangrove ecosystems management, climate change resilience, and mitigation

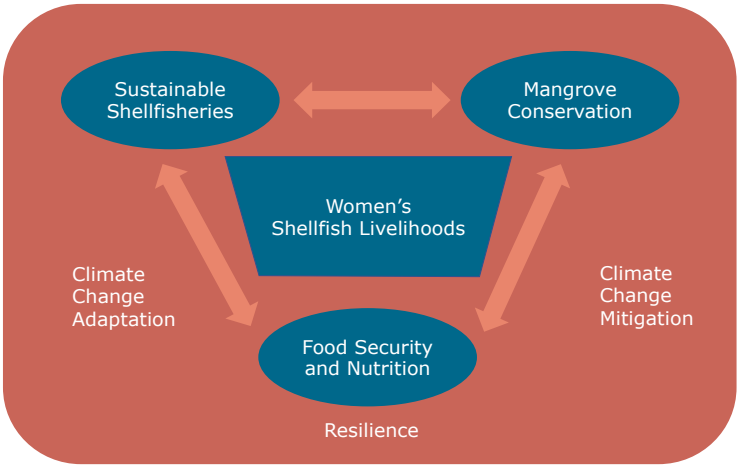


Figure 2: Linkages Catalyzed by a Model Focused on Women's Shellfish Livelihoods

4. Barriers to and Opportunities for Success

A. Barriers

There are many reasons why West Africa shellfisheries currently are not better utilized for sustainable economic gain. At the production level, barriers include:

- Economically marginalized women with limited livelihood options tend to practice this activity. Men often have more lucrative alternatives in the fishing sector;
- High time and labor investment that provides minimal returns;
- Short marketing chains where most production is consumed or marketed locally, so it is an "invisible fishery";
- Low availability of capital to improve productivity, add value to products, or invest in intensified production through aquaculture;
- Low food processing and business skills of women in the supply chain;
- Low visibility and support from government decision makers, as it is a women's activity;
- Gender bias, where women's work is seen by mostly male decision makers as of low value, similar to how child rearing, cooking, and household cleaning are not valued as a significant livelihood or economic contribution to the household;
- Women in many coastal communities have less formal education and lower literacy rates than men, which is a barrier to upward economic mobility;
- Women are less likely to have a voice in decisions concerning local development priorities as women are disadvantaged due to lower education, lack of formal advocacy networks, lack of representation, lack of time, as well as gender inequalities regarding the value of women and their livelihoods.

At the management level, barriers to scaling up good management practices include:

- Shellfisheries of estuarine and mangrove ecosystems are not a policy priority;
- Governments rarely offer use rights or protections to shellfishers in ecosystems that are generally common property and open access;
- Ministries and Fisheries Departments with limited human and financial resources tend to focus on higher volume fisheries for food (small pelagics) and export (tuna), or where economic benefits are concentrated and revenues to the state for licensing can be captured;
- Governments may not be inclined to take an integrated approach to ecosystem management that can enable women to succeed;
    - Even when aware of cross-sectoral opportunities for synergies and inter-institutional cooperation, it is difficult for government institutions to do this without good arguments and evidence of the benefits of cooperation;
    - Government institutions often compete for resources from the central treasury, so strong incentives to cooperate and disincentives not to may be required to change this dynamic;
- Ministries of Fisheries may lack gender policies, action plans, funds, or personnel to implement plans. They may have inadequate gender-sensitive data, few women in decision making positions, poor engagement with women's groups, or simply not prioritize women.

B. Opportunities

Despite these barriers, there are opportunities, especially to use women's shellfish co-management as an entry point for integrated mangrove conservation efforts. These include:

- Bivalves and molluscs have clear advantages for small-scale, community-based management;
  - Results of management actions can be seen in short periods of time, providing positive feedback loops. Shellfish are short lived and highly fecund, so in overfished situations, stock recovery can be quick, if other conditions are not the main factor of stock decline (e.g., water quality, loss of mangrove habitat);
  - Management units can be relatively small, such as a single tributary of an estuary or an entire estuary system, because they do not migrate over large distances;
- Ministries of Fisheries working with shellfishers could be an effective entry point for a demand-driven, community-led, livelihoods-based approach to sustainable fisheries management;
- The bivalve and mollusc shellfish value chains are generally not highly specialized and are dominated by the women harvesters at all nodes. This provides an opportunity to incentivize harvesters to practice sustainable management measures through rights-based co-management as improvements at any node in the value chain can benefit harvesters directly. In many fisheries, the benefits of value chain improvements are captured primarily by non-harvester value chain actors while harvesters disproportionally bear the burden of controlling fishing effort to achieve sustainable management;
- Linkages between women's empowerment and sustainable fisheries are increasingly being documented. Efforts such as the USAID Learning Initiative on Women's Empowerment, Access to Finance, and Sustainable Fisheries, include estuarine ecosystems applying community-based shellfisheries management (USAID/SFMP, 2020);
- Empowerment of women shellfishers does not usually threaten existing high-stakes power and economic agendas, as can be the case when dealing with management of fisheries that include both industrial and small-scale fisheries. Improving estuarine shellfisheries management adds value for all actors in a neglected sub-sector where even marginal increases are economically meaningful for women shellfishers with few economic alternatives;
- Improving shellfisheries through empowerment of women shellfishers enables multiple ministries with limited means to benefit from the contribution of this approach to their goals and public commitments;
- The strong motivation of women shellfishers as drivers of mangrove conservation when provided with a rights-based fisheries co-management platform has been demonstrated in a few cases in West Africa. Examples funded by USAID in The Gambia and in Ghana show how women shellfishers proactively engage in mangrove protection and restoration when they understand how this can sustain the shellfisheries which provide them with food and income;
- Mangrove conservation efforts in West Africa most often focus on government-led initiatives through Ministries of Environment, Forestry, or Parks and Wildlife. Many of these agencies have proven approaches for community-based mangrove management that can also act as an entry point to support sustainable shellfish management and livelihoods in a positive feedback loop.

This toolkit provides a practical approach to integrated shellfish management and mangrove conservation. It identifies strategies for empowering communities, especially women, but also men. It suggests a means for managing shellfishing seascapes and adjacent landscapes to address a broader range of threats and drivers of mangrove degradation and strengthen other ecosystems services they provide. This approach can be part of a broader integrated marine/coastal seascape effort, as documented in a regional assessment of exposure to coastal climate stressors in West Africa (USAID, 2014).

5. Some Basics on the Biology and Ecology of the Major Shellfish Species Harvested in West Africa

Regionally, several estuarine mollusc species are of most importance for women harvesters (Chuku et al., 2021). These include mangrove oysters and bloody cockles (bivalves) as well as periwinkles (gastropods). All of these have similar life stages and biology that are important for their management.

The West African Mangrove Oyster (*Crassostrea tulipa*) is the dominant oyster species found on the west coast of Africa. The adults of this species are found either attached to the stilt roots of red mangroves (*Rhizophora mangle*), the pneumatophores of white mangroves (*Avicennia* spp.), or to rocks in the intertidal zone. The species is also found in the shallow hard-bottom sediments of lagoons and estuaries (Figure 3).

Figure 3: The Mangrove Oyster Attached to Mangrove Roots and on Bottom Habitat
(Source: ICRAF (top), UCC (bottom))

The oyster starts its life as larvae after mature adults release gametes (sperm and eggs) into the water column. When the planktonic male and female gametes randomly meet, fertilization takes place — this is called broadcast fertilization. Larval development begins quickly after fertilization and progresses through three main stages—the trochophore, veliger, and pediveliger larvae—after which settlement occurs in a few weeks. They settle by attaching to suitable hard substrates, and are at this stage referred to as spat. The rest of their life is spent in the location where they settle, and they do not perform any active movement as adults. Hence, oysters are referred to as sessile organisms (see Figure 4 for a general depiction of the life cycle). Settlement success depends on the type of material the larvae settle on, as substrates with harder surfaces tend to be more effective for spat settlement (Chuku et al., 2020). Oyster assemblages confer protection and food for various invertebrates and fishes (Gillies et al., 2018) and therefore contribute to biodiversity of estuarine environments. As filter-feeders, oysters feed on phytoplankton (e.g, green algae, diatoms, golden flagellates or dinoflagellates) and substrate particles (Cognie et al., 2001). Oysters survive in brackish to marine water environments, but do not survive in pure freshwater conditions. Low turbidity, alkaline conditions, sufficient dissolved oxygen in the water, and microalgal diet within the environment promote good growth and survival of oysters.

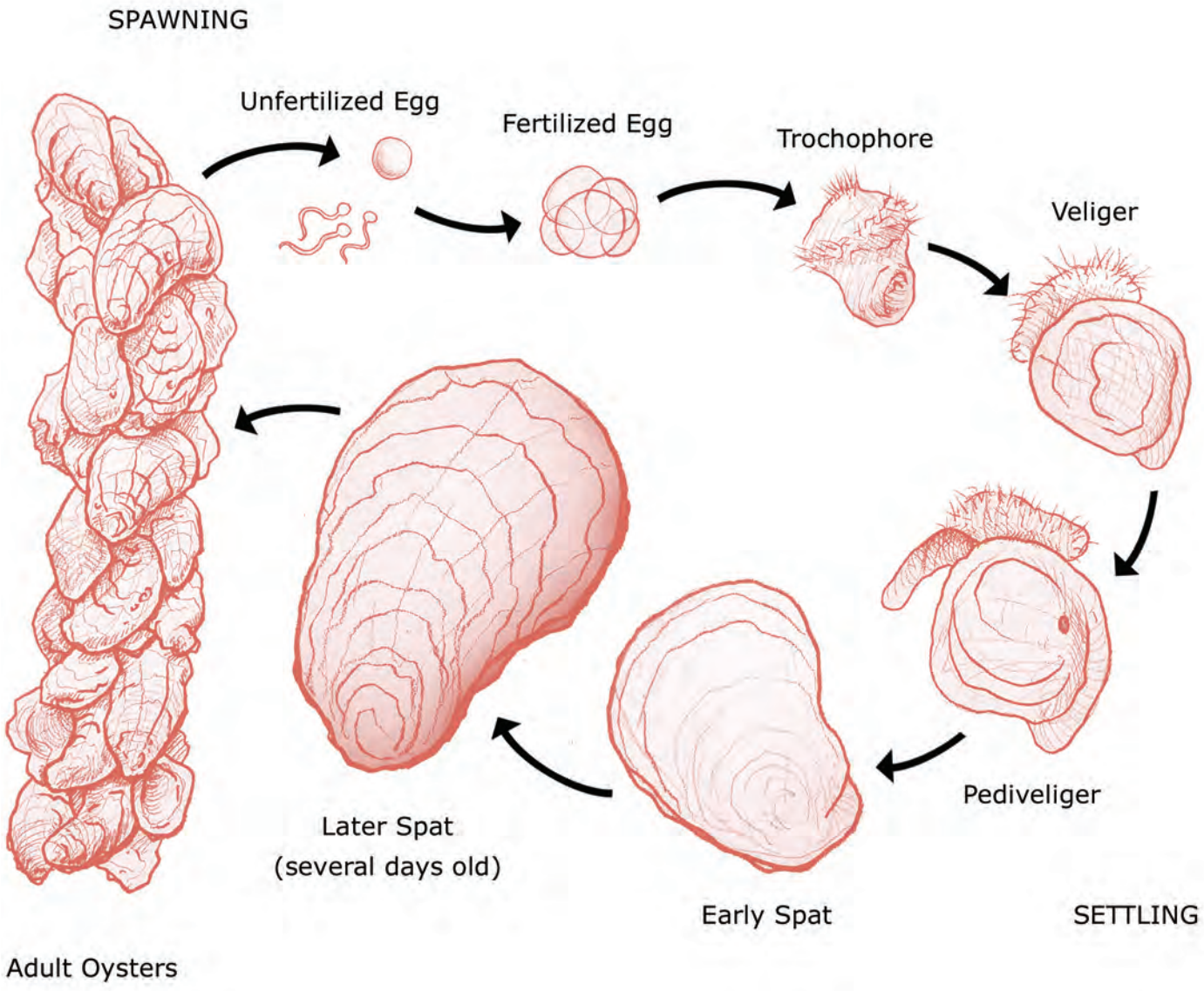


Figure 4: Life Cycle of the Mangrove Oyster

The Bloody Cockle (*Senilia senilis*) is typically found in muddy environments of estuaries of West Africa. It is often found in mud between the prop roots of the red mangrove but can also be found on open intertidal mud flats. Like the mangrove oyster, it has a life cycle that starts in the water column before settling in mud and transforming into its adult form as a two-part hinged shell enclosing the soft tissues of the organism. It thrives in brackish water and cannot survive in pure seawater or freshwater environments.

Figure 5: The Bloody Cockle (left) and the West African Periwinkle (right)

The West African periwinkle, also known as the "mud creeper," (*Tympanotonus fuscatus*) is a snail that lives in brackish water creeks, mudflats, and mangroves in West Africa. It differs from oysters and cockles, which are bivalves (have a two-part hinged shell), as it has only a non-hinged shell and is classified as a gastropod. Periwinkles vary in size from about 2 to 5 cm in their adult form and have a larval stage in the estuarine water column in early life before settling onto muddy bottom habitats. These snails crawl along the muddy bottom and on the roots of mangroves, so they are "motile" (capable of movement) and not sessile creatures, like cockles and oysters.

As each of these organisms has particular life stages and habitat preferences, maintaining the ideal habitats and water conditions for their survival is important to maintaining a healthy fishery. Aspects of the ecology, thermal tolerance, heavy metal assimilation, and the population dynamics have been documented (Egonmwan, 2007; Ideriah et al., 2009; Jamabo and Chinda, 2010; Bob-Manuel, 2012; Moruf and Lawal-Are, 2015).

6. Model Approach and Best Practices

A growing body of evidence suggests that a rights-based, ecosystem-based, participatory co-management approach, when applied to women dominated shellfisheries, is a practical, empowering, and effective entry-point for improved management of shellfisheries, as well as for the broader ecosystems that serve as shellfish habitat and deliver many ecosystem services (Figure 6).

Prioritizing women's shellfish livelihoods as an entry point for improved governance of complex coastal ecosystems is a focused, realistic, win-win action for communities and governments to implement, including those with limited resources and capacity. The following section of the toolkit provides guidance and resources for stakeholders to act on this opportunity.

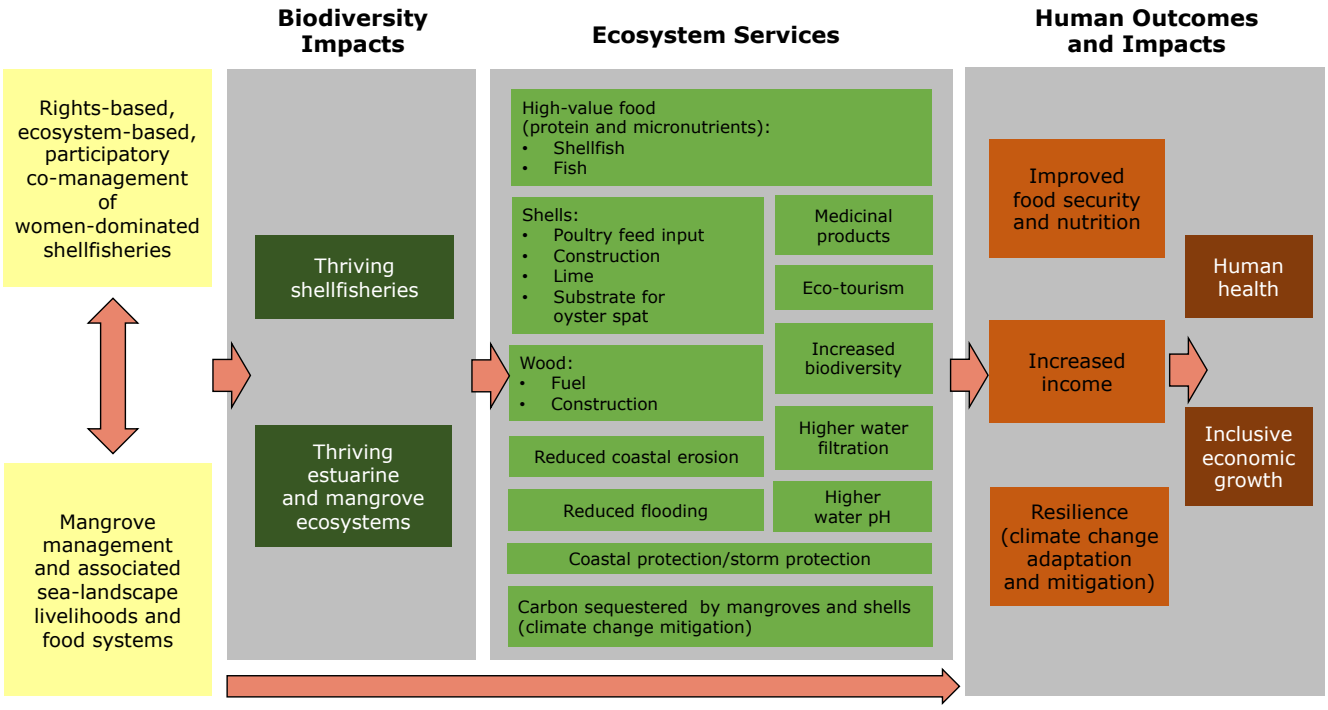


Figure 6: Women-Dominated Shellfisheries are a Compelling Entry Point for Improving Ecosystem Health and Resulting Portfolio of Ecosystem Services That Contribute to Human Health and Economic Well-Being

A. Key Principles

Participatory, rights-based co-management of shellfisheries by women harvesters in estuarine and mangrove ecosystems is an approach to sustainable natural resource management that applies Elinor Ostrom's design principles for managing natural resource commons (see Figure 7). The approach also aligns with the Food and Agriculture Organization (FAO) Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries (see Annex C).

Ostrom's Design Principles
1. Clear boundaries of the resource and effective exclusion of unentitled parties; 2. Match rules governing use to local needs and conditions; 3. Those affected by the rules can participate in modifying the rules; 4. Rule-making rights of community are respected by outside authorities; 5. A system by community members for monitoring members' behavior; 6. Use graduated sanctions for rule violators; 7. Provide accessible, low-cost means for dispute resolution; 8. Build nested governing tiers from the lowest level up the entire system.

Figure 7: Elinor Ostrom's Design Principles for Management of the Commons
(Source: Ostrom, E. 1990)

In applying these principles, additional guiding approaches include the following:

» Co-Management

Co-management is a process of management in which the government shares power with resource users, with each given specific rights and responsibilities relating to information and decision-making, resource use, and enforcement. Co-management can be used for both large and small-scale ecosystems. In instances of shellfisheries where the fisheries ecosystem units are relatively small — a small area of an estuary or an entire small estuary — this can consist of a single village or a collection of neighboring villages that can form a group of users for management. This is referred to as community-based management. The emphasis here is placed on community-level decision-making, supported and endorsed by other actors. Generally, user groups can be supported by several different types of external institutions. Government can create favorable policies or officially approve management plans. NGOs, government, or universities can facilitate the proess and provide technical support.

