

Small-scale fisheries development in Africa: lessons learned and best practices for enhancing food security and livelihoods

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Abstract

Small-scale fisheries (SSFs) play a significant role in ensuring food security, providing employment and generating livelihoods, however the sustainability and viability of their existence into the future is under threat with global pressures such as climate change, the increasing industrialisation of larger fishing activities and depleting fish stocks. The objectives of this article are to highlight the contributions of SSFs to poverty alleviation and food security and document the lessons learned and best practices for small-scale fisheries development in Africa to guide realistic policy reform and sustainable development projects. This paper brings together lessons from the development of Africa's SSFs over the last thirty years alongside a range of case studies, taken from across the continent, of best practices for further development of SSFs from the perspective of food and nutrition security and of improving livelihoods and income. The key findings of best practices and their application to the sustainable development of African SSFs were: (i) supporting local or community governance; (ii) developing integrated, system-oriented policies which focus on the role SSFs play in food and nutrition security; (iii) investing in low cost innovation; (iv) diversifying fishing practices and livelihoods opportunities; and (v) supporting and cross-pollinating existing infrastructure and initiatives. The effective implementation of these practices by projects or governments necessitates the mobilisation of resources, on-the-ground engagement with stakeholders and using local knowledge to make meaningful change.

Keywords

Small-scale fisheries; fisheries development; sustainable fisheries; artisanal fisheries; sustainable practices

1. Introduction

Small-scale fisheries (SSFs) or artisanal fisheries have always existed as essential components of coastal communities (Garcia et al., 2012), and still make up ubiquitous occupation. With the evolution of industrial fisheries in the last century, large-scale fisheries tend to dominate the focus of research and policy, increasing the marginalization of SSFs, or evolving them into recreational activities in the developed world (Misund et al., 2002). Thus, SSFs are predominantly associated with developing regions, where the majority of the human population exists. There is much variation around the definition of SSFs, predominantly based on the varying scales and contexts under which SSFs are described (WorldFish Centre, 2008; Smith & Basurto, 2019). Across Africa, this heterogeneity is similarly vast and presents interesting

1 cases for the varying means of operation of SSFs, the governance structures regulating
2 practices, the species targeted, the gears used, and the markets in which they operate. Some
3 consistencies can be seen, particularly in the low-capital systems within which the SSFs
4 operate, the use of relatively small vessels, and remaining within close distances from the shore
5 (Belhabib et al., 2015a). However, SSFs tend to vary in description from country to country
6 and defining them would result in a definition too narrow or inappropriate for particular
7 contexts (Garcia-Florez et al., 2014). Thus, it is urged that countries and decision makers define
8 their SSFs in a way that fits their particular context to avoid reductionistic definitions that make
9 SSFs illegible to outsiders and limit them only to the likes of gear and boat size (Smith &
10 Basurto, 2019).

11
12 In Africa, the high level of employment within the artisanal fishing sector is significant for
13 many communities who possess few opportunities to earn an income through means other than
14 fishing. The small-scale sector makes up 85% of harvesters (FAO, 2020), 47% of landed value
15 in the region (Pauly & Zeller, 2016) and contributes to the food security of more than 200
16 million people in Africa (Sowman & Cardoso, 2010). This clearly illustrates the importance
17 and economic potential of SSFs for the African population. However, despite the significant
18 role that they play in local and national economies, the artisanal sector, when compared with
19 other food economy sectors of the continent, is poorly planned and regulated, underfunded and
20 often marginalized by better developed sectors (World Bank, 2004). Moreover, African SSFs
21 face notable pressure on livelihoods and fish stocks by large overseas industrial fleets such as
22 those of China, Russia and EU countries (Alder & Sumaila, 2004; Belhabib et al., 2015b).
23 These pressures result in SSFs which are even further overfished and overexploited in a bid to
24 try and build the sector to keep up with development (Cinner et al, 2012).

25
26 This paper reviews case studies and documents lessons learned to formulate best practices on
27 small-scale fisheries development practices towards the increased sustainable contribution to
28 food security, livelihoods and income. This study aims to review the last 30 years of SSF
29 development in Africa, focusing on research and governance mechanisms for artisanal
30 fisheries, programs for SSF development and other factors which influence the development
31 or constraints of SSFs. Within this context, this study investigates best practices for sustainable
32 development of SSFs, which is defined in this paper as a combination of environmental,
33 economic and social factors that improve economic and social benefits for small scale fishers
34 but within environmental limits.

35 This is achieved using case studies from the perspective of food and nutrition security, and
36 from the livelihoods and income perspective, using examples from across the continent to
37 highlight opportunities and lessons learned. From these best practices, ways forward for the
38 sustainable development of small-scale fisheries are explored. Outputs of this review can be
39 used to inform sustainable fisheries development and governance of sustainable exploitation
40 of fisheries resources in Africa.

41 42 **2. Methods**

43
44 The paper drew on on-the-ground experiences, knowledge, and discussions between co-authors
45 to establish the significant drop in efforts that embody the sustainable livelihoods approach. To
46 retrieve relevant literature on SSFs in Africa an extensive search using electronic library
47 databases Scopus, Science Direct and Google Scholar, was conducted. The keywords “small-
48 scale fisher”, “small-scale fisheries”, “artisanal fisher”, “fisher folk”, and “fisher communit”
49 were used, each alongside the word “Africa”. Similarly, searches of the websites of relevant
50 organizations such as FAO, SmartFish, The African Union and The African Union InterAfrican

1 Bureau for Animal Resources were conducted to attain greater coverage, as well as direct
2 contact with author networks within these organizations to inform case study choices. Further
3 keywords used alongside the others included “sustainable livelihoods”, “food security”, “food
4 and nutrition security”, “best practice”, “sustainable”, and “progress”, among others. In all
5 cases, variations of the words were also used to broaden the search.

6
7 Inclusion of peer reviewed literature is based on the principle that peer-reviewed publications
8 can serve as indirect measures of knowledge produced on a topic because they are a well-
9 established means through which scientific information is communicated and verified across
10 academic communities (Van Raan, 2004). However, peer-reviewed journals inevitably provide
11 an incomplete picture of knowledge produced on any topic and are certainly not the only means
12 through which scientific findings are communicated. Therefore, the inclusion of grey material
13 was decided upon, also as often pilot projects are documented under reports for implementing
14 agencies and not as peer reviewed literature. Articles were included in both French and English.

15
16 The practices represented in this paper were selected as case studies because they cover a range
17 of different situations across Africa and are perceived to be representative of the Sustainable
18 Livelihoods Approach and focus on small-scale practice that help overcome the
19 marginalization imposed on SSFs by the favouring of governance mechanisms for industrial
20 fisheries. It is important to note that there are many other examples across the continent which
21 exhibit good practices beyond those included in this paper. This synthesis does not aim to
22 declare the practices included in this paper as an all-encompassing narrative or as the sole
23 solutions to the myriad of issues that SSFs face. Rather, this paper seeks to bring to light those
24 activities and approaches that are working in the context of sustainable livelihoods and food
25 security to inform the efforts associated with sustainable developing Africa’s small-scale
26 fisheries sector.

27 28 **3. Review of the last 30 years of small-scale fisheries development in Africa**

29 African waters are well known for their abundance of fishery resources. Three of Africa’s six
30 large marine ecosystems (LMEs) rank among the top four most productive in the world
31 (Rosenberg et al., 2014). This productivity, coupled with a productive network of inland water
32 systems, makes fish an important food source for the African continent. Specifically, fish
33 makes up 19% of African protein consumption (Béné et al., 2015) and significant critical
34 micronutrient contributions (Bennet et al., 2018; Hicks et al., 2019; Costello et al., 2020). The
35 value added by the fisheries and aquaculture sector as a whole in 2011 was estimated at more
36 than USD 24 billion, 1.26% of the GDP of all African countries, of which 0.76% was produced
37 by inland and marine SSFs (Lymer & Welcome, 2012; de Graaf & Garibaldi, 2014; AU-IBAR,
38 2015), the highest of all the fisheries sectors in Africa.

39 In terms of GDP, SSFs are especially important contributors to local GDP (Figure 1) in Western
40 Africa (particularly from Mauritania, Sierra Leone and Ghana) and Central Africa where the
41 Democratic Republic of Congo and Uganda are major contributors from inland artisanal
42 fisheries (Lymer & Welcomme, 2012). SSFs make up a valuable portion of the continent’s
43 fisheries production, accounting for around 44% of total landed catches (Pauly & Zeller, 2016),
44 with Western Africa being the highest SSFs producing area with regional catches exceeding
45 1800,000 tonnes and generating over 2000 million USD (TBTI 2018).