Co-management is a best practice in which the government can provide official endorsement of traditional management practices, provide the legal granting and legitimacy of use rights, and assert authority for sanctioning individuals who do not comply with agreed practices

In some cases, community management may form organically and be informal, whereby resource users follow rules and expected behaviors become accepted community norms over time and may or may not be endorsed by traditional authorities. Although this form of de facto or traditional management can be effective, there are many cases in which these norms have started to break down as fishing pressure increases and resources become scarce. Hence, a best practice is to support a co-management approach, in which the government can provide official endorsement of traditional management practices, provide the legal granting and legitimacy of use rights, and assert authority for sanctioning individuals who do not comply with agreed practices. In such instances of community-based co-management, endorsement by community leaders or traditional authorities can still be important, and should be encouraged, as it can help strengthen community acceptance of rules and support for management actions.

» Participatory

A participatory, stakeholder-driven approach is at the heart of co-management, and especially community-based management. The premise is that the more the resource users engage in and take responsibility for management, the greater the legitimacy of the management system, resulting in higher voluntary compliance with rules. This is a bottom-up, rather than top-down,

approach. There are many tools and methods available for participatory development. For shellfish planning and management, it is critical that a careful stakeholder mapping and engagement strategy is implemented, as discussed further in Section B, "Steps in the planning process." All stakeholders, especially resource users, need to be involved, and no groups with an interest in, or who are using the resource, should be excluded from the process. This may include part-time shellfishers or migrants, who may not live close to the fishery area but have a history of temporary migration and residence in the area at certain times of the year specifically for the purposes of harvesting the resource.

» Rights-Based

A rights-based approach to development seeks to achieve a positive transformation of power relations among two key development actors — the rights holders and the duty bearers. Rights-based approaches aim to strengthen the capacity of duty bearers and empower rights holders. In fisheries, the rights holders are fisherfolks or resource users, and the duty bearer is the government that provides or grants such rights. In fisheries, the state (or duty bearer), and not the rights holder or resource user, owns the fisheries resource (property). The state grants exclusive privileges or rights for harvest of the resource. In fisheries, user rights can take the form of (1) a right to access a fishery or certain species through licensing or leasing, (2) a right to fish in a certain area, or (3) a right to harvest a certain percentage of a total allowable catch. Rights can be granted to an individual, a group, or a corporation. Exclusive-use rights formally provided to groups or individuals for harvesting in defined areas promotes stewardship by resource users and better compliance with community-based rules. Generally, this requires a law or policy that allows granting of use rights to a user group by the government fisheries or mangrove management authority. Granting of use rights can be complicated inside parks and reserves, such as many of West Africa's coastal RAMSAR sites. Sometimes, the jurisdiction of wildlife authorities and fisheries authorities overlap. In such cases, one solution can be to have both authorities jointly approve the granting of use rights as part of the management plan. Traditional management, de-facto management, or use rights can be supported in the absence of formal regulations, but it is best if such rights are formally supported by conventional government authorities. Support by traditional institutions has the advantage of reinforcing among local communities the rights and rules granted by conventional government.

Exclusive-use rights formally provided to groups or individuals for harvesting in defined areas promotes stewardship by resource users and better compliance with community-based rules

More information on how use rights are applied in promoting sustainable management areexplained in Section C, Management Options, of this guide.

» Gender-Sensitive

People in authority tend to be male and, due to cultural norms prevalent in West Africa, women often lack the opportunity to share their views and participate equally in decision-making. Co-management planning processes must identify gender barriers as well as model systems and behaviors for both men and women that promote gender equity. Women need to gain capacity to advocate and negotiate. Women may have lower rates of business enabling skills such as literacy, numeracy, and access to finance than men. Women have reproductive, childcare, and household responsibilities in addition to their livelihoods.

Approaches that employ peer-to-peer sharing of experience and good practices are well suited to the needs of women shellfishers

In coordination with a rights-based governance approach, integrated programs that address the multiple needs of women shellfishers should be considered to enable them to implement the management measures required to manage shellfish resources and ecosystems responsibly. These measures often require short-term economic hardship in favor of medium to longer term benefits. Programming interventions should provide them with knowledge, skills, and tools for sustained production, ecosystem health, human health, and social and business development.

Women can do a lot on their own, but they need assistance to advance their development and empowerment. Local and national governments beyond just the fisheries departments, development organizations, and academics can provide support. Approaches that are well suited to the needs of women shellfishers employ peer-to-peer sharing of experience and good practices, combine local ecological knowledge with scientific knowledge, consider women's time management, and use methods tailored to the non-literate.

Figure 8: Women shellfishers at the Bulock Community in The Gambia (Source: UCC)

A gender-sensitive approach to shellfish value chain development is paramount in West Africa to ensure that economic opportunity for women is not reduced. Women harvesters currently dominate all nodes of the value chain in most countries. For many, shellfisheries are a primary livelihood. Value chain improvements could unintentionally displace women, who may have less capacity than men to adopt new technologies or access higher value markets. As marine fin fisheries come under increasing pressure, more men may engage in shellfisheries that were previously perceived as too low-value, displacing women.

A gender-sensitive approach to shellfish value chain development is paramount in West Africa to ensure that economic opportunity for women is not reduced

» Ecosystems-Based

An ecosystems-based approach to fisheries management is a holistic way of thinking that considers the entire ecosystem in which the fishery resides. It presumes that a healthy ecosystem contributes to a healthier, more resilient fishery. In practice, this tends to consider not just single-species management, but looks more holistically at all species being harvested (multi-species management) and interactions among them. Often, this involves integrating concerns of excessive by-catch (e.g., if endangered or protected species are incidentally caught) as well as protecting critical habitat important to all life stages of the species harvested. In the context of women's shellfisheries, an ecosystem-based approach needs to consider maintaining critical habitats, such as mangroves or oyster reefs, and maintaining water quality conditions that promote healthy growth and survival of shellfish, among other considerations.

» Adaptive Management

Adaptive management is an interactive process of doing, learning, and adjusting management strategies and actions over time as additional information and knowledge are gained through implementation. Often, the data and understanding of a specific fisheries system may be limited. This provides a degree of uncertainty concerning the predictability of decisions made to manage the resource sustainably. However, the absence of information is not a reason for inaction. Through actions, knowledge is gained that can be used to adjust the management system. Adaptive management tests explicit hypotheses about expected consequences of management actions and allows for changes in strategy if results differ from the expected effect.

» Integrated

An integrated management approach takes a broad, holistic view of the fisheries system, its ecological and human elements, the surrounding watershed, and the various development needs of the resource users. It is similar to an ecosystems approach, but can go well beyond considering the fishery just within the estuarine ecosystem. A broader integrated approach looks more closely at food security and production in the adjacent landscape; public health issues, including water supply and sanitation issues; and livelihood development needs of the resource users. There is a danger of integrating too broadly, however. Then the ambitions for shellfish management may start to look like a local development plan, rather than focusing on the shellfish and its main users. An integrated approach can also be incremental, starting with a few key issues, gaining experience and capacity over time, and gradually building a more complex system by adding issues, such as mangrove conservation, diversified livelihoods, shellfish sanitation, and food diversification in the proximate landscape.

B. Steps in the Planning Process

» Initiating a Shellfishery Co-Management Planning Process

A fishery co-management planning process is often initiated by those outside the resource user community with the vision, experience, and resources to support a process in collaboration with resource users. The process could be facilitated by a fisheries agency, an NGO, or an academic institution. To initiate the process, these actors may establish a working committee that will be responsible for implementing the planning process and engaging stakeholders as participants, decision-makers, and ultimately, as stewards and implementers. Such a working committee can facilitate the use of good practices in the management planning process, as described in the Phases and Steps of this section and in the Management Measures section below. The committee should have the capacity and the resources to document the process and the decisions made in a written Shellfish Co-Management Plan for a defined area. The plan serves as a reference document for implementation and continuing adaptation of management actions. The Shellfish Co-Management Plan should be legally enforceable, if approved by the relevant authorities. Although informal rules and traditional norms can be beneficial for sustainable management, it is best if these are strengthened with explicit legal authority and recognition by the government.

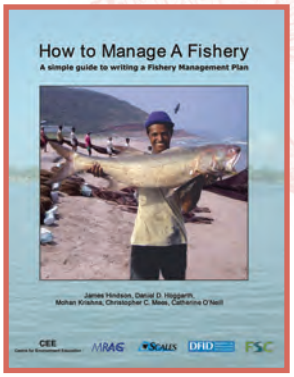
Figure 9: The Cockle and Oyster Fishery Co-Management Plan for the Tanbi Special Management Area, The Gambia (left) and The Densu Delta Community-Based Fisheries Management Plan, Ghana (right)

The written management plan represents the end product of the planning process and serves as a living document to guide managers. A plan should do the following (Hindson et al., 2005):

- Analyze the current situation in a fishery;
- Set out some principles that should be followed in management (see Section A, above);
- Detail goals and objectives for the fishery;
- Say how they are to be achieved; and
- Say how they are to be monitored.

Examples of women-led rights-based shellfishery co-management plans approved by their national governments exist in West Africa in The Gambia and Ghana (Figure 9).

In this section of the toolkit, key steps in developing and implementing a women-led shellfishery co-management plan are provided. This section draws from an excellent user-friendly guide, titled "*How to Manage a Fishery: A simple guide to writing a Fishery Management Plan*" (Hindson et al., 2005) The basic phases are provided in Figure 10 below. They include Phase I — understanding the local context, Phase II — vision setting, Phase III — planning actions to achieve the vision, and, Phase IV — establishing a monitoring, evaluation and implementation strategy. The figure also depicts what is sometimes referred to as adaptive management, in which continuous cycles of planning and implementation are carried out based on learning and progress made toward achieving goals. Hence, planning and implementation are a continuing cycle of activities by stakeholders.



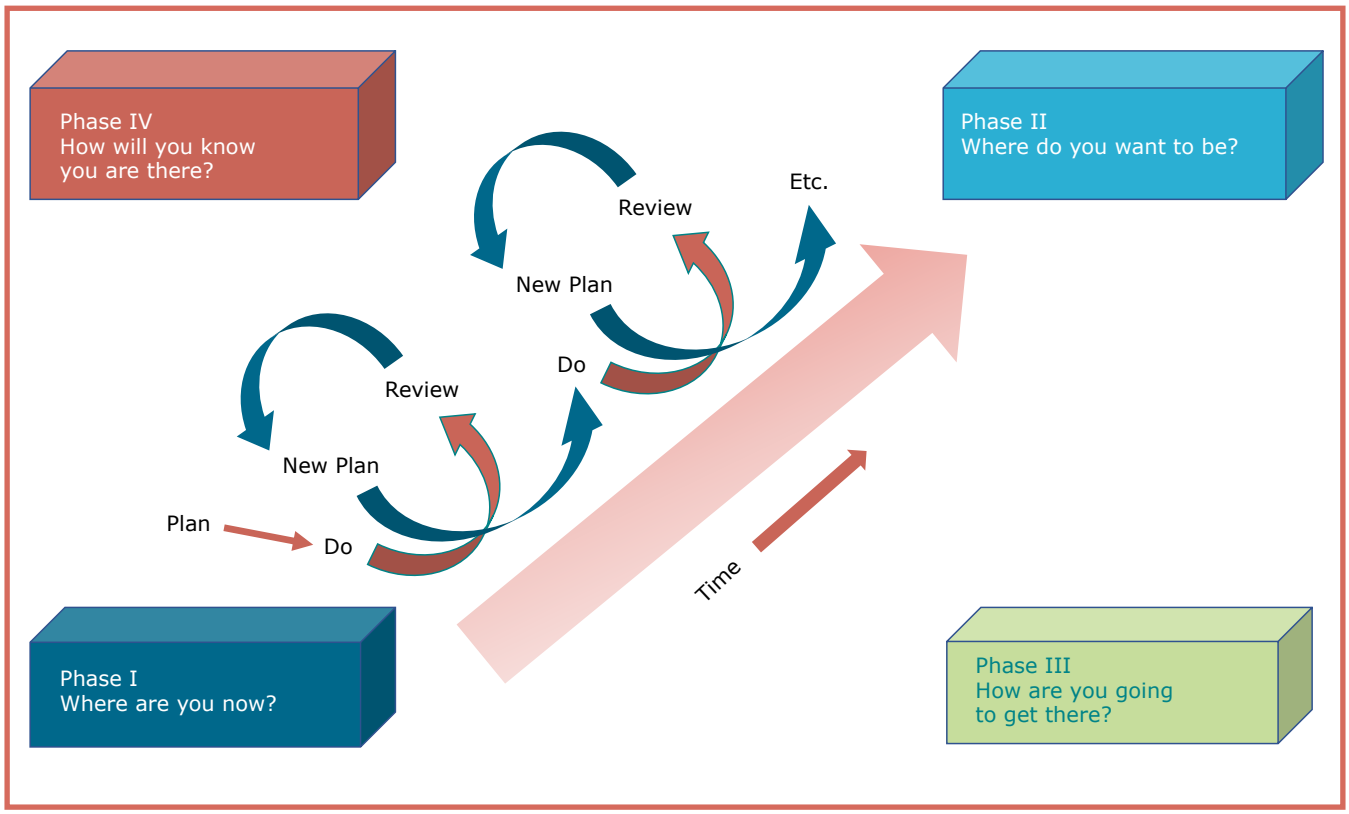


Figure 10: Phases in the Planning and Implementation Process
(Source: Hindson et al., 2005)

The steps are not necessarily sequential. It is not unusual for several steps to occur simultaneously, or for the development team to revisit an earlier step

Figure 11 (on following page) depicts the detailed steps in preparing a management plan. Although the graphic looks like the steps are sequential, it is not unusual for several steps to occur simultaneously, or for the development team to revisit an earlier step as new information becomes available and decisions are made along the way. Table 2 also shows the Phases and steps in the planning process and key decisions that need to be made at each step.

Figure 11: Steps in the Planning Process
(Source: Adapted from Hindson et al., 2005 to overlay Ostrom, 1990 design principles)

Table 2: Phases and Steps in the Process of Developing a Shellfishery Co-Management Plan

Phase	Step	
Preparation for developing the management plan ***Where are you now?***	1	**Define** Define the fishery your management plan is for and the management area boundaries
	2	**Stakeholder Analysis** Carry out a stakeholder analysis and decide how you are going to involve the stakeholders
	3	**Situation Analysis** Carry out a situation analysis and list the problems faced by your fishery
	4	**Institutional Arrangements** Establish the governing arrangements for implementation of the management plan
Developing the management plan ***Where do you want to be?***	5	**Vision or Purpose** Agree on the overall purpose of your plan
	6	**Goals and Objectives** Decide on the biological, ecological, social, and economic goals needed to achieve your purpose and define objectives for each goal
Developing the management plan ***How are you going to get there?***	7	**Management Measures** Decide the management actions you are going to take to achieve the objectives
	8	**Penalties and Sanctions** Determine the penalties for those who violate the plan's rules
	9	**Resources** Identify the resources needed to implement the plan
Planning to implement, evaluate and review the management plan ***How will you know you are there?***	10	**Formal Approval** Rule-making rights are recognized by outside authorities
	11	**Implementation** Make an action plan to implement your management plan
	12	**Monitoring** Monitor regularly how well your plan is achieving objectives
	13	**Reviewing** Review and update your plan every few years

Phase I: Preparation for Developing the Management Plan: Where Are You Now?

Step 1. Define the Fishery and the Boundaries of the Management Area

Species to be managed and management unit boundaries (management area) should be defined. Not all species harvested in an estuary need to be included in a management plan. Prioritize a few to be managed, based on volume and importance to the local communities and shellfishers. For women shellfish harvesters in West Africa, for oysters and cockles, an estuary, a wetland, a lagoon, or part of one of these ecosystems, can be the spatial boundary for the unit of stock and therefore considered the ecological management unit. For larger estuaries, a portion of the entire system might be designated as the management area. In this case, perhaps only certain tributaries demarking a section of an estuary can be used as the management area. The boundaries of the shellfish management area might also be chosen based on the boundaries of an existing management area already designated for protection or managed use, such as a national park, Marine Protected Area, or Ramsar site. The management area should encompass all the areas where harvesting the species of concern takes place and its essential habitat (e.g., mangroves).

Step 2. Stakeholder Analysis

» Stakeholder Mapping

Stakeholders need to be identified with a priority on resource users and a focus on shellfish harvesters, while including others whose livelihoods are linked to the shellfish value chain or institutions with authority over the resource and associated habitat areas. Stakeholder mapping should identify their role and interests in the fishery. In West Africa, most bivalve and mollusc shellfisheries do not have a high degree of specialization in the value chain. Women are the dominant harvesters, and harvesters are often also the dominant actors at the processing and marketing nodes. Although other fisheries may overlap shellfish harvesting areas, such as use of "brush parks" or shrimp or finfish harvesting, which typically involve more men and sometimes women in harvesting, it is best to keep the planning process focused on those resources where women dominate in harvesting and vertically in the value chain. This also helps to empower women and minimize potential for their marginalization by male dominance of decisions, if all estuarine fisheries are combined into one plan. Where there may be spatial conflicts between women harvesters and male dominated fisheries, this could be part of the planning process. A final plan could include some rules of spatial separation or joint decision making. However, management of other estuarine fisheries resources could be a separate planning and management effort with a plan and associated use rights developed for those fisheries with its particular users.

As the authority responsible for management of fisheries and natural resources, governments are key stakeholders. In a shellfishery co-management planning process, various ministries and agencies in addition to those responsible for fisheries (i.e., forestry, parks and wildlife, environment, climate change) should be included in the planning as involved stakeholders.

Local authorities and traditional authorities are also important to consider in the planning process. Academic and research institutions (Rice, 2021), local and international NGOs, multilateral organizations, and donors who could support the process should also be identified.

» Organizing into Resource User Associations or Strengthening Existing Organizations

The extent to which resource users are organized into formal and informal groups, associations, or organizations is an important consideration in stakeholder analysis. This varies across the 11 countries in West Africa assessed by the Women Shellfishers and Food Security project (see Annex H for a list of organized groups per country). Only one country has a shellfishery organization at the national level, the TRY Oyster Women's Association in The Gambia. Detailed information on stakeholders in West Africa is provided in The Women Shellfishers and Food Security project regional assessment report, the 11 individual country reports, and the Literature Review Report (see Annex J for hyperlinks). The University of Cape Coast's Centre for Coastal Management is the repository for detailed stakeholder databases and contact information for stakeholders in the 11 countries. Stakeholders planning to develop shellfisheries initiatives in these countries can contact UCC, ccm at ucc.edu.gh.

Even where organized groups exist, they tend to have weak capacity. Once the key stakeholder groups are identified (or the potential to establish such groups), at this step in the process, assessing their capacity, planning to strengthen their organizational capacity and, if informal, their eventual acquisition of legal status should begin. Establishing such groups (where they are non-existent) that build trust and solidarity around common interests among previously isolated individual women shellfishers can be one of the most transformational and empowering outcomes of the co-management process. It forms the basis for their continued capacity development and the sustainability of their shellfish and ecosystem management actions.

> *If you come to the town council as an individual it is hard for us to help you. If you come as an association, with issues and proposals that are priorities of your member communities, we can more easily support you.* Bruno ADJOVI, 1st Mayor Associate, Office of the Ouidah City Mayor, Benin (Adite, et al., 2018).

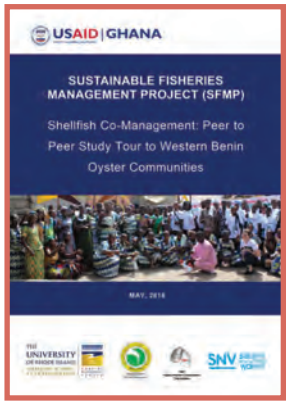
> *…It should be ensured that the range and diversity of the small-scale fisheries subsector along the entire value chain is appropriately represented through the creation of legitimate, democratic, and representative structures. Specific attention should be paid to the need to work toward the equitable participation of women in such structures.* Voluntary Guidelines for Securing Sustainable Small Scale Fisheries, (FAO, 2015).

Peer-to-peer exchanges and study tours among women shellfishers and groups, including representatives of the government agencies who support co-management, have proven to be an effective approach to individual and organizational development of women shellfishers. Peer-to-peer exchanges are likewise highly effective at all steps of the co-management planning process.

Networking across countries on women's shellfisheries has been ad hoc and supported by individual, time-limited projects. A more formal network of women shellfishers and shellfisheries stakeholders could boost development of the sector in the sub-region and serve as a platform to establish and develop the capacity of resource user associations as co-management entities.

A competencies-based approach to capacity development for resource user associations with co-management responsibilities can be useful. Tools for organizational self-assessment and monitoring developed in other regions (Leeney et. al, 2019, see Appendix A) can be adapted for shellfisheries co-management in West Africa.

Lessons Learned from Ghana, The Gambia, Benin Peer-to-Peer Study Tour



For women oyster harvesters who traditionally work individually in their own village settings, realizing the value of forming associations to link harvesters locally and nationally to achieve shared objectives is a learning and engagement process that needs time, persistence, and strong leadership.

Effective practices shared:

Initiate joint activities that build mutual understanding and trust to address common problems. These included exchange visits, participatory research facilitated by local researchers to share local knowledge and test ideas for improving oyster production, harvest festivals, etc. In Benin, frequent flooding was a problem that could not be addressed individually and convinced oyster producers to start working as a group, even though many women were discouraged by high oyster mortality.

Conduct an open, transparent, and inclusive process that has repeated cycles of outreach over time to inform and identify all interested actors, enables them to be welcomed, their perspectives to be heard and their concerns to be addressed. Densu Oyster Harvesters Association (DOPA) is the result of this ongoing process initiated in 2016 in Ghana. TRY Oyster Women's Association was formed in The Gambia in 2007, but the process is continuous even after a decade. In Benin, it is just beginning.

Try a step-by-step approach, working first in one or two communities to demonstrate the expectations and benefits of association. Other communities are more willing to join after observing the results.

Ensure that women lead and own the process. The experience of Ghana and The Gambia has been that, as the principal oyster producers, women are in the best position to steward sustainable management of the resource, their own livelihoods, and benefits for the broader community, even if some men engage in the activity. Leadership training and coaching have helped women leaders in The Gambia and Ghana assume leadership roles and lead effectively.

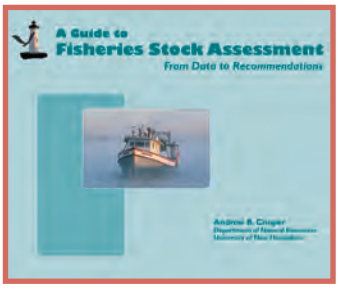
Step 3. Situation Analysis

In this step, information should be gathered on the status and health of the shellfish stocks and associated habitats (e.g., mangroves). This analysis should also include the socio economics of the fishery, including number of harvesters and changes over time; locations of harvesting areas; demographics of users; income and consumption; and their role in the value chain. The processing, marketing, and distribution channels should be mapped. There are many guides on how such information can be collected, including scientific stock assessments and participatory rapid appraisals. Quite often, resources for detailed scientific studies may not be available, and in these situations, rapid appraisal techniques, drawing primarily on local traditional knowledge, can be adequate to formulate simple management plans.

Stock assessments: A stock assessment is the process of collecting information that provides managers with information about the condition of the fish stocks, level of fishing intensity, and changes over time. This helps managers understand the health and sustainability of the fishery, whether stocks are declining or stable, and whether fishing intensity is too high to achieve maximum sustainable harvests. Generally, stock assessments are conducted by fisheries biologists, who use mathematical models that require large amounts of biological data to determine current status and future trends. Scientific stock assessments of estuarine shellfisheries are rare, so Participatory Rural Appraisal (PRA) methods can be used to provide qualitative information based on local knowledge and history. Key questions to ask include:

- Is the number of fishers increasing, decreasing, or about the same?
- Is it taking a longer amount of time to harvest the same quantity of product?
- Is the resource becoming scarce to find, so that harvesters need to travel longer distances to find stocks to harvest?
- Is the average size of the species harvested becoming smaller?

Click on the images for examples of Participatory Rural Appraisal tools, a stock assessment guide, and academic research used in this context.



If the number of harvesters is increasing, it is taking longer to harvest the same amount, the resource is becoming scarce, or the size is getting smaller, these are indications of overfishing and possible decline in abundance of stocks. If this is the case, then the management plan goals, objectives, and actions need to address these issues, with an aim to rebuilding the fishery. If the stocks and harvests seem stable and healthy, then the plan should attempt to maintain the fishery at sustainable levels. Use a precautionary approach if uncertain.

Legal review: A legal review is necessary to understand the policy-enabling environment for management, such as who has authority over the resources to be managed and approves regulations and management plans concerning their harvest. The review should determine if laws, regulations, or policies allow authorities to delegate fisheries management responsibilities and use rights to stakeholders. In some countries, this is allowed, but in others, it may not be. In some instances, national fisheries laws may require management plans to have a certain content or follow a certain procedure for approval. The local plan and rules must be consistent with national laws, policies, and regulations.

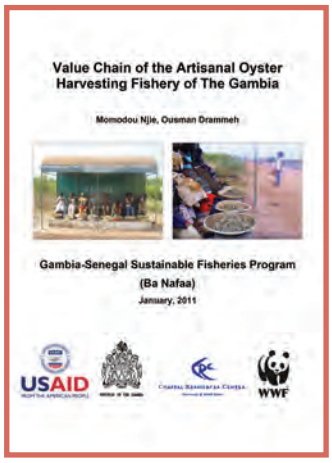
Understanding the role of traditional authorities is also important, whether it be formal or through informal institutions and norms.

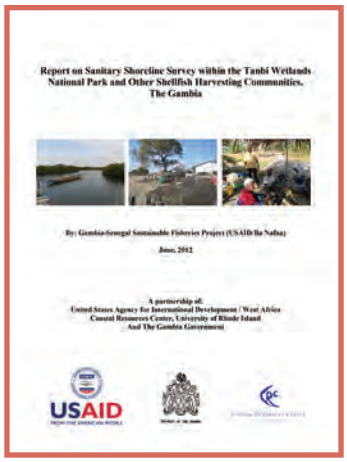
Whatever the enabling conditions, stakeholders should be encouraged to take initiatives within their control and drive development of improved enabling conditions through their demonstrated experience. Communities can lead; governments are "elected followers."

Stakeholders should be encouraged to identify and take initiatives within their control and drive development of improved enabling conditions through their demonstrated experience

Other studies: A variety of studies could be considered in this analysis, if they exist. If not, they can be initiated at this stage or later in the process to improve evidence for management decision making. These include:

- Fisheries Value Chain Study, to identify opportunities for improvements;
- Sanitary Shoreline Survey, to identify potential pollution sources and risks;
- Participatory Action Research on shellfish biology, fishing effort and catch monitoring, environmental conditions, and other themes;
- Water quality testing to identify potential health risks and overall health of the estuary.





Click on the images for examples of some of these types of studies.

Step 4. Establishing Institutional Arrangements

In this step, the governing arrangements for the implementation of the management plan need to be discussed and decided. The decision whether to delegate exclusive-use rights and to which entity or individuals should be determined at this step. For implementation of a co-management plan, institutional structures, either formal or informal, are required. Determine which key stakeholders are charged with implementing the management plan, monitoring and evaluation, and adjusting actions as needed, among other functions. Typically, this takes the form of a management committee and possibly, other sub-committees or advisory or technical committees. The number of committees should be kept small and membership not too large, if they are to be effective and agile. Rules on how committee representatives are chosen, terms of office, and responsibilities need to be clear and explicit.

For community-based management, the resource users need to be the prime members of a management committee. Experience has demonstrated that in setting up institutional arrangements for community-based management, outside groups, such as government, NGOs, or research institutions, should act in an educational, advisory and supportive capacity for the user group. Government plays a unique role, as it has ultimate authority to approve management plans and grant use rights. A user group management committee or committees for small-scale isolated systems, ideally, should have membership made up entirely of shellfish harvesters, and not include any government or other outside representatives. This is to fully empower the users in decision making and prevent the possibility of elite capture by committee members that may have different or higher socioeconomic standing than the users. This is particularly important if the harvesters are predominantly women with low socioeconomic status and where a large proportion may be illiterate or have little or no formal schooling. Decision making is best left in the hands of the users.

Advisory committees with technical staff or respected community leaders should not be involved directly in decision making but play an advisory role, or provide a final endorsement and approval of regulations drafted by user groups. A government authority, an advisory committee or technical committee can review the plan to ensure it does not contravene any national laws or regulations and promotes sustainability of the resource. Local authorities or fisheries agencies can have veto power if regulations proposed by the resource users are deemed damaging to the environment or the shellfish resource.

The makeup of the management committee and other supporting committees, if any, their means of selection, length of service, and roles and responsibilities should be articulated in the plan. Roles of supporting groups, such as a government fisheries agency, local government, a local university, or an NGO can also be described.

For community-based management, the resource users need to be the prime members of a management committee

Bear in mind that the planning group that initiates the process with resource users is not necessarily the same as the final management committee charged with implementation. Although some members may be in both a planning group and a management group, for community-based management, the management group should be centered around and dominated by the resource users themselves. Planning facilitators need to phase down their role as institutionalization of a management committee and its capacity gears up.

Phase II: Developing the Management Plan: Where Do You Want To Be?

By this phase of the process, a planning group is established, key stakeholders are identified in a situational analysis and engaged, shellfish species to be managed, and issues and needs concerning management of the fishery are identified. Before jumping into discussions on management actions and regulations for the plan, work with the stakeholders on determining the ultimate purpose of the management plan, a vision for the fishery, and related goals and objectives stakeholders hope to achieve for the fishery. Keep in mind that the fishery includes both a biological and ecological component, as well as social and economic elements.

Step 5. Vision or Purpose

In this step, the planning group and stakeholders should decide the purpose of the management plan or set a broad vision of what the plan hopes to achieve. This generally is a single statement or a few short sentences that are outcome-oriented. This is a statement of a future desired state for the fishery and is not time-bound. For participatory community-based management, a written statement could be accompanied with a pictorial graphic of the vision developed by the stakeholders themselves. The purpose or vision statement needs to be fully owned and endorsed by the stakeholders, and, ideally, developed themselves through a facilitated process. Later in the process, the decision can be made exactly how and when to measure whether the objectives and, ultimately, the purpose of the plan have been achieved. Here is an example of a purpose statement:

> *The purpose of this co-management plan is to ensure the sustainable management and development of the cockle and oyster fishery and enhanced benefits to those involved in the market value chain (*Cockle and Oyster Fishery Co-Management Plan for the Tanbi Special Management Area, The Gambia, 2012*).*

Step 6. Goals and Objectives

At this step, the planning group and stakeholders need to decide on the goals and objectives to achieve the vision or purpose statement. These are not yet actions or rules, but broader statements. Typically, goals could be related to an ecological or biological goal (e.g., prevent overfishing, restore degraded habitats), or socioeconomic goals (improve income or food security of resource users) and capacity development (strengthen the co-management association). Objectives are more specific than goals, can be realistically achieved in the plan timeframe, and are typically time bound, realistic, and easily measurable. For example, to achieve a goal of preventing overfishing, objectives might be to limit catches or effort at certain levels or prevent harvesting of juveniles. A socioeconomic objective to improve income could be for a certain percentage of women harvesters to be earning incomes above the poverty threshold.

Goals and related objectives need to be user-generated and driven and agreed on by the majority of those who will be affected. Outside agents play a role by facilitating dialogue and generating consensus among resource users and sometimes making suggestions. Some plans may have fewer tiers of purpose, vision, goals and objectives. For example, they may have only a vision statement

and objectives. Regardless of what you decide, each level becomes more specific and is designed to achieve the level above. It is important, however, to arrive at realistic and specific objectives that the group has confidence can be achieved before proceeding to the next steps. Figure 12 shows an example from the Densu Delta Community-Based Fisheries Management Plan, Ghana.

Purpose	Goals	Objectives
Establish an ecologically and economically sustainable oyster fishery	Biological: maintain oyster stocks well above exploitation levels to ensure sustained harvesting	Establish sustainable harvesting of oyster resources that avoids juveniles from being picked and allows larger more valuable oysters to be harvested
	Ecological: rehabilitate mangrove habitat to levels that can ensure sustained harvesting	Maintain the health and functioning of the mangrove ecology, thereby protecting important habitats of oysters and other fish species
	Socio-Economic: improve the standards of living for local oyster harvesters through improvement in oyster value chain activities and employment opportunities leading to improved income levels of resource users	Improve post-harvest value chain activities for oysters, thereby reducing poverty and improving food security among both women and men oyster harvesters
	Capacity Development: association strengthening	Strengthen local community involvement in planning implementation and decision-making in the sustainable use of oyster resources Strengthen capacity of membership and leadership of the Densu Oyster Pickers Association to participate in key community decision-making

Figure 12: Example of Co-Management Plan Purpose, Goals, and Objectives

Phase III. Developing the Management Plan: How are You Going to Get There?

In this phase of plan development, decide on a set of measures and actions to achieve your plan's objectives and overall vision. A precautionary approach should be taken. In this phase, decide on penalties for any infractions of rules established and what resources are needed to implement the management measures.

Step 7. Management Measures

In this step, management actions need to be selected that, once implemented, provide a reasonable expectation that the plan's goal and objectives can be achieved. Actions need to address the problems or issues identified as part of the situational analysis directly. As objectives of the plan could relate to biological, ecological, and socioeconomic issues, actions need to be tailored to each of the specific objectives identified.

At this stage, it is easy to develop a long list of measures that can quickly become unrealistic and unachievable. Brainstormed laundry lists of actions can be culled, factoring in what can be done with resources available and what stands the best chance of contributing to achievement of

the plan objectives through a process of prioritization by resource users. It is important to stay practical, taking into account what a small group of resource users can accomplish on their own with limited resources. It is also important that most actions be user-focused and minimize dependence on outside agents or institutions to implement.

There is a menu of good practices that can be selected to achieve sustainable harvesting objectives, detailed below (see Section C, Management Measures). The menu also has suggestions for achieving socioeconomic goals as well, such as post-harvest improvements aimed at value addition. In some cases, a rule or action may contribute to several plan objectives. Although it is best to organize regulations and other actions by each objective, where overlap occurs, try to place the action where you think it makes the biggest contribution. Comments or accompanying text can acknowledge its partial contribution to other objectives in the plan.

Harvest-control measures generally consider input controls that restrict fishing effort (e.g., licensing to restrict access or limits on days harvesting), output controls that limit catch (e.g., limiting individual daily harvests or an annual maximum quota), or technical measures that restrict how or when shellfish can be caught (closed seasons, closed areas, or gear restrictions). In most instances, control of harvesting practices will require that several management measures be implemented in combination, but the rules should be kept as simple and easy as possible for resource users to understand and follow.

It is best if the selected rules and actions are decided by the resource users themselves to ensure legitimacy and high compliance on implementation. All users should understand the rationale for the rule and expected benefits it will provide for the fishery. For shellfisheries involving oysters, cockles, or periwinkles, closed seasons, closed areas, and size limits are popular choices. If use rights are provided as part of the plan, then consideration needs to be given in how to determine who can harvest, when, where, conditions for allowing any new entrants into the fishery, and if fees should be collected from users. Fees can then be used to support management actions and enforcement. Consideration of historical seasonal migrant fishers' rights must also be considered.

Step 8. Establishing Penalties and Sanctions

The plan must also establish penalties for any users, or other persons or groups who violate the rules established in the plan and identify a group or persons able to impose sanctions and determine penalties. This step occurs after the management actions are determined; penalties can be generic for any infraction of rules or specific and vary based on the rules in the plan. They must be severe enough to deter possible violators, but not so severe as to impose an undue economic and social burden on an offender, especially for first offenses.

Generally, the authority to sanction violators is provided in the formal management plan. It is important that higher authorities endorse and support the legitimacy of resource users to set their own rules and the right to enforce them. Best practice calls for graduated sanctions, where penalties for a first offense are lighter than for a second, third, or multiple offenses. Penalties must be considered fair by the resource users and be strong enough to deter infractions, but not so harsh that no one will want to impose them on violators. Some examples may be a verbal warning by the management committee or a request for an apology by the violator and a promise not to do it again for a first offense. Subsequent infractions could involve a monetary fine and/or loss of rights to harvest for a period of time or permanently. Simple systems of deterrence and justice are often easier to implement than complicated ones. Penalties proposed should be reviewed to ensure they are allowed and legitimate in the local governance system.

Often, if there is a dispute by the violator on penalties decided by a management committee or enforcement sub-committee, resolution can be arbitrated by the government authority, a traditional leader, or a co-management advisory board. Respected traditional authorities can play a role in imposing penalties or act as a mediator if there are disputes about infractions or the penalties imposed. Where users from several villages may be involved, traditional authorities from each village can also play roles in ensuring compliance or in deterring others from their village, where a violation may have been committed in a neighboring village.

Step 9. Resources

At this step in the process, the planning group should identify what resources are needed to implement the plan. This can be itemized for each action contained in the plan. Resources include a budget requirement, in-kind resources of the users themselves, and those who can play supporting roles.

Phase IV. Planning to Implement, Evaluate, and Review the Management Plan: How Will You Know You Are There?

Step 10: Formal Approval of the Plan

As indicated in Table 2 (on page 16), this is the step at which the written management plan is formally approved and rule-making rights recognized by outside authorities. This is usually the national fisheries agency or local government authority if they have delegated authorities for fisheries management. Although it is best to have one lead agency approve the plan, it can have signed endorsements of concurrence from other authorities, such as a forestry agency. In cases were the plan area overlaps a park or a reserve, a wildlife division, as well as a local district head can sign endorsements. Endorsements might also include a traditional authority such as a river priest, village headman, or local chief.

Formal approval should be made in a public ceremony at the site of the management plan, where resource users, local community members, and local authorities are represented. This has been demonstrated to strengthen the legitimacy of the resource users' rights and responsibilities as they undertake implementation. The presence of respected local authorities and traditional leaders can be particularly important.

Step 11. Implementation

In practice, many communities begin informal implementation of the management plan well before it is formally approved by outside authorities. Annual action planning and review facilitates implementation. Plans should be viewed as living documents. As experience is gained and lessons learned during implementation, revisions to the plan should be considered. This could be done during annual reviews, or, after a few years, a full-scale review of the plan and amendment should be considered.

Step 12. Monitoring

Develop a monitoring and evaluation plan that is practical, based on the capacity and resources of the co-management institutions to achieve. The status of the resource and the amount of harvesting taking place should be monitored in addition to monitoring whether management actions specified in the plan were implemented. This will track how well management is working and improve understanding of how the fishery functions. Engaging the resource users themselves and youth from resource-user communities can facilitate data collection and analysis, especially in the absence of government agencies providing resources to do this. Academic and research institutes can also support monitoring and evaluation. Scientists and resource users working together to collect data can produce more relevant, more trusted, and a greater quantity of data than scientists working alone, in addition to the support for fisheries management it generates.

Scientists and resource users working together to collect data can produce more relevant, more trusted, and a greater quantity of data than scientists working alone, while also generating support for fisheries management

Harvester groups can collaborate with government and academic partners to design data collection programs and assist with analysis and interpretation. Information about shellfish populations and harvesting activity generated through participatory research can then be used as indicators of progress and to design, evaluate, and refine management measures. Monitoring plans can use input or output indicators for activities and outcome indicators for the objectives. An example below from the Densu Delta Community-Based Fisheries Management Plan shows output indicators for oyster harvesting activities.

Management Action(s)	Measurable Indicators	Means of Verification	Baseline	Target	Frequency
Closed areas as oyster refuge for oyster restoration and growth	Number of 'closed areas' established measured in acres	Total number of acres closed	0	2 (measured in acres of total area)	Annual
Closed season for oyster stock replenishing	Number of oyster resource is banned from harvesting	Total effective days counted for banned oyster harvesting (photos from closed season durbar ceremony)	0	150	Annual
Pilot oyster culture	Number of individual oyster culture established (measured in total acres)	Photo evidence of oyster culture sites and progress report	4	5	Annual
Establishment of size limit for harvesting oysters (minimum of 4cm)	Percentage of harvested oysters returned to river because of minimum size limit (measured in total kilogram)	Photos and progress report	0	30% of total catch	Annual

Figure 13: Example of Output Indicators and Targets for Oyster Harvesting Management Actions from the Densu Delta Community-Based Fisheries Management Plan

Figure 14: Women Shellfishers and Youth Trained by UCC to Monitor Water Quality in The Tanbi Wetlands in The Gambia (Photo Credit UCC)

Step 13. Reviewing

Plans should include a regular schedule of review and mechanisms for making adjustments without a burdensome amendment process, to encourage adaptive management that keeps pace with changing environmental, demographic, economic, and health emergency conditions including Ebola, Cholera, and now COVID-19. Formative reviews can be conducted annually and if the plan is time bound, such as for five-years, then a mid-point or end-of-period comprehensive review should take place.

The purpose of reviews is to decide whether the objectives and goal of the plan are being met, and whether tactical or strategic actions need to be modified or changed to better meet the plan's goal and objectives. Changes in actions or management measures should be at the discretion of the management committee. The formal approval authority (e.g., fisheries agency) can review these,

but should not intervene unless they contradict existing law or are harmful to the sustainability of the fishery. Formal review and renewed approval of plan changes is likely needed if the goal or objectives of the plan change. For example, the Cockle and Oyster Fishery Co-Management Plan for the Tanbi Special Management Area, The Gambia states:

> *Rules need to be approved by the majority of the TRY management committee in a meeting where a quorum (majority) of committee members are present and noted in written minutes. Rules must be communicated to all TRY members via TRY community committees verbally or in writing within 14 days and transmitted for information purposes only (not approval) to the Department of Fisheries, Department of Parks and Wildlife Management and Department of Forestry for assistance in enforcement and as a basis of annual audits and to ensure consistency with existing national laws and regulations.*

» Public Education and Awareness Creation of Regulations

During the planning phases, educating shellfishers about shellfish biology, estuarine ecology, and water quality helps provide a better understanding of the rationale for various types of management measures. Shellfishers also need to be educated about each management action considered, and for harvest control measures, how each works to protect the resource and contribute to sustainable and enhanced harvesting yields in future years. These education and awareness creation actions should be part of the participatory planning process. Additionally, once rules are established, penalties decided, and committees established, all stakeholders need to be fully aware of what they are as well as how and why they are being implemented.

Information, communication, and educational campaigns should continue as part of implementation actions. For instance, information of harvesting rules or closed areas can be shared in harvesting communities through posters, signboards or informational brochures. As many shellfishers may not be literate, consider means other than through written materials alone. Use more pictorial or visual aids. This can also be accomplished through community events, community dramas, or involving school-aged children of harvesters.

Finally, a reminder that although this section presented 13 Steps in the management process in sequential order (one after the other), fisheries management is not a linear process. Several steps may occur simultaneously, or the development team may want to revisit an earlier step as new information and decisions are made along the way. Implementation of management measures may also be started while planning is ongoing and can generate momentum for the process through collective action and early results.

C. Management Measures

Once the fisheries issues of concern have been identified and goals and related objectives for management established, the process of selecting a choice of management measures can begin. This is part of Phase III described previously. The options below are not an exhaustive list of options, but represent most of the basic approaches to managing a sustainable fishery, applying ecosystem-based approaches, and achieving ecological/biological, socioeconomic, and development objectives. The menu of options below is focused mainly on examples for cockle and oyster fisheries that are of most concern for women shellfishers in the West Africa region. However, most can be applied to almost any mollusc fishery or even other types of artisanal fisheries (shrimp, crabs, finfish).

The choice of management measures should be decided by the harvesters themselves but can be guided with technical support provided from external institutions

The choice of actions should be related to the objectives set by shellfish harvesters during the planning process. The choice should be decided by the harvesters themselves, but can be guided with technical support provided from external institutions, such as academic research institutions, universities, government fisheries and forestry departments, or environmental NGOs, among others. Actions should be selected to achieve a biological or socioeconomic objective, but in many instances, one action can also contribute to more than one of the management plan's objectives. In many instances, there will be tradeoffs between improving ecosystem health versus a short term decline in fishery landings. However, research,

local knowledge, and scientific expertise can help resource users determine a good course of action for maximizing ecological gains and minimizing short-term reductions in catch. A key principle here is that choice of actions is not absolute and can change over time, based on the relative results from each action implemented, and as issues in the fishery change. For instance, changing the duration and timing of a closed season, or whether to allow or restrict additional harvesters into the fishery. This is the application of adaptive management, whereby actions are evaluated periodically and changes made as needed, based on information as to whether the actions are achieving expected results.

Below are good practices geared toward biological objectives that promote and protect sustainable harvesting, while also addressing overfishing and declines in stock of the species under management.

» Closed Seasons and Closed Areas

Closed seasons can reduce pressure on the population of shellfish by reducing the amount of fishing effort over a given year. This helps retain a viable population of organisms that can spawn and reproduce the next generation of shellfish that can be harvested in subsequent years. If the spawning period for the species of concern is known, then closed seasons during spawning periods is a good practice to help protect spawners or spawning periods and allow oysters to grow to maturity before harvesting. A good rule of thumb is that harvested species should have the opportunity to spawn at least once before being harvested, such as waiting to harvest until after the main spawning season. The spawning season can be assessed by looking at the condition of reproductive organs (gonads) inside of the shellfish to see when they are about to spawn. Generally, a trained biologist is needed to make this sort of assessment. However, another approach would be to assess when baby oysters (spat) or baby cockles seem to be most abundant. It could then be inferred that peak spawning likely occurred about a month earlier.

Figure 15: Members of the Densu Oyster Pickers Association Announcing the Fifth Consecutive Annual Closure of The Lagoon to Oyster Harvesting (Source: Development Action Association)

Spawning seasons for shellfish vary from place to place and may be linked to rainfall, salinity, or water temperature. Oysters, for instance, generally spawn when water temperature increases. In some cases, there may be no peak spawning season and they may spawn year-round. In this case, a closed season would have an objective more toward reducing fishing effort if it is excessive (more and more harvesters over time or more time spent harvesting daily), and if the size of the organisms is decreasing with too many juveniles being harvested. A closed season can also help shellfish grow to larger sizes, which may have an economic or market price advantage. This may be a way to increase price and profits for harvesters.

The length of a closed season can vary from a few months up to 8 months of each year. An eight months closure is practiced in The Gambia and five months in Ghana (see Figure 15). If biological goals lend themselves to longer closed seasons, this approach may need to be moderated by considering the socioeconomic circumstances of the harvesters. A long closure could mean an extended period of reduced income and food for harvesting households, creating undue hardship if they have few alternative means of food and income generation. If a long closure is not preferred, other actions (see following page) can be combined to achieve an overall objective to promote sustainable harvests.

Another option to a closed season throughout an estuary would be to select some areas within the estuary as areas that can be permanently or seasonally closed. A good rule of thumb for permanent closed areas is to set aside 20 percent of the shellfish habitats in closures. Permanent closures also help improve the overall biodiversity of an estuary and provide a reservoir of spawning stock to ensure sustained harvests annually. If the objective is to protect a spawning

stock, then areas selected should have a good abundance of the species being managed. However, if an area previously had high abundance of the organisms and was depleted due to overfishing, then a closure can help rebuild depleted populations in areas that were subject to overharvesting. The purpose of a closure in any given area should be clear as part of its establishment.

As many shellfish – bivalves in particular - are sedentary (they do not move far during their life, once they settle from their larval stage in the water column onto their bottom habitat), permanent closures could lead to such high abundance that the rate of bivalve production decreases due to competition for food and space. Therefore, rotational closures can also be considered, where one or more areas may be closed for a season or even a few years, then opened to harvesting, while other areas previously open are then closed.

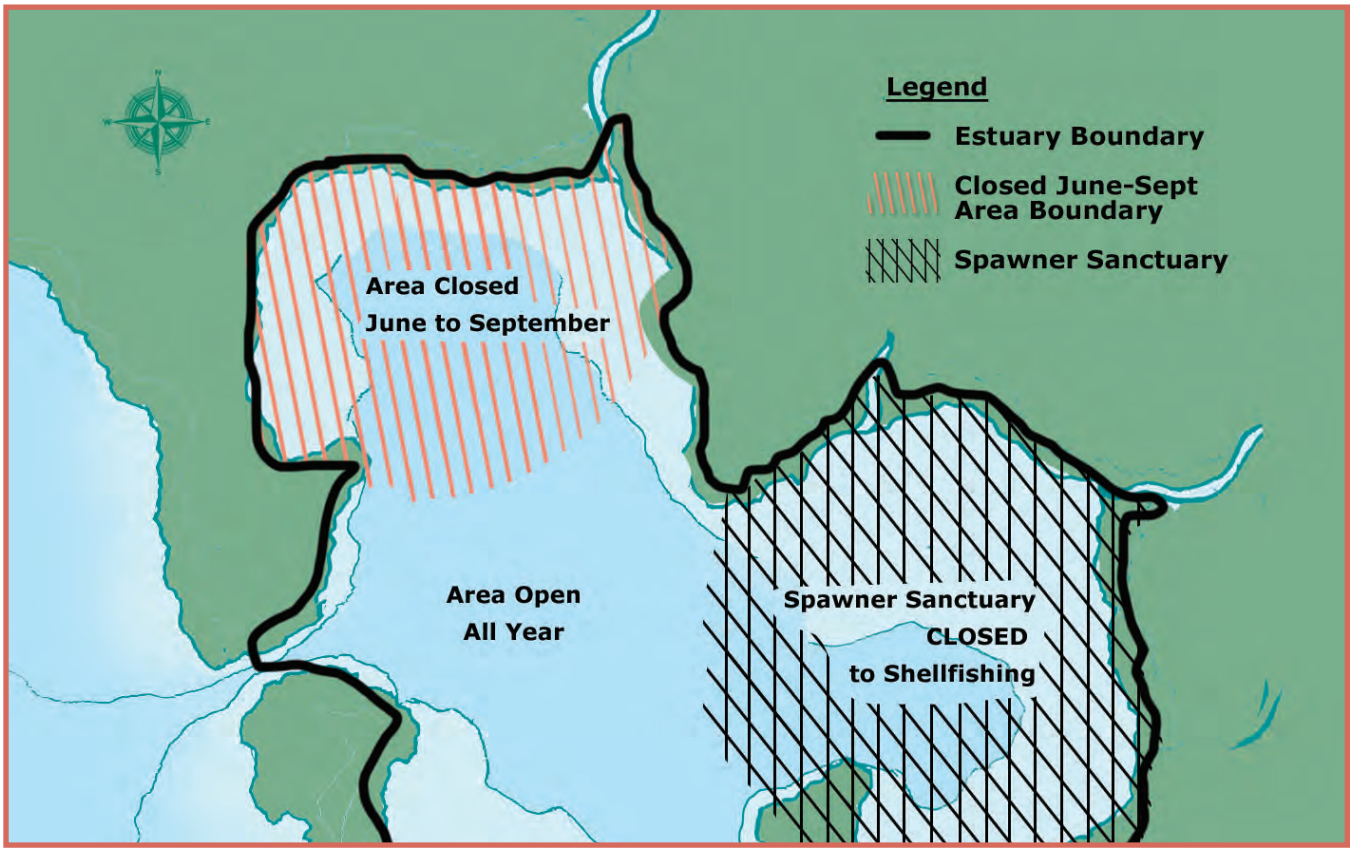


Figure 16: Map Showing a Shellfish Management Permanent and Temporary Open and Closed Areas in Estuary Boundary

There are many variations and options when considering closed seasons and closed areas (see Figure 16). There is no one best way or an easy means to determine which may be best for any given estuary. Some experimentation over time may be needed, relying on direct observations of shellfish harvesters on whether the approach is working or not. In some circumstances, a university or government agency could help with biological monitoring using scientific methods, but this can be costly and unlikely to be applied everywhere in a large number of remote harvesting areas. Hence, dependence on local knowledge and qualitative judgement of the shellfish harvesters may be the only means of evaluating results of management actions.

Often, seasonal closures or areas are supported by traditional authorities and may not be codified in formal regulations of the government. However, if supported by the communities and harvesters, informal or de facto rules can be as effective, or more effective in some instances, than formal government issued regulations. Ideally, such rules can have both formal recognition in current law and informal support from traditional institutions.

» Size Limits

Harvesting-size limits can be used to ensure that individuals harvested are not too small. This ensures that individuals have the opportunity to spawn at least once in their life before being harvested. Typically, a size limit for an oyster, a clam, or any fish species is at or above the mean age and size of maturity (the age or size when the average individual can spawn or reproduce). This allows at least half of the organisms to reproduce at least once before death from harvesting and helps ensure there is a next generation to be harvested in subsequent seasons or years.

Size limits may be the only choice to manage a fishery in some instances. This would not restrict the number of harvesters, allowing many to harvest. However, if over time, there are many harvesters and overfishing is occurring, most of the "legal"-sized individuals might be harvested quickly in any given year or become hard to find while gathering. This would be a sign of overfishing (too many harvesters and a long period to harvest a given number of individual oysters or cockles). A size limit would ensure that the resource is sustained, that there would be future harvests, and that the species would not be completely depleted in a given estuary, but the overall amount of harvested resource would be smaller than what could be sustained annually. Size limits are often combined with seasonal and/or area closures or daily catch limits to maintain healthy populations and maximize harvest.

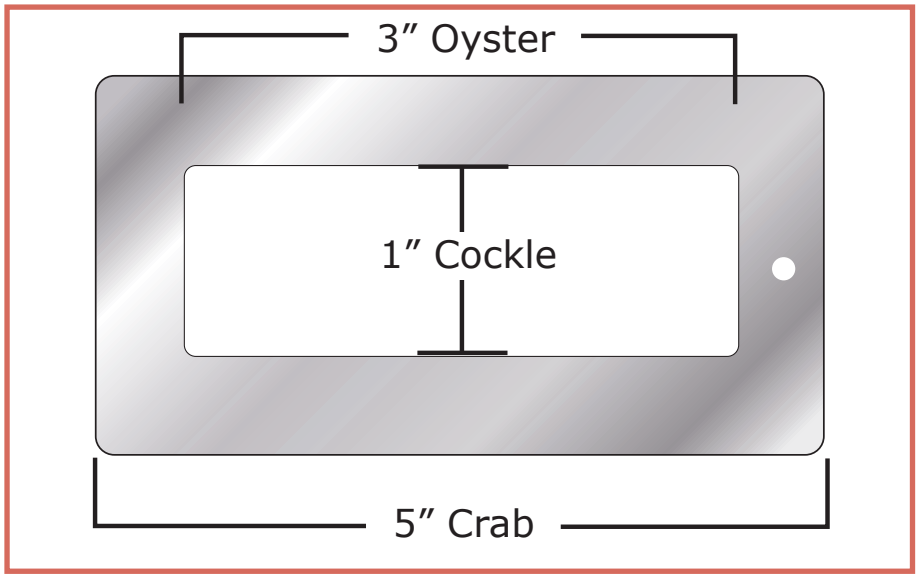


Figure 17: Gauge for Measuring Legal Minimum Size Allowable for Harvest

A harvesting-size limit means that a harvester cannot keep or sell undersized individuals. This is a relatively easy rule to comply with and enforce. Gauges are used in many countries by harvesters and enforcement authorities to determine if the organisms harvested are of legal size and can be kept. Otherwise, it has to be thrown back or returned to the environment where it was harvested. Gauges are simple to make from wood or aluminum sheet metal. They can be specific for one species, but can also be one gauge for measuring several species, as shown in Figure 17. For clams or cockles, the shell thickness is used (see Figure 18). If the clam is placed in the center hole of the gauge and falls through, then it is undersized. If it does not pass through the slot, it is of legal size and can be kept (Figure 19). Oysters and crabs can be measured using the length of the gauge and the length of the individual. For crabs, the carapace (main shell covering the crab) length is used (Figure 18). Size gauges typically have a small hole drilled on one corner, so a small string can be tied to it and then attached to a person's waist or a small float so it is not lost if dropped in the water.

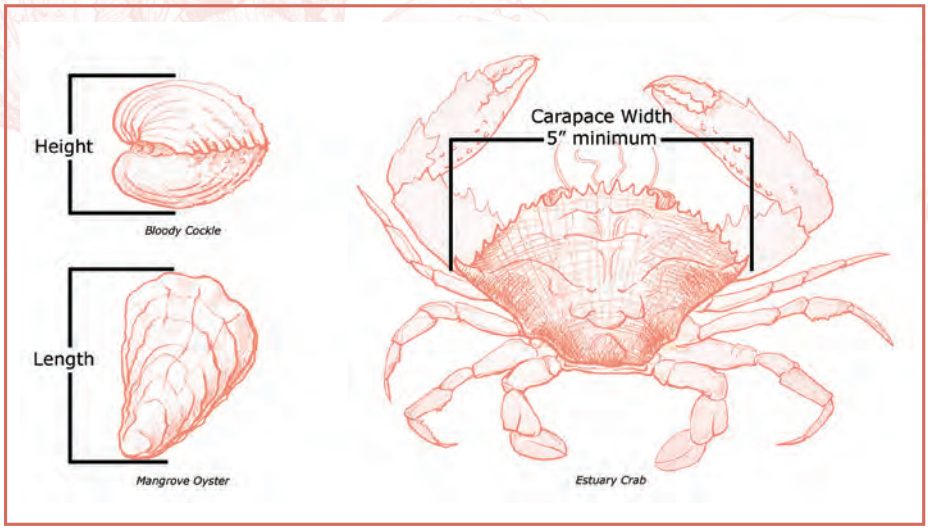


Figure 18: How to Measure Shellfish and Crabs

Figure 19: Child Learning How to Measure the Legal Size of a Clam. This One's a Keeper, as it is Not Falling Through the Gauge

» Daily Quotas

A daily quota can be used in instances where there are many harvesters and overfishing may be occurring. A daily quota restricts the level of effort in an attempt to maintain adequate levels of spawning stock biomass. Daily quotas are typically combined with size limits, which can ensure optimum reproductive success. An example of a daily limit would be no more than one pail or basket harvested per individual per day.

Determining an optimum daily harvest limit is difficult without data on current daily catches per individual or time series data on catch per unit of effort. In a data-poor context, where overfishing is suspected and numbers of harvesters have been increasing, harvesters can be asked to estimate their current average harvests per day to set as a baseline. A daily quota can then be set somewhere below this baseline, such as 75 percent of the current average daily harvest. Reassessing the situation annually by judging whether the abundance of shellfish has been increasing or if it is easier to fill a basket in a given time period would be a sign the daily quota is working. The daily quota could be adjusted up or down annually as needed.

Bear in mind that daily quotas can restrict the amount of product harvested per individual and therefore restrict income. This could lead to shellfishers cheating on quotas to make more money, so effective enforcement mechanisms and maintaining support for management would need to be considered.

Figure 20: Oyster Harvest in a Boat (Source: UCC)

Species	Minimum Size	Non-Management Area		Management Areas	
		Resident Limit	Non-Resident Limit	Resident Limit	Non-Resident Limit
Bay Quahaug Mercenaria mercenaria	1” hinge width	1/2 bushel	1 peck	1 peck	1/2 peck
Oyster Crassostrea virginica	3” longest axis	1/2 bushel	1 peck	1 peck	1/2 peck
Scallop Argopecten irradians	no seed possession	1 bushel	residents only	1 bushel	residents only
Surf Clam Spisula solidissima	5” longest axis	1/2 bushel	1 peck	1 peck	1/2 peck

Shellfishing is prohibited statewide between sunset and sunrise. (rev. 11/30/2021)

Figure 21: An Example of Shellfish Size and Daily Quota Regulations in Rhode Island

» Limiting Days Allowed for Fishing

Where excessive fishing is occurring, effort can be limited by restricting the days that can be fished. For example, no fishing allowed on Mondays or Tuesdays and weekends. These types of fishing “holidays” are common in many places of West Africa, and are often supported by traditional authorities. Another option would be restricting the time of day when shellfish could be harvested, only in the morning or afternoon, and not after sunset or before sunrise. The effectiveness of this type of measure on reducing harvest depends on harvesters not being able to make up for restricted days and times by harvesting more during the allowed days.

Restricted Access and Licensing

Restricted access is where the number of harvesters allowed to harvest is limited. This could be in the form of issuing licenses to each individual harvester, and then restricting the number of harvesters or licenses to a limited number. A license can be issued by a government agency with authority for fisheries management or an association that has exclusive-use rights to the fishery. In some countries, shellfishing licenses are purchased, and a fee is paid. This can be a source of revenue for a management entity, government, or user group. The license fees can be used to support management. Similar to a driver’s license, a shellfishing license typically needs to be carried by license holders while shellfishing to show proof that they have a license to harvest. Low-cost ID/license badges made of waterproof plastic are available in most countries. The license can be printed from a laptop or desktop computer and can include a picture of the person and a bar code in the license card (see Figure 22). Harvesters found collecting without a license can be fined.

Figure 22: A Mock-Up Example of a Shellfishing License Issued by a Town Government (right), License and Size Gauge Placed on a Lanyard Worn Around the Neck by the Harvester While Shellfishing (left)

» Habitat Protection and Restoration

The above menu of management actions provides ways and means to control harvests to ensure maximum sustained yields or to help rebuild depleted shellfish stocks. However, they are not the only actions that should be considered. Good practices in fisheries management also apply ecosystem-based management approaches within the entire estuary, to ensure the health of the ecosystem as a whole in which shellfish thrive. The concept and application of essential fish habitat comes into play here. This refers to the need to protect and maintain healthy habitats where the harvested species live during critical life stages. The following examples point to actions harvesters can take to protect shellfish habitat and associated ecosystems and thereby contribute to the health of the harvested species of shellfish.

◇ Mangrove Conservation and Protection

Many shellfish species live on (the mangrove oyster) or under (bloody cockles) mangrove trees. Mangrove trees also create the appropriate environmental conditions (e.g., temperature, dissolved oxygen, and flow) for shellfish to live in. Hence, mangroves should be protected as essential habitat for these species. Good practices in this regard would be to prohibit cutting of mangrove roots to collect mangrove oysters, or using tools to remove the oysters from the roots that minimize damage to the mangrove roots (see Figure 23). This is a regulation practiced by oyster harvesters in the Tanbi Estuary in The Gambia.

Figure 23: Axe for Harvesting Oysters Selectively to Protect Mangrove Roots and Leave Juvenile Oysters to Grow
(Source: UCC)

Mangrove protection and restoration should be promoted in tropical areas where mangroves have been degraded or where there is habitat loss from cutting or conversion to other uses. The trend analysis (as indicated in Annex D), based on the data from Global Mangrove Watch, indicates that most of the countries in West Africa experienced declining mangrove cover over the past several decades. Only The Gambia and Benin, to some extent, have shown marginal increases. However, it is important to note that in-depth analysis at a broad scale can obscure differences at the local level. For instance, in The Gambia, while there was little change overall nationally, the detailed breakdown of the changes in different estuaries showed losses in some areas and gains in others. Reforestation/restoration can be accomplished in many ways. Although many countries have bans on cutting of mangroves, particularly in parks and reserves, this practice is common, as mangrove wood is used for cooking oysters, making charcoal, smoking fish, and in household construction, among other things.

If bans can be effectively enforced, then that should be promoted. However, in cases where mangrove cutting has been practiced for a long period of time, another approach would be to promote sustainable mangrove harvesting practices. If shellfishers are educated about the importance of protecting mangrove habitat to maintain a healthy shellfishery, that could be a strong motivator for increases stewardship behaviors among harvesters. Shellfish harvesters can be leading actors and promoters of local mangrove protection.

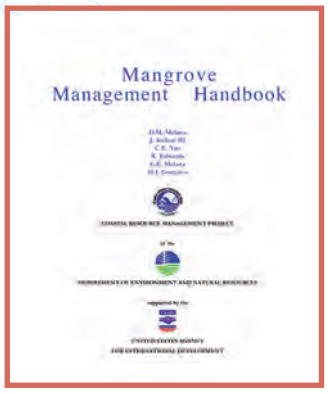
In many cases, mangrove forests are severely degraded. In these cases, or where mangroves may have been completely deforested by mangrove harvesters, shellfishers can promote regeneration and replanting of mangroves. Regeneration is done by facilitating the natural spread and growth of mangroves by protecting their habitat, especially on the borders of mangrove areas, and by ensuring that mangrove seedlings sprouting naturally are not destroyed. Replanting can be done by directly transplanting seedlings (called propagules) collected from the wild, by growing wild propagules in a nursery so that they are more mature before replanting, or by growing mangrove seedlings in a nursery from seeds for planting. Before replanting is undertaken, communities should identify local expertise to ensure that the considerable time and effort involved in replanting and maintaining survival of planted areas is successful, especially if hydrologic conditions have changed (see Figure 24).

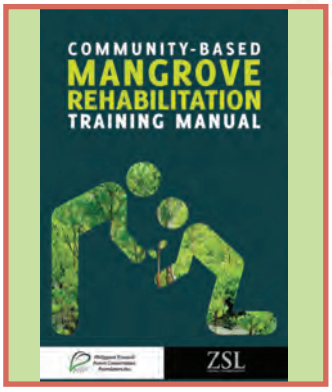
Figure 24: Promoting Wild Regeneration, Harvesting Wild Propagules for Replanting, and Establishing a Nursery (left to right) (Source: DAA)

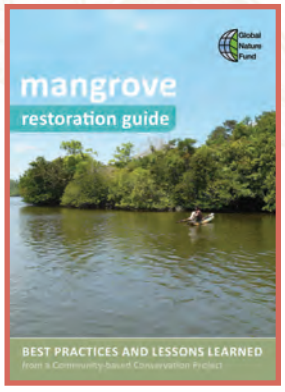
Although replanting is a good practice, as seedlings grow and mature, they are likely to be cut down again, unless the key drivers and practices that led to their deforestation or degradation in the past have been changed. Mangrove cutting may be done by women shellfishers but often involves other actors and male harvesters. In such instances, these stakeholders should be involved in reforestation efforts. For example, In the Densu Delta of Ghana, women shellfishers were supported by USAID to replant mangroves, where almost the entire delta had been depleted previously (see Figure 25). The men who were the main mangrove harvesters and used them for fish capture "brush parks" were convinced and agreed to the women oyster harvesters' suggestions to substitute other readily available and locally grown land-based trees, such as acacia and moringa, grown by local farmers.

Figure 25: Mangrove Seedlings in the Nursery and Transported for Replanting by Development Action Association and Densu Oyster Picker's Association in the Densu Estuary in Ghana (Source: DAA)

There are several guides for how mangrove replanting or sustainable harvesting can be done (click on images for hyperlinks to the documents).







As estuarine and mangrove ecosystems that serve as habitat for shellfisheries in West Africa face multiple threats, identifying threats (direct factors) and drivers (indirect factors) is the first step, followed by identifying actions that can address them. The following methods and tools can be considered and applied to mangrove associated land/seascapes. These can help inform communities of a more robust and effective co-management process for shellfisheries that acknowledges the need for management of mangrove habitats more broadly in shellfish management plans that address drivers and threats beyond those within the direct control of women shellfishers.

Understanding mangrove ecosystem changes requires understanding the land and seascape in which mangroves exist. Mangroves are used by people for different purposes. To understand the drivers and threats, it is key to know:

- How many people use the mangrove vegetation and for what particular reasons;
- How people living in the land-seascapes are changing their interactions with the ecosystems;
- How the land-seascape containing the mangrove vegetation is changing in terms of environmental variables, (e.g., climate change, land use practices, human settlement, etc.);
- The land-use/land-cover attributes in the land-seascape;
- The long-term local ecological knowledge of the resident communities with respect to changes in the land-seascapes. This is key to understanding the state of mangrove vegetation decline due to natural causes such as disease, or soil chemical changes.

Identifying the drivers and threats in a specific ecosystem could be informed by the generic situation analysis for mangroves shown in Annex D and could be done in three ways:

- Participatory tools and methods: These include use-focused group discussions, transect walks, field observations;
- Review of existing documents and reports: This could include local government reports, review of relevant initiatives and projects, research records, and any other data and documentation from local actors, including NGOs;
- Geospatial land-use/land-cover analysis: This is an advanced tool requiring scientific expertise, if aerial photos or satellite data is used. It generates information on the change in hectares of mangroves over a given period, what other land uses are replacing the mangroves, if any, and whether the observed changes are due to natural attributes or human actions.

The application of the above tools depends on the level of detail needed to design the mangrove management actions. The approaches could also be used in combination. For example, a participatory discussion may be followed by geospatial land-use/land-cover change analysis. Participatory approaches could also be used to validate the observations from the geospatial assessments.

There are numerous challenges in the use of the above tools. If such assessments are done at the local level by local communities, community capacity to design and manage the assessment may be low. For tools such as geospatial techniques, communities need external support to undertake such assessments. The other challenge is the need for continuous monitoring and the cost associated with it. Changes in such ecosystems are continuous, hence the drivers may also be changing. Therefore, investment in monitoring, to ensure that the changes and the underlying drivers are captured and reflected in management plans, is necessary.

Strengthening rights-based community management of mangrove resources and collaborative technical support partnerships for communities may help in developing and updating management plans that address drivers and threats by incorporating a landscape/seascape vision for mangrove conservation, improved livelihoods, and food and nutrition security (see also diversified livelihoods and food production sections below). Technical partners could bring in tools and methods in order to train communities to build local capacity for developing and monitoring such plans. There is also a need for enhanced collaboration among local, national, and regional development actors to enhance effective use of mangrove resources to benefit communities and ecosystems. In 2019, recognizing this need, an additional protocol to the Abidjan Convention on Sustainable Mangrove Management (click on the image at left) was adopted and endorsed covering 22 parties, including the coastal states of West Africa. The protocol signals national commitment that communities can reference for holding their governments accountable.

◇ Oyster Reef Restoration

In many locations in West Africa, oysters grow on mangroves, but can also be found in clusters or clumps on bottom substrate, particularly in estuaries with sandy and rocky bottom types. These are often referred to as oyster "reefs," where the quantity of oysters is abundant, with clumps of dead shells and living oysters that can build up a bed or reef consisting of oyster shells fused together through growth over years. Such habitats also support other organisms and biodiversity that live in and among the oyster shells.

It is not unusual in many oyster harvesting communities to see large piles or middens (see Figure 26) of oyster shells in the processing areas in the community. These shells can have value, such as conversion by burning to produce lime used in construction, and as fill for house foundations, pathways, and roads. Shells can also be ground and used as grit on chicken farms.

Figure 26: Piles or "Middens" of Oyster Shells in Village and Processing Areas in The Gambia (left); Returning Oyster Shells as Substrate in the Densu Delta (right)
(Source: TRY and DAA)

Where oysters are found on bottom substrate and in oyster beds or reefs, excess removal can lead to loss of this hard substrate, an essential habitat that serves as settlement areas for larval oysters. These water-column-swimming larvae need a hard substrate to transform into bottom-dwelling juvenile oysters (called "spat"), and oyster shells are ideal for this. As they settle, they transform from larvae to small juvenile oysters and grow into adults that are eventually harvested. Without the hard substrate to settle on, the abundance of oysters could decline. A good practice is to return a portion of the shells harvested back to the nearby harvesting sites to enhance successful spat fall (recruitment) of oysters. Over time, this can also have the effect of expanding oyster beds and creating additional oyster-growing habitat and enhance production for harvesters.

As the shells can be of value and used for other purposes, rules can be established as to where and how much of the shells must be returned to the environment, such as a certain percentage of the total amount of shells harvested.

Returning shells to the harvesting beds can be labor-intensive. This offers opportunities for community-wide events to promote community-level good stewardship. There are periods of time that are better for reintroducing the oyster shells, where spat fall will be greatest in certain seasons or locations of the estuary. This often requires scientific studies that can be carried out by universities or by university students supervised by qualified faculty. Where such support is not available or practical, harvesters can use a trial-and-error approach to determine the best places and times for oyster reef restoration projects. Typically, areas adjacent to where existing oysters are harvested (rather than on top of areas where they are being harvested) or in areas where they used to be found but were depleted from overharvesting are good candidate sites. Monitoring should look for a good number of small baby oysters on the larger shells, a month or so after being reintroduced, compared to the level of other bio-fouling organisms on the shells, such as tunicates or algae.

◇ Water Quality Monitoring and Protection

Oysters, clams, and other shellfish can be affected by poor water quality, and their locations in estuaries are often determined by certain water conditions— such as salinity ranges, freshwater pulsing from rainfall events in the watershed, depth, or degree of siltation in the water column. Excessive nutrients from agriculture and human waste can lead to dangerous algal blooms that can kill oysters or create public health risks by consuming contaminated shellfish. Healthy and abundant oyster populations also help clean estuaries of nutrients and can reduce excessive nutrient loading — for instance, protecting seagrass beds that need good water clarity. Abundant oyster populations have other ecosystem service provisioning benefits (see Figure 27).

On the negative side, filter-feeding organisms, including cockles and oysters, can accumulate contaminants, such as human pathogens from fecal matter from livestock, water birds, or humans that get washed into the estuary. Heavy metals (e.g., mercury, cadmium) deposited in water higher up in the estuarine watershed can also create public health risks, if contaminated oysters are consumed. Of particular concern is mercury, often used in illegal small scale gold mining, during which the mercury waste is washed into rivers and carried down into an estuary where it can be absorbed into the tissues of oysters or cockles.

Figure 27: Tanks Filled with Bay Water, Right-Hand Tank Contained Oysters That Filtered Out the Murky Water Containing Algae and Detritus, Left-Hand Tank Had No Oysters
(Source: twistedsifter.com/2014/10/two-tanks-filled-with-same-water-one-has-oysters)

Water-quality monitoring and protection measures can ensure that conditions are optimum for maintaining healthy shellfish populations that are safe from contaminants. Some simple water-quality parameters such as temperature, salinity, and turbidity can be easily monitored and recorded by harvesters in the community with even primary school levels of education (simple reading, writing and math capabilities). This can be a useful management action performed by monitoring groups consisting of shellfish harvesters who can be easily trained by university or government fisheries staff. Simple, low-cost tools such as pool thermometers, Secchi disks, optical salinometers or hydrometers, and data collection clipboards can be purchased and provided to monitoring groups. This should be accompanied by education of harvesters on the ecology and biology of the shellfish being managed and the optimum parameters to maintain healthy populations.

Certain types of water contaminants, such as mercury or fecal coliform, require specialized expertise to monitor properly. They require laboratories and testing equipment generally found at universities or in government laboratories. Water quality risks can be assessed using shoreline surveys and upper watershed observations to determine if the types of activities that create contaminants are present and may be of concern.

Figure 28: Women Harvesters Conducting Water Quality Monitoring in the Densu Delta in Ghana (Source: DAA)

For public safety in human consumption of shellfish, water quality monitoring should involve shellfishers (see Figure 28), as it promotes good stewardship and educates them about healthy estuarine ecosystems. They can assist technicians, university students, or faculty in sample collection. However, they should be engaged beyond just data collection and be actively involved in reviewing results, their interpretation, and implications for management. This sort of approach is often referred to as "action research."

In areas where contaminants may be found, the community itself may not be able to directly solve an issue — such as illegal gold mining contributing to mercury contamination, or poor agricultural practices and logging that create high levels of siltation. In some cases, they may be able to promote some simple actions that can improve water quality conditions. In many cases, they may need support from communities in the upper watershed or other actors, such as government agencies and environmental NGOs. In all cases, an active group or association and a co-management plan can strengthen shellfishers' ability to advocate for their interests and recruit resources to address problems beyond their control. An example of community action was in The Gambia, where a shoreline survey identified a few piggeries and latrines on the edge of the estuary that contributed directly to fecal contaminants in adjacent water bodies where oysters and cockles were harvested and were close to nearby processing areas. These facilities were then relocated away from the estuarine shoreline, thereby reducing the direct impact on water quality.

» Productivity Enhancements

There are ways that the productivity of shellfishing can be enhanced. Improved productivity means increased harvests per area of estuary. This can be achieved via aquaculture or use of hatcheries for enhanced stocking of wild populations. Habitat restoration and good harvesting practices described previously also contribute to higher productivity.

◇ Aquaculture

Shellfish aquaculture in estuaries (also known as mariculture) has been practiced around the world for centuries in Asia, Europe, and the Americas. The farming techniques are well known for both large-scale commercial and low-cost, small-scale aquaculture systems. In places such as Asia, for instance, oyster spat collectors made from old oyster shells can be tied to lines and suspended from wooded bamboo poles in intertidal waters. Oyster larvae settle on the shells and then grow to harvestable sizes. Shellfish aquaculture is seen as relatively benign environmentally, compared to shrimp farming, as it requires no feed inputs or clearing of mangroves. There have been many pilot programs demonstrating the feasibility of culturing oysters in West Africa, for instance in Senegal, The Gambia, and Ghana (see Figure 29). However, there are few viable, self-sustaining farm systems at present that have moved beyond the pilot feasibility stage and are not subsidized by the government or a donor project. This is likely due to issues concerning markets, prices, local preferences, and economic viability. Although local pilots and experiments can be supported, without more attention to market potential and economic feasibility, they may not be adopted by current shellfish harvesters.

◇ Hatcheries

Basic techniques to spawn and raise various species of clams, oysters, and other molluscs have been developed and are in use in many countries to support shellfish farming, where seedlings grown in hatcheries are sold to farmers. Hatchery-raised seedlings, or "spat," are also used for restocking and enhancing wild stocks by broadcasting hatchery-raised spat back into the water and onto bottom sediments suitable for the species of concern. This can be effective for reseeding oysters quickly into areas that have been overharvested or depleted, but requires skilled technicians to operate these hatcheries effectively. Universities or government fisheries institutions with the proper facilities, technical capacities, and budget can support such activities and use reseeding programs as a means of fostering stewardship behaviors of harvesters. In high-income countries, many of the shellfish hatcheries are run by the private sector, but typically only in cases with mature shellfish aquaculture industries and where the price of the shellfish is high enough to support profitable private sector hatcheries. In West Africa, where these conditions do not exist, a first step may be for hatcheries to be subsidized by government or for universities to provide free or low-cost seedlings to oyster farmers and to communities for broadcasting and enhancing abundance of wild populations.

Figure 29: Measuring Processed Oysters Harvested from Aquaculture (top); Harvest of a Shellfish Farm (Hanging Rack Culture) in The Gambia After 1 Year (bottom)
(Source: TRY)

◇ Transplanting Spat

In some estuaries, recently settled larvae of bloody cockles, called spat (baby cockles) can have certain areas with very high density (numbers per square meter) of spat. In these areas, the baby cockles compete for space and food as they grow, which can result in high mortalities of the spat. In cases where high-density spat can be found in some areas, the spat can be collected and then broadcast or transplanted to areas with low density of cockles. This is a form of shellfish ranching widely practiced in Asian countries such as Malaysia for example. Such experiments have been carried out in the Allehein river in The Gambia and in the Sine Saloum in Senegal. Ranching of oysters is practiced in Benin. In the Volta River in Ghana, transplanting of clams to grow-out areas is also a common traditional practice. In the Volta River case, transplant areas are often claimed as property marked by the individuals who did the transplanting and where others are not allowed to harvest "their" clams.

» Leasing or Licensing of Harvesting or Aquaculture Areas

As many molluscs, such as bivalves, are sedentary in their adult life phase, (do not move once they settle onto the bottom substrate within the estuary) these areas can be leased or licensed for exclusive harvesting by an individual, group, or business. Typically, such leased parcels of submerged bottom are marked on the boundaries with markers made of simple floats (e.g., painted plastic water bottles), floats used for fishing nets, or with a stake of wood pushed into the bottom substrate. In other cases, exclusive-use rights to certain areas are practiced. For instance, in the Tanbi wetland in The Gambia, on some tributaries or "bolongs," only members from the local community near these tributaries are allowed to harvest that tributary. Other areas are open to all communities and members of the oyster association.

Area leases are a form of use right. If this sort of system is considered, there needs to be a fair and transparent process for determining who can obtain an area lease or license; the maximum size or area that an individual, group, or company can lease; where they can lease areas and enforceable penalties, if someone should illegally harvest from someone else's leased area. A lease or license should be in the form of a written document provided by the authorized management body (a fisheries agency or user group with legal use rights). As many shellfish harvesters cannot read or write, such leases can be granted under verbal authority. If there is high demand for lease space, the lack of a written lease or license could more easily lead to disputes and conflict.

Management authorities can charge a fee for a lease, either a set fee or based on the size of the area, and use those revenues to support management of the fishery. As a form of use right, discussions and clarity on the leasing policies should include the duration of a lease (one year or several years before having to be renewed). Whether the lease is transferable (to a child or spouse or other person), and saleable (can be sold to another person based on an agreed price between buyer and seller).

» Promoting Public Health

Shellfish consumption can contribute to a healthy diet, as they are a highly nutritious food protein source, generally of low cost, and are an accessible resource available to low-income households living near coastal estuaries (See Figure 30). One serving of oysters meets 26% of the iron and 100% of the zinc Recommended Dietary Allowance for women. Adequate iron consumption is important to prevent anemia, which is very high among women of reproductive age in West Africa. Women with anemia have an 84% increased risk of postpartum hemorrhage, a leading cause of maternal death. Oysters as part of a balanced daily diet can contribute to reducing iron deficiency in women. Therefore, oyster consumption can be promoted as part of a healthy and diversified diet.

Because shellfish are filter feeders, they can also concentrate harmful contaminants in their tissues, including human pathogens such as fecal coliforms, vibrio (the cholera pathogen), and others that can cause disease (see *Fish Safety Notes: Illness Causing Bacteria, Parasites and Viruses Among Fish and Shellfish*). Bivalves can also accumulate harmful concentrations of heavy metals such as mercury, if the water column or sediments are contaminated with these substances. Microplastics contamination in water, sediment, shellfish, and other aquatic organisms is an emerging concern for ecosystem and human health. In Northern countries, such as Europe and the United States, national and local shellfish sanitation programs have been established to reduce the risk of consumption of contaminated shellfish. There are no equivalent shellfish sanitation programs in West Africa at present, but preliminary studies have been done in The Gambia that point to a way that these could be established in the future.

Figure 30: Women Shellfishers in Ghana Promoting Oyster Consumption
(Source: DAA)

Shellfish sanitation programs are focused on keeping oysters, clams, and other shellfish safe for human consumption. This is related to the water quality protection objective explained previously, but more from a seafood safety perspective. Fecal coliforms (*E. coli*) in the water column or tissues of bivalves are used as an indirect indicator of potential human pathogens that can cause diarrhea, cholera, and other gastrointestinal diseases. Establishing a shellfish sanitary program requires

monitoring of *E. coli* within an estuary for several years, to determine areas or seasonal periods when harvesting and consumption of bivalves could present high risk to human health. This is of particular concern where the shellfish are consumed raw or not well cooked. Cooking, however, will not remove heavy metal contamination in the organisms' tissues. Thorough cooking, proper handling, and not eating raw shellfish can reduce these risks. Contaminated areas can be closed permanently or just seasonally, if there are periods of time where *E. coli* levels are lower and within limits for safe shellfish consumption. Alternatively, shellfish harvested from contaminated areas can be transferred to clean water areas for a few weeks to a month and then harvested safely.

Assessing potential risks from heavy metal contamination requires sampling and testing of bivalve tissues and water by qualified laboratories. This can be much more expensive than testing for *E. coli*, which is a relatively simple procedure. Shoreline and watershed surveys can determine whether there is a potential for concern first, without the need for testing as the first step. For instance, if illegal gold mining using mercury is occurring in the watershed, then testing for potential mercury contamination is warranted. If there is no mining in the watershed or other potential sources of a contaminants, there is likely low probability for concern and no need for testing. In estuaries near large cities or population centers, there may be risks from other heavy metals due to discharges from certain industries or disposal of car batteries. In these cases, screening for a few of the typical contaminants such as lead or cadmium may be warranted.

In areas of high population density, where livestock often bathe or walk through the upper watershed of the estuary, or where there are low levels of adequate sanitary facilities for the human population (high degree of open defecation along the shoreline), there is likely concern regarding presence of human pathogens, and *E. coli* tests would be warranted. Even without water quality testing for *E. coli* or mercury, if the physical sources of contaminants can be identified, then actions can be taken to reduce direct deposition and runoff of human or animal feces into the estuary or to stop illegal mining (See Figure 31). In The Gambia, a shoreline survey identified a backyard piggery and several latrines on the shoreline adjacent to harvesting areas. These were relocated away from the shoreline to reduce the potential for shellfish contamination and reduce the public health risk.

Figure 31: Examples of Sanitation Risks to Shellfisheries (Source: URI)

Generally, shellfish sanitation programs are carried out by environmental or fisheries agencies, in cooperation with public health agencies. In West African countries, simple shellfish sanitation programs may be possible in the future. Simple program goals could be to indentify high risk areas with high concentrations of *E. coli* or heavy metals and have these areas permanently closed from shellfishing, while low risk areas can be maintained for shellfishing. Where such closures can provide a public health benefit, they also provide ecological benefits for biodiversity conservation and shellfish stock protection as de-facto closed areas or spawner sanctuaries. Temporary closures or seasonal closures based on, for instance, the presence of *E. coli*, are more difficult and costly as they require ongoing daily or weekly testing to ensure they are opened only when the threshold limits are below allowed maximum levels established by regulation.

» Improving Working Conditions and Safety for Women Harvesters

Oysters and cockles are harvested predominantly by women, because their habitat is accessible. However, working conditions are dangerous, and become riskier as women venture further as the nearest oyster and cockle stocks become overexploited. Improving working conditions and safety for women harvesters has helped offset the hardship of fewer harvest cycles. Footwear, life jackets, and a communications alert system using cell phones are measures undertaken in The Gambia and Ghana during harvest operations in tidal areas (see Figures 32 and 33).

Figure 32: Women in The Gambia Using Local Methods to Protect Their Feet From Sharp Shells and their Faces and Bodies from Mosquitoes While Harvesting Oysters (Source: TRY)

Figure 33: Shellfisher Receiving a Lifejacket and Learning How to Wear it Properly in The Gambia (Source: TRY)

» Post-Harvest Improvements

Sustaining and enhancing the production of shellfish will benefit harvesters with better yields, but there are also many opportunities to improve post-harvest processing and handling that could provide new markets or better prices for harvesters. In the case of the predominantly women dominated shellfishing of oysters and cockles in West Africa, the production and supply chain is vertically integrated—with harvesting, processing, selling and consumption all done primarily by women harvesters (Figure 34). Therefore, any improvements in harvesting, processing, or selling these products can economically benefit the shellfishing households directly. This can help to incentivize sustainable management as women harvesters are the ones who limit their fishing effort and consequently are most likely to suffer short term economic hardship from restricted management measures. Value chain development should consider approaches that do not displace women and that recognize the need for sustainable management to accompany market improvements to prevent market-driven over exploitation from increased demand.

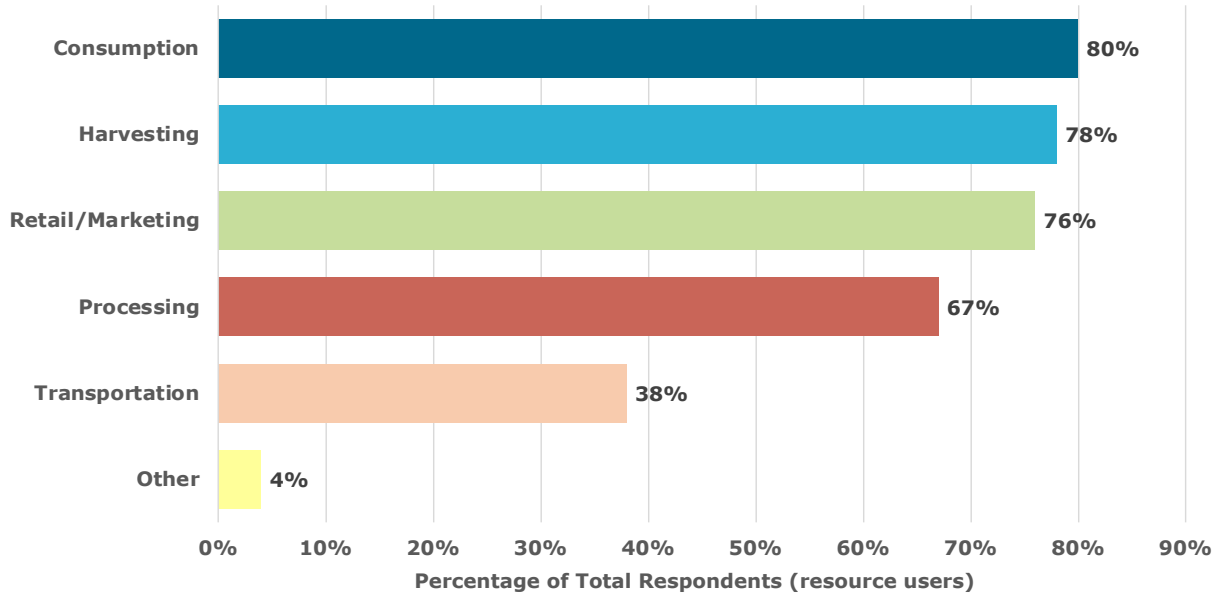


Figure 34: Resource Users' Involvement in the Shellfisheries Value Chain in West Africa (Source: Chuku, et al., 2021)

Improving product processing and handling can reduce post-harvest losses in terms of less spoiled product (loss of quantity) or added value (reduce loss of quality) of the product. Some opportunities for post-harvest improvements are provided below.

◇ Improved Handling Practices

Oysters and cockles should be kept alive as long as possible after harvesting and before processing. If kept cool and wet, they can live for several hours or days before processing or consumption. If for raw (uncooked) human consumption, only live oysters should be eaten. Live oysters and cockles after harvest should be kept cool, even iced, especially if for raw consumption, as bacteria levels in the gut can increase after harvest if they warm up. If boiled and shucked and then sold, shucked oyster and cockle meat should be kept cold — iced or frozen — and not be kept for long periods of time in cooked form without refrigeration. Cooked shucked oysters and cockles can be dried, smoked, pickled, or canned, especially if markets are distant from harvesting areas, or if refrigeration for cooked meat is not readily available.

Figure 35: Shellfishers in The Gambia Selling Off the Ground, Under a Shade, Covering the Oyster Meat with Netting and Wearing the TRY Branded Apron to Signal to Consumers the Quality of the Product (Source: TRY)

◇ Improved Processing Facilities

Improved clean shucking and processing facilities can be small-scale and relatively simple — the size of your average household kitchen with a roof overhead, a tiled or stainless-steel table top, cement flooring with good drainage, and supply of freshwater. These facilities are open air, where walls may not go up to a roof level but only waist-high. It is best if the open areas are screened to reduce flies, other insects, and pests from entering the processing area. Raised tables with tiles and sinks for washing and cleaning should be included. This keeps oysters and other shellfish off the ground, keeps dirt away, and keeps animals like goats and chickens from walking over them (see Figure 35). A small processing shed can and should be integrated with sanitary facilities for people (water seal toilets or latrines with adequate soap and water supply for flushing and handwashing). These can be private or communal facilities. Processing sheds can also be sites for training harvesters in improved processing technologies and social and economic development. For example, the sheds can host meetings for savings and loan groups, classes in literacy and numeracy, business development, safe processing, handling, and packaging techniques, oyster and estuarine ecology, and leadership training.

» Diversified Livelihoods

Diversifying livelihoods is a common objective of many fisheries programs, especially where income is low or where the fishery is severely overfished. This approach differs from providing alternative livelihoods, where the implied objective is to remove fishers from the fishery as an approach to reducing effort and excessive harvesting. Alternative livelihood approaches cannot be used as a means of effort control if the fishery remains open access, as for each person who leaves, another will take up the shellfish livelihood. Hence, a diversified livelihoods approach seeks to increase income from sources other than shellfishing, but is not necessarily intended for the individuals to stop harvesting altogether. They may reduce effort, or be more willing to support management measures, such as a closed season, if there is lower dependence on the shellfishery as a source of income, but the main objective is income diversification and improved economic resilience.

Figure 36: Microfinance participant in The Gambia
(Source: TRY)

Many alternative and diversified livelihood initiatives for fisherfolk globally have not been successful, so careful design and planning is needed if this is an objective in the management plan. Generally, promotion of group-based livelihoods tends to fare worse than those focused on individuals or households as the business units. A similar fate is common when the livelihood choices are predetermined by outside groups. One approach would be to offer general skills training and financial support that can allow individuals or households to move into non-shellfishing livelihoods of their choice. This could include entrepreneurial training, numeracy and literacy training, creation of village savings and loan associations among shellfishing households and communities, and grants for vocational training, among other options. Another approach may be to focus on young women in shellfishing households who can develop livelihoods that are less dependent on shellfishing for income than their mothers' livelihoods.

Another approach is to build on assets and skills that women shellfishers already have and expand the livelihoods they are already engaged in. Expanding existing enterprises tends to have better success rates than assisting people to change to occupations that they are not readily familiar with or lack existing skill sets to be successful. For women shellfishers, this approach could involve a focus on post-harvest improvements and value chain improvements, where they can reap the benefits of potential increased profits.

For shellfisheries, we often view the fishery as a food source, but in West Africa, the regional assessment (Chuku et al., 2021) identified some cases where the shells themselves may be more valuable than the meat in the shell. Revenue from shells for poultry-feed inputs, construction, and lime are all possibilities. All countries reported these uses. Togo had the most developed market for shells as a poultry-feed input supporting shellfish shell value chains not linked to harvest of the meat. Men primarily harvest the shells, and women are employed for cleaning and bagging them. Ghana is seeing increased demand for clam and oyster shells for this purpose. Many countries in West Africa have prioritized locally produced poultry value chains, including locally produced feed. Shellfish as a locally produced calcium source can contribute to this objective and can engage Ministries of Agriculture and Livestock in supporting sustainable shellfishery management efforts and coastal mangrove ecosystems.

» Diversified Food Production Systems

Shellfish is only one part of the diet for shellfishing households. Although there are many nutritional benefits to the consumption of shellfish, diversified food production can help to achieve certain socioeconomic goals, if food insecurity is an issue in these communities. Oysters and cockles are not typically consumed in high quantities, so they must be supplemented with other food sources for a healthy and adequate diet. Food insecurity may be seasonal, and if closed seasons are considered to manage shellfish, a readily available source of household food and income could be lost for several months in a year, which could exacerbate food insecurity. Although much of the previous discussion has been on managing the water-based and mangrove areas of lagoons (the seascape), the development model proposed in this Toolkit suggests expanding the approach to include assessment of the adjacent landscape of these estuaries and lagoons, particularly in the context of food security.

The model proposed in this Toolkit suggests expanding the approach to include assessment of the adjacent landscape of shellfishery estuaries and lagoons particularly in the context of food security

Smallholder food production in sub-Saharan Africa is dominated by starchy staple crops. The availability of micronutrient-rich crops like fruits and vegetables is highly season-dependent, which is one reason for low consumption. When considering production seasonality, nutritious food portfolios could be promoted to ensure year-round harvests and deliver key micronutrients for diets (McMullin et al., 2019). Through an iterative process, portfolios are co-developed with local communities based on their species preferences, food priorities, income and other uses, and are customized for site suitability (see Annex E).

Standardized tools, including surveys, are used to capture information on farm production diversity and food consumption. In addition, focus group discussions are conducted to determine priority species (identified by local communities) for inclusion, their months of availability, and nutritional value. This agro-ecological approach helps generate tailored recommendations for the cultivation of a diverse range of food tree species (including underutilized species), along with vegetables, pulses, and staple crops. In addition to filling harvest gaps, certain nutrient gaps are addressed by mapping the nutritional value of selected species using food composition data. Key micronutrients, vitamins A and C, iron, and folate are prioritized to address public health concerns based on their supportive functions and natural high quantity in tree foods. To simplify nutrition information, a scoring system accompanies the customized portfolios to support the species selection. However, this data is limited for underutilized species—a knowledge gap due to inadequate investment, and hence research, is hampering a full contribution of these species in local food systems.

7. Conclusion

This Toolkit aims to equip stakeholders with a guide that both inspires action and provides practical guidance for improved shellfish livelihoods, food security, and sustainable management of shellfisheries and coastal ecosystems in West Africa. Many lessons learned have been shared, but it is the application and practice of these approaches that will drive their development. This toolkit also aims to catalyze and continue that process across the region and beyond.

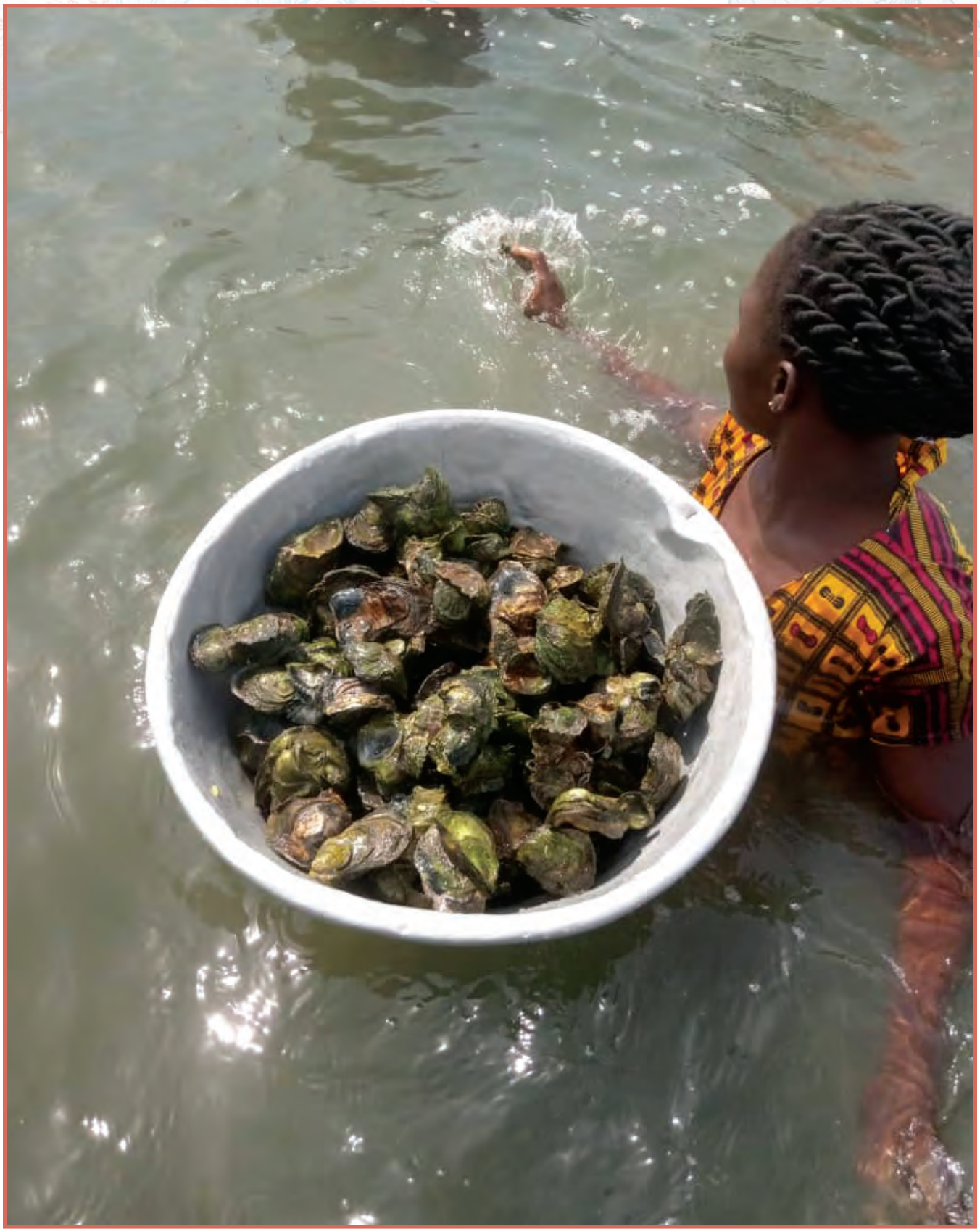


Figure 37: Oyster Harvest After a 5-month Closed Season in the Densu Delta in Ghana
(Source: DAA)

Annex A. Acronyms

CCM	University of Cape Coast Centre for Coastal Management
CEDAW	Convention on the Elimination of All Forms of Discrimination Against Women
CSO	Civil Society Organization
DAA	Development Action Association
DOPA	Densu Oyster Pickers' Association
FISH4ACP	Sustainable Development of Fisheries and Aquaculture Value Chains in ACP Countries
EAF	Ecosystem Approach to Fisheries
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus-Group Discussion
FELOGIE	Fédération locale des Groupements d'intérêts économiques (FELOGIE). Federation of Local Economic Interest Groups
HFIAS	Household Food Insecurity Access Scale
ICRAF	International Council for Research in Agroforestry
MAHFP	Months of Adequate Household Food Provisioning
MRAG	Marine Resources Assessment Group
NGO	Nongovernmental Organization
PRA	Participatory Rural Appraisal
RAMSAR	Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat
RAMPAO	Réseau régional d'Aires Marines Protégées en Afrique de l'Ouest
SDG	United Nations Sustainable Development Goals
SFMP	Sustainable Fisheries Management Project
UN DRIP	UN Declaration on the Rights of Indigenous Peoples
URI/CRC	University of Rhode Island Coastal Resources Center
USAID	United States Agency for International Development
VDG	Village Development Group

Annex B. SDG Linkages

Table 3: Rights-Based Women's Shellfish Co-Management in West Africa Contributions to the United Nations Sustainable Development Goals (SDGs)

SDG	Description	Contributions of Rights-Based Women's Shellfish Co-Management in West Africa
	End extreme poverty in all forms by 2030	Toward the improvement of livelihoods of women for poverty alleviation in coastal communities along the West African coast.
	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	The enhanced management of shellfisheries will directly provide food fish for consumption. The conservation of mangroves also improves their ecosystem function of nursery grounds for marine fishes that serve as food for coastal inhabitants.
	Ensure healthy lives and promote well-being for all at all ages	The essential dietary minerals, including iron and zinc, acquired by the human body from the consumption of shellfish (especially oysters) improve the health of women, especially pregnant and lactating women.
	Achieve gender equality and empower all women and girls	The estuarine and mangrove ecosystem-based shellfisheries along the coast of West Africa is a gender-centric livelihood and one of the few fisheries livelihoods in which women are the dominant harvesters. The value chain for these shellfisheries, especially for the bivalves and gastropods, is also highly vertically integrated with women harvesters dominant at all nodes. Rights-based co-management regimes in this sector empower women as resource managers and value chain actors who can benefit directly from responsible management and value chain improvements.
	Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all	The development of shellfisheries stands to enhance the inclusion of women's participation in the currently male-dominated harvesting node and provide a sustained source of employment for the rural poor in coastal communities of West Africa.
	Ensure sustainable consumption and production patterns	The promotion of co-management of shellfisheries in estuarine and mangrove ecosystems, which includes the delegation of exclusive-use rights to the resource users for the governance of the resource, both directly, by measures such as closed harvest seasons and indirectly, through measures barring the indiscriminate exploitation of mangrove vegetation, promotes responsible consumption and sustainable production of shellfish.

SDG	Description	Contributions of Rights-Based Women's Shellfish Co-Management in West Africa
	Take urgent action to combat climate change and its impacts	Both molluscs and mangrove vegetation sequester large quantities of carbon from the environment, thus contributing immensely to the global agenda to slow down long-term changes in temperatures. Mangroves also provide coastal protection.
	Conserve and sustainably use the oceans, seas, and marine resources for sustainable development	Shellfish form a major underwater species that is conserved when measures on sustainable exploitation are instituted and implemented.
	Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	The mangrove ecosystem is a terrestrially based ecosystem that interfaces with the aquatic environment and whose protection has enormous benefits to protecting shorelines against erosion of shorelines.
	Strengthen the means of implementation and revitalize the global partnership for sustainable development	The co-management model for estuarine and mangrove ecosystem-based shellfisheries fosters a coherent partnership between the resource users (women shellfishers) and other key stakeholders, including government, academia, NGO/CSOs, and regional and international organizations.

Annex C. FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication Linkages

The Key Principles presented in this Toolkit Section 6, Model Approach and Best Practices are strongly aligned with the FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries Part 1, 13 Guiding Principles and Part 2, Sections 5 to 8, key topics for responsible fisheries and sustainable development. Table 4 summarizes these linkages to highlight for governments and other stakeholders how women's shellfish co-management initiatives demonstrate global leadership in the application of these guidelines.

Table 4: Rights-Based Women's Shellfish Co-Management in West Africa Linkages to Application of the FAO SFF Voluntary Guidelines

Women's Shellfish Co-Management Principles	FAO SSF Voluntary Guidelines Topics and Guiding Principles Addressed	FAO SSF Guiding Principles for Reference
Elinor Ostrom's Design Principles for Management of the Commons	Section 5: Responsible governance of tenure and sustainable resource management. All 13 Guiding principles	1. Human rights and dignity 2. Respect of cultures 3. Non-discrimination 4. Gender equality and equity 5. Equity and equality 6. Consultation and participation 7. Rule of law 8. Transparency 9. Accountability 10. Economic, social, and environmental sustainability 11. Holistic and integrated approaches 12. Social responsibility 13. Feasibility and social and economic viability
Co-Management	Section 5: Responsible governance of tenure and sustainable resource management. All 13 Guiding principles	
Participatory	Section 5: Responsible governance of tenure and sustainable resource management. Guiding principles 1, 2, 3, 4, 5, 6, 7, 8, 12, 13	
Rights-Based	Section 5: Responsible governance of tenure and sustainable resource management. Guiding principles 1, 5, 7, 10, 13	
Gender Sensitive	Section 8: Gender equality; Section 6: Social development, employment and decent work; Section 7: Value chains, post-harvest and trade. Guiding principles 1, 3, 4, 5, 6, 10, 11, 12, 13	
Ecosystems-Based	Section 5: Responsible governance of tenure and Sustainable resource management. Guiding principles 10, 11, 13	
Adaptive Management	Section 5: Responsible governance of tenure and Sustainable resource management. Guiding principles 6, 10, 11, 13	
Integrated	Section 6: Social development, employment and decent work; Section 7: Value chains, post-harvest and trade. Guiding principles 1, 10, 11, 12, 13	

Annex D. Drivers and Threats to Mangrove Ecosystem Changes and Restoration Options

Trend analysis (as indicated in Table 5 below), based on the data from Global Mangrove Watch, indicates that most of the countries in the region experienced declining mangrove extent, as shown below.

Table 5: Summary Attributes of Mangrove Conditions in West Africa

Country	Mangrove Area (2016) (km^2)	Mangrove Area Change (1996-2016) (km^2)	Coastline Length (km)	Mangrove Coastline (km)	Non-Mangrove Coastline (km)	Mean Mangrove Height (m)	Mean Carbon Stock (t/ha)
Gambia	597.17	+2.45	195.64	83.11	112.46	9.30	54.98
Ghana	204.18	-23.78	620.43	72.70	547.74	5.89	40.47
Senegal	1,247.84	-52.16	865.82	271.51	594.31	6.27	28.55
Liberia	189.23	-3.62	619.31	153.79	465.52	6.85	35.58
Guinea-Bissau	2,571.69	-3.28	2,822.09	1659.54	1162.55	11.45	70.51
Guinea	2,225.98	-16.82	2,216.19	1361.66	854.52	9.80	58.16
Cote d'Ivoire	57.92	-4.91	540.14	108.63	431.51	13.02	95.65
Nigeria	6,894.17	-93.88	2,010.85	980.17	1030.68	12.03	82.69
Benin	1.41	+0.20	127.73	4.03	123.70	2.44	7.19
Sierra Leone	1,264.03	-4.51	1,085.87	434.25	651.62	9.79	61.59

Note: Information for Togo is not available largely due to its very small mangrove area estimated to be less than 11 square kilometer as at 2006.

The above analysis was compiled by World Agroforestry (ICRAF) as part of the Women Shelfishers and Food Security project site-based research in Ghana and The Gambia. The technical report is referenced below.

Citation: Duguma, L., Bah, A., Muthee, K., Carsan, S., McMullin, S., Minang, P. (2022). Drivers and Threats Affecting Mangrove Forest Dynamics in Ghana and The Gambia. Women Shellfishers and Food Security Project. World Agroforestry (ICRAF), Kenya. 50 pp.

As part of this research, participatory assessment of threats and drivers of mangrove ecosystem degradation and preferred restoration options in selected six sites in Ghana and The Gambia was conducted. Using land use land cover dynamics assessment between 2000 and 2020, it emerged that The Gambia gained 78 km^2 of mangroves with an annual gain of 3.9 km^2, while Ghana lost 539 km^2 of mangrove with an annual loss of 27 km^2.

Four main categories of drivers and threats to mangrove restoration were established. The main drivers include **population increase**, which exerts pressure on mangrove forests in search for wood for energy, construction, and for sale. **Economic drivers and threats** relate to conversion of mangrove forests for infrastructural development, aquacultural development, commercial agriculture expansion, and rice farming. **Natural factors** include climate change and variability, changes in sea level, storms, as well as changing precipitation, and temperature patterns. Other **sporadic factors** behind mangrove changes include transborder mangrove exploitation, unregulated exploitation of mangroves, and weak natural resources law enforcement. A mangrove situation model that can be used as a tool for identifying site specific drivers and threats is presented below.

Four mangroves restoration responses were proposed. They include **policy responses**, such as promoting co-management and rights-based approaches to enhance community participation, and enhanced policy and regulation framework. **Practical responses** include mangrove areas rehabilitation, livelihoods diversification, and shellfishery management. **Governance responses** involve legal protection, development of community management plans and cross-border mangroves resources management. **Behavioral responses** entail changing attitudes and promoting sustainable use of mangrove resources. All these complementary responses can effectively be anchored on rights-based shellfishery and mangrove co-management approaches which local communities and women play a key role in.

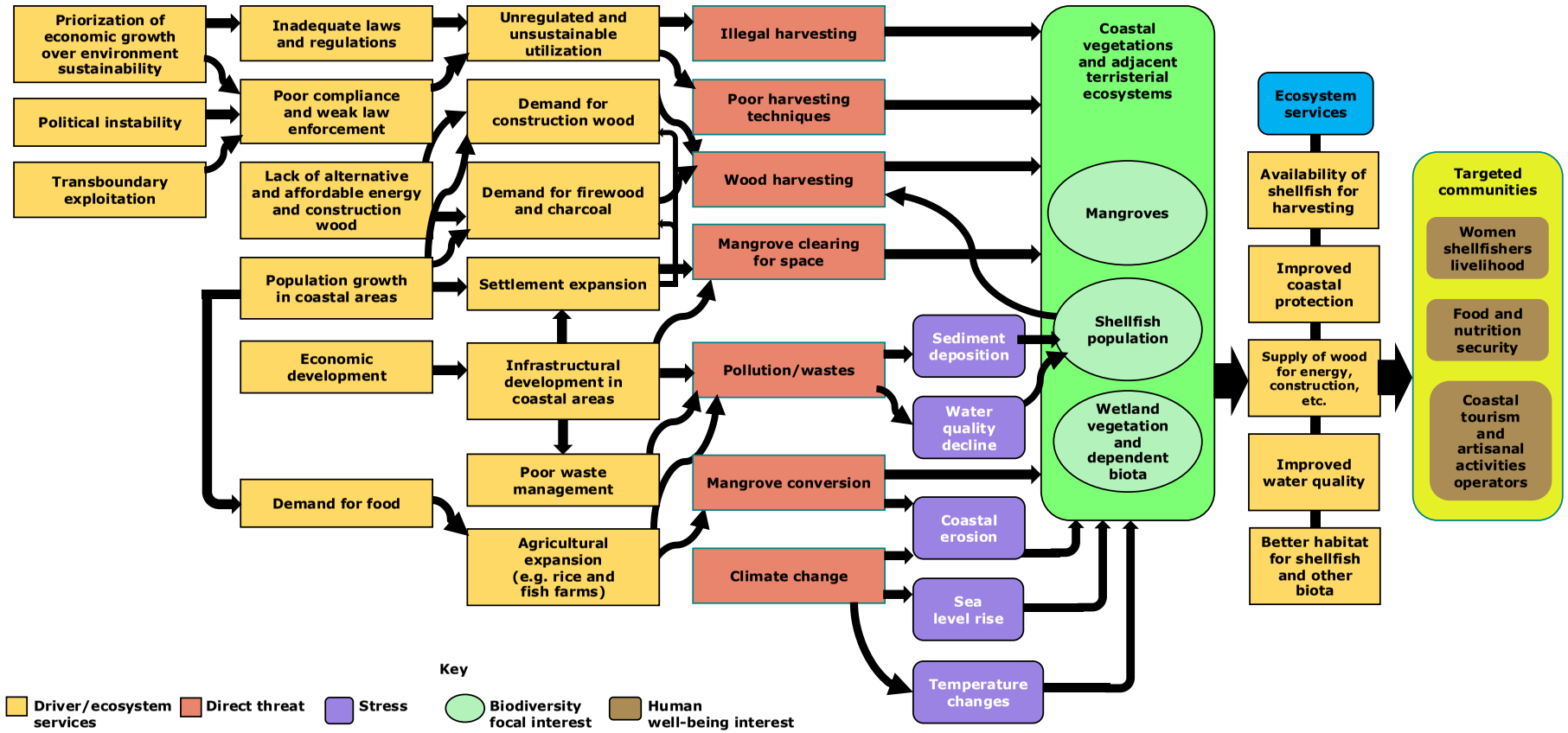


Figure 38: A Generic Mangrove Situation Model Representing the Interconnectedness Between Drivers, Threats, Ecosystems and their Services and Human Wellbeing

Annex E: Diversified Food Production Systems

Land-Seascape Food and Nutrition Profiles

Background

The Women Shellfishers and Food Security Project engaged women shellfishing communities in The Gambia and Ghana to better understand the status and opportunities for increasing the use of agricultural and wild biodiversity to meet seasonal food and dietary needs. The underlying premise is that, if such high-value wild food and feed tree species become part of the food systems, livelihoods, and household resilience of local communities will improve and pressure on mangrove ecosystems will decrease, thereby boosting sustainability of shell fishing and household resilience. The approach and detailed results for the six sites studied are documented in the following technical report by World Agroforestry (ICRAF). A summary of the approach and an example food and nutrition profile are presented here.

Citation: Carsan, S., McMullin, S., Obiri, B., Duguma, L., Guuroh, R., Bah, A., Orero, L., Muthee, K. (2022). Land-seascape food and nutrition profiles. Women Shellfishers and Food Security Project, World Agroforestry (ICRAF), Kenya and Forestry Research Institute Ghana. 80 pp.

Approach

The study confirms the role of agrobiodiversity in heterogeneous coastal ecosystems to mitigate fisheries resource scarcity associated with closed season supply deficits. Intervening factors on optimal resource use require consideration for mangrove health status, household nutrition, wood energy deficits, governance, gender, and youth employment

The food and nutrition portfolios (or ***Nutritious Food Portfolios***) are context-specific recommendations for producing and consuming a greater diversity of nutrient-rich foods to address seasonal food harvest gaps and micronutrient gaps in local diets. They consist of a variety of indigenous and exotic trees and crops, including fruits, vegetables, pulses, and staples. The portfolios were co-developed with communities, taking into consideration the socioecological dynamics of food production, including seasonal availability, food security, and food consumption. They were further informed and validated with communities based on their needs and priorities for producing food for home consumption and income generation. A participatory screening of agricultural and wild biodiversity, including food and feed, was conducted in each field site. For each of the prioritized species, their contribution to food and nutrition security at the landscape level was assessed based on existing production potential, including land availability for planting, and the respective nutritional value for key micronutrients vitamins A and C, iron, and folate. The portfolios matter in our research because they are an approach to ensuring that agricultural and wild biodiversity are prioritized as part of a solution for promoting greater diversity of nutritious foods in local production systems and diets.

Recommendations

- The activity contributes to knowledge on use of diverse food trees in urban and peri-urban coastal areas with increasing human settlement and where aspects of food homogenization remain unclear;
- Findings permit recommendations to be made on important food portfolios from agriculture and forest resources for consideration by development workers and government ministries charged with nutrition improvement works;
- Across the six sites, there are varying degrees of agricultural and wild biodiversity use by the communities. This requires site-specific recommendations to be contextualized for the sites to respond to the interests and priorities of communities;

- Six site-specific nutritious food portfolios have been devised, with an average of four food tree species, three vegetable, and three staple crops in Ghana, and five food tree species, six vegetable, and four staple crops in The Gambia, which are mapped for months of seasonal availability and key micronutrients, including vitamins A and C, iron, and folate;
- To support the communities' livestock keeping, fodder species have been included in the nutritious food portfolio to address better animal feed, which can indirectly improve nutrition of families via the production - consumption pathway of increased, more consistent produce yields, and through the production income pathway, for purchasing foods from markets;
- A more diversified food system could improve diets and income sources when oyster fishery activities are off-season.

» Specific Recommendations to Support Community Level Implementation

Shortages of planting materials, labor, water due to unfavorable climate, risks/injury and poor pricing of tree products were reported as major constraints on improving crop polycultures and agroforestry activities. Some interventions going forward could involve:

- Community and rural advisory services support with knowledge on planting and managing priority tree species and access to improved planting materials;
- Innovative techniques on tree protection against livestock browsing, harvesting/ management plans and conflict management for mangrove resources in sites such as Densu in Ghana;
- Investment in irrigation or moisture retention strategies to support plant growth;
- Supporting coastal fishery communities with farming designs, integrating trees in home gardens or under limited farming space;
- Develop capacity on priority tree and other plants establishment and management in small spaces for processing and sale, e.g., with moringa leaves;
- Availing improved high-yielding and low-statured marketable varieties, e.g., for coconut, and innovative farming plans, including vegetables;
- Knowledge for planting material production in nurseries establishment and management.

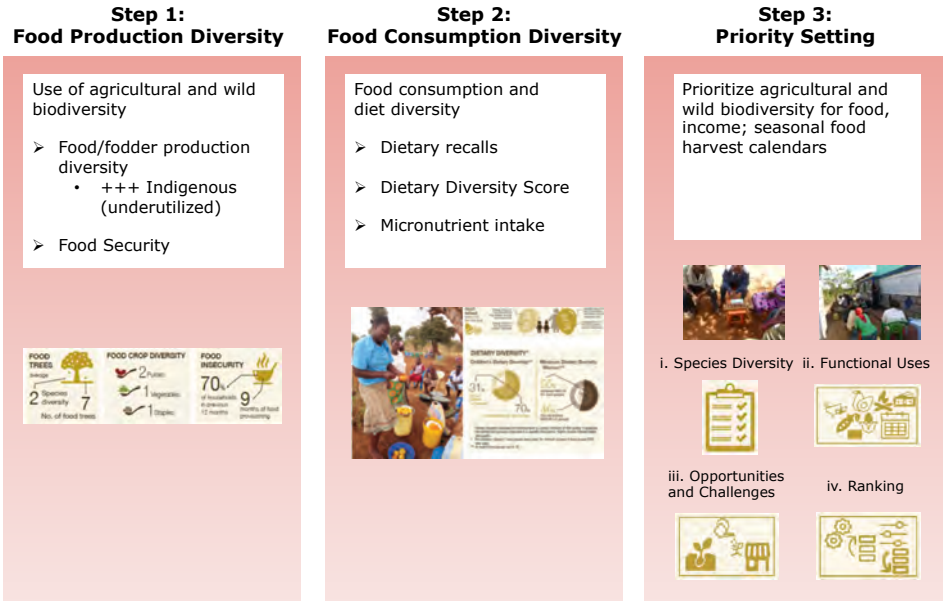


Figure 39: Three Preliminary Steps That Inform Development of a Nutritious Food Tree and Crop Portfolio (see example portfolio in Figure 40)

< Food harvest mapped against months of food insecurity

Site	Crop Type	Food Crop	Botanical Name	Part/Preparation	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Vitamin A	Vitamin C	Iron	Folate
Narkwa	Food Trees	Lime	*Citrus latifolia*	Raw	■	■	■	■	■	■	■	■	■	■	■	■		++		
		Papaya	*Carica papaya*	Pulp, Raw	■	■	■	■	■	■	■	■	■	■	■	■	++	+++	~	~
		Mango	*Mangifera indica*	Pulp, Raw	■	■	■	■							■	■	+++	++	~	~
		Cononut	*Cocos nucifera*	Flesh, Raw	■	■	■	■	■	■	■	■	■	■	■	■			++	~
		Adesema*	*Adesema*		■	■	■									■				
		Oil Palm	*Elaeis guineensis*		■	■	■									■				
		Avocado	*Persea americana*	Pulp, Raw				■	■	■	■							~	~	~
		Orange	*Citrus sinensis*	Raw						■	■	■	■	■	■			+++		~
	Vegetables	Capsicum	*Capsicum annuum*		■					■	■	■	■	■	■	■				
		Aubergine	*Solanum melongena*							■	■	■	■	■	■					
		Okra	*Abelmoschus esculentus*						■	■	■	■								
		Tomato	*Solanum lycopersicum*							■	■	■								
	Staples/Starchy Roots and Tubers	Maize	*Zea mays*	Sweet, Yellow, Boiled					■	■	■						~		~	
		Cassava	*Manihot esculenta*	Tuber, Boiled	■	■	■	■	■	■	■	■	■	■	■	■		~	~	
		Plantain	*Musa paradisiaca*	Yellow and Green, Raw	■						■	■	■	■	■	■	++	++		~
				Green, Boiled	■						■	■	■	■	■	■		~		~
				Yellow, Boiled	■						■	■	■	■	■	■		~		++
	Fodder	Ficus spp	*Ficus spp.*	Leaves																
		Cassava	*Manihot esculenta*	Peels, Leaves	■	■	■	■	■	■	■	■	■	■	■	■				
		Plaintain	*Musa paradisiaca*	Leaves	■						■	■	■	■	■	■				
		Papaya	*Carica papaya*	Leaves, Fruits	■	■	■	■	■	■	■	■	■	■	■	■				

< Addressing nutrient gaps, matched with nutritional value (vitamins A, C, iron, folate)

< Selected based on ecological suitability, seasonality, community priorities

< Supply of diverse foods/nutrients (direct) and income–surplus/ high-value crops (indirect)

Carefully designed *portfolios* combining food trees – those that supply fuits, nuts, leaves, etc. – with vegetable, pulse and staple crops to address seasonal gaps and micronutrient deficits

■	Months of harvest
+++	High source
++	Source
~	Present but low source
	Not a source
	Data compilation on-going

Figure 40: Example of a Nutritious Food Tree and Crop Portfolio for Narkwa Land-Seascape in Ghana
(Source: McMullin et al., 2022)

Annex F. Case Studies and Resources

(Inspired from the 11 countries including The Gambia and Ghana)

- TRY Oyster Women's Association. The Gambia. 52.200.163.216/sites/default/files/TRY%20%28Gambia%29.pdf;
- Densu Oyster Picker's Association, Ghana. www.edc.uri.edu/projects/SFMP/Docs/SuccessStories/SuccessStory_ComanagementDensuEstuary.pdf;
- Federation of Local Economic Interest Groups of Niodior, Senegal. www.equatorinitiative.org/wp-content/uploads/2017/05/case_1348160384.pdf;
- Livelihoods Carbon Fund and Oceanium, Senegal. www.livelihoods.eu/wp-content/uploads/2020/03/MANGROVE-RESTORATION-IN-SENEGAL-Impact-Summary-Report-LIVELIHOODS-FUNDS-March-19-2020.pdf;
- RAMPAO (Mauritania to Sierra Leone, including Cape Verde). Regional Network of Marine Protected Areas in West Africa www.rampao.org/Finalite-et-objectif.html?lang=en this site has a documentation of all MPAs, a communications toolkit and a resource center;
- FISH4ACP Senegal and The Gambia Oyster value chain projects: www.fao.org/in-action/fish-4-acp/resource-detail/en/c/1378933.

Annex G. Links to Other Relevant/Associated Toolkits

- land-links.org/issue/marine-tenure;
- biodiversitylinks.org;
- www.climatelinks.org;
- toolkits.knowledgesuccess.org/toolkits/phe;
- gaap.ifpri.info/files/2011/12/GAAP_Toolkit_Feb_141.pdf;
- elearning.fao.org/course/view.php?id=530;
- gender.cgiar.org/tools-methods-manuals.

Annex H: Organized Shellfisheries Groups, Countries of Activity, and Legal Status

The following is a list of stakeholders identified in 2021 and included in West Africa regional assessment report titled, The Estuarine and Mangrove Ecosystem-Based Shellfisheries of West Africa: Spotlighting Women-Led Fisheries Livelihoods.

Table 6: Organized Shellfisheries Groups in West Africa

Number	Organized Shellfisheries Groups	Country	Legal Status
1	Union locale de Falia	Senegal	Formalized/Registered
2	Fédération locale des Groupements d'intérêts économiques (FELOGIE) de Niodior	Senegal	Formalized/Registered
3	FELOGIE de Dionewar	Senegal	Formalized/Registered
4	Federation locale des femmes du Njombatto	Senegal	Formalized/Registered
5	Groupement des femmes cueilleuses de Ziguinchor	Senegal	Formalized/Registered
6	TRY Oyster Women's Association and community groups	The Gambia	Formalized/Registered Delegated co-management entity
7	Lamin Nganyabola Kafo	The Gambia	Formalized/Registered
8	Fajikunda Women Oyster Association	The Gambia	Formalized/Registered
9	Kamalo Women Oyster Kafo	The Gambia	Formalized/Registered
10	Old Jeshwang Oyster Women's Association	The Gambia	Formalized/Registered
11	Kuloyaa Oyster Harvesters Kafo	The Gambia	Formalized/Registered
12	Berending women Oyster Association	The Gambia	Formalized/Registered
13	Kartong Women oyster Harvesters Association	The Gambia	Formalized/Registered
14	Fass Jom	The Gambia	Formalized/Registered
15	Bulock Oyster Women Association	The Gambia	Formalized/Registered
16	Naafi	Guinea Bissau	Formalized/Registered
17	Associaçao de Mindjeres Bideiras de Oystrade Ilha de Formosa	Guinea Bissau	Informal
18	Quitapesca	Guinea Bissau	Formalized/Registered
19	Grap Go Fenam Social club	Sierra Leone	Informal
20	Women in Development	Sierra Leone	Informal
21	Gbomgboma Association	Sierra Leone	Informal
22	Tewo Association	Sierra Leone	Informal
23	Liberia Fishermen Association (LFA), Marshall City	Liberia	Formalized/Registered
24	SCOOPS-COMTFRES	Côte d'Ivoire	Formalized/Registered
25	Association ETCHON of Lahou-Kpanda	Côte d'Ivoire	Formalized/Registered
26	KOBADIA	Côte d'Ivoire	Formalized/Registered
27	Batcha de NERO Boupé	Côte d'Ivoire	Formalized/Registered

Number	Organized Shellfisheries Groups	Country	Legal Status
28	Densu Oyster Pickers Association (DOPA)	Ghana	Formalized/Registered. Delegated co-management entity.
29	Agorpo Clam Fishers and Processors Association	Ghana	Formalized/Registered
30	Kpomkpo Clam Women Association	Ghana	Informal
31	Association of Women oyster Harvesters of Benin	Benin	Formalized/Registered
32	Otchananmi. Association of women shellfishers	Benin	Informal
33	Ibo Town Women Oyster Association	Nigeria	Formalized/Registered

Annex I: Hectares of Coastal Ecosystems with Shellfisheries Identified as Ramsar Sites for Conservation

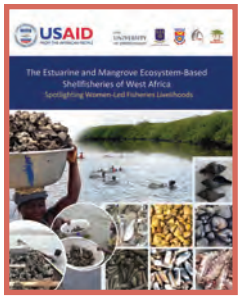
Table 7: Hectares of Coastal Ecosystems with Shellfisheries Identified as RAMSAR Sites

Protected Shellfisheries Areas		
Country	**Ramsar Site (with shellfisheries)**	**Area (Ha)**
Senegal	Parc national du Delta du Saloum	73,000
Gambia	Tanbi Wetland Complex	6,304
Guinea Bissau	Parc Naturel des Mangroves du Fleuve Cacheu (PNTC)	88,615
Guinea Bissau	Archipel Bolama-Bijagós (1,046,950 ha total marine and islands)	relevant area not available
Sierra Leone	Sierra Leone River Estuary	29,500
Liberia	Mesurado Wetlands	6,760
Liberia	Lake Piso	76,091
Côte d'Ivoire	Grand Bassam	40,210
Côte d'Ivoire	Iles Ehotilé-Essouman	27,274
Côte d'Ivoire	Parc national d'Azagny	19,400
Côte d'Ivoire	N'ganda	14,402
Ghana	Densu Delta	5,893
Ghana	Keta Lagoon Complex	101,022
Togo	Entire Coast (shellfish in these limited areas)	100
Benin	Entire Coast (shellfish in these limited areas)	6,600
	TOTAL	495,171

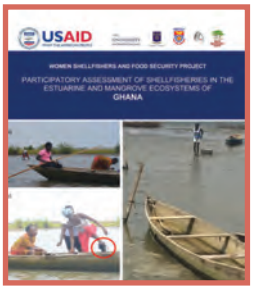
(Source: rsis.ramsar.org/ris/1631)

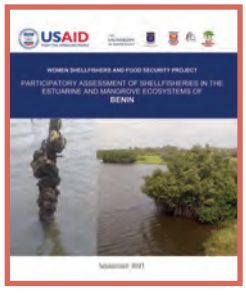
Annex J: Women Shellfishers and Food Security Activity Reports

Regional Reports



Country Reports





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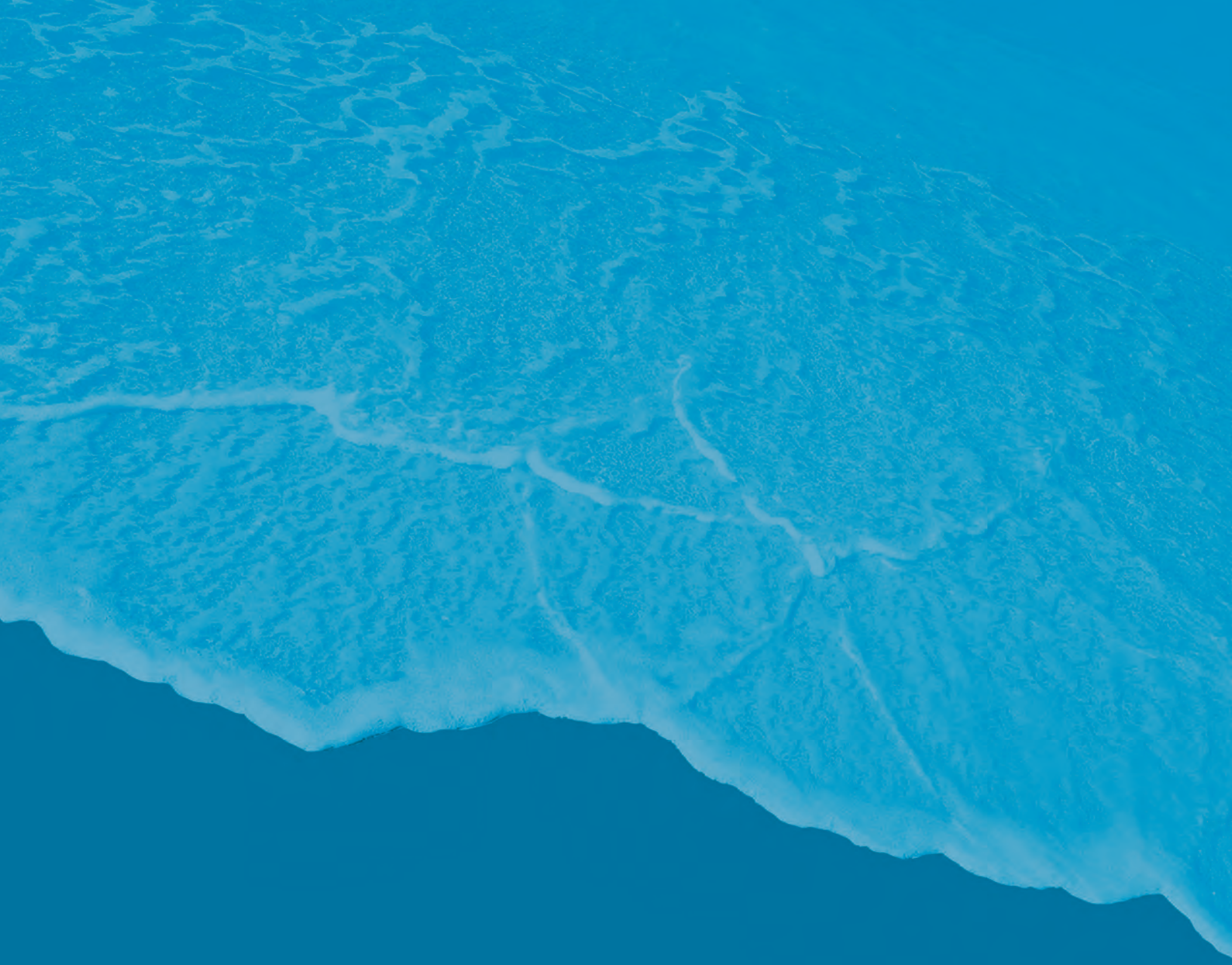

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