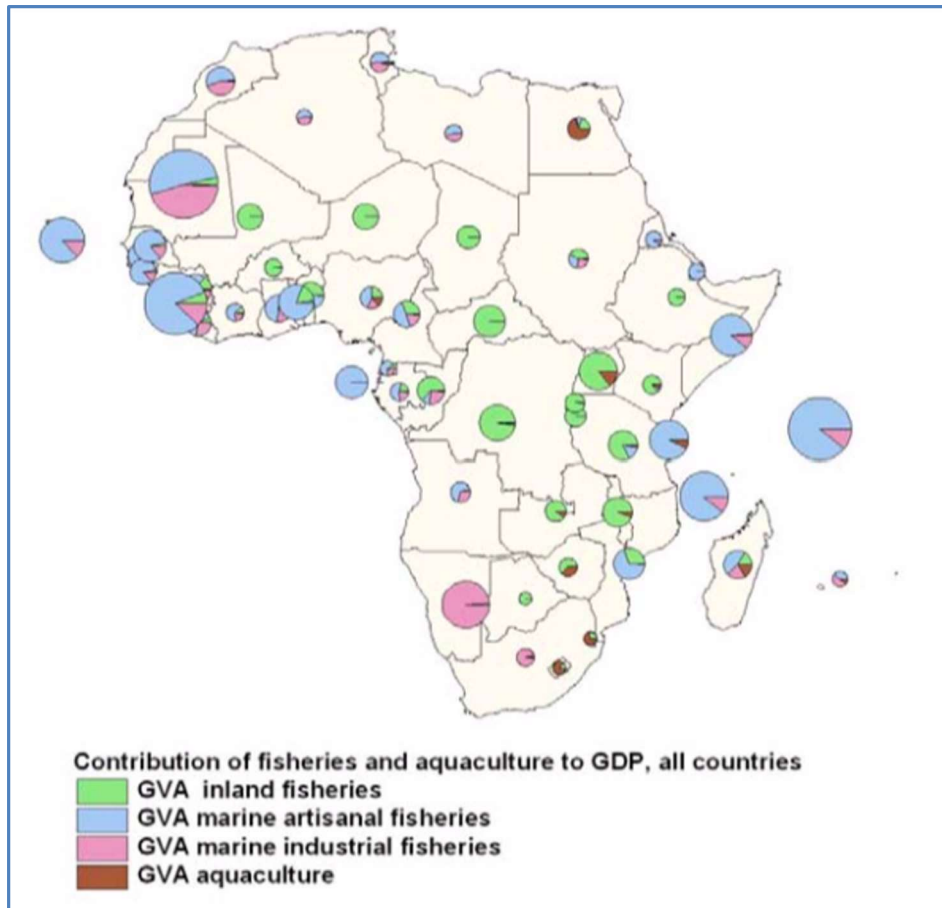


Figure 1: Contribution to GDP by fishing sub-sector by gross value added (GVA). The blue segments highlight the contributions by SSFs to national GDP. The size of the pie signifies the overall contribution of the fisheries sector to GDP. Taken from de Graaf & Garibaldi, 2014

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5 In Africa, the high level of employment within the artisanal fishing sector, which employs
6 around 5.2 million fishers (FAO, 2018), is significant for many communities who possess few
7 opportunities to earn an income through means other than fishing. In Southern Africa, SSFs
8 employ around 43,000 individuals in South Africa (Sowman & Cardoso, 2010) and around
9 200, 000 in Mozambique (FAO, 2019c), in Western Africa the artisanal sector is responsible
10 for the employment of nearly one million people (Belhabib et al., 2015a). From a Northern
11 African perspective, SSFs employ around 15,000 individuals in Libya (IUCN, 2011), 660,000
12 in Egypt (Samy-Kamal, 2015) and 35,500 in Tunisia (FAO, 2019b). Generally, SSFs in Africa
13 do not have a strong relevance to the national economy, however at the local level, fishing
14 provides for food and a source of employment for local coastal inhabitants.

15

16 While a highly productive sector, landed values have been in decline since 2004 despite an
17 increase in fishing effort and industrial catches (Pauly & Zeller, 2016). The viability of SSFs
18 is under question as over-exploitation of fish stocks is driving the costs of fishing higher than
19 feasible for African coastal communities (Béné, 2016). This overexploitation has been
20 exacerbated significantly over the last few decades through bilateral fisheries partnership
21 agreements which permit fishing in African waters by European, Chinese and Russian fleets.
22 These agreements have been designed and implemented without a critical focus on the
23 development needs of SSFs and their associated communities (Witbooi, 2008). The agreements
24 were developed with the intention that the collection of license fees and high-value fish exports
25 would provide enough foreign income into the African countries to increase the domestic
26 supply of lower value fish and provide valuable income for infrastructure development (Failer

1 & Binet, 2011). However, few coastal communities seem to have benefited from these
2 agreements in terms of employment (both direct and indirect), improved living standards or
3 increased food security (Alder & Sumalia, 2004; Failler & Binet, 2011). The provisions of
4 access agreements have often been manipulated by foreign fleets, with the quotas and effort
5 levels exceeded beyond what is stipulated, misreporting landings, and fishing outside of
6 territorial waters, all without renegotiation of licensing fees. This is exacerbated by corrupt
7 governments allowing fleets to breach the agreement terms, and the fact that many countries
8 lack the financial and human capacity to effectively enforce agreed standards or ensure
9 compliance (Alder & Sumalia, 2004). This ineffective exchange has led to severe
10 overexploitation of fish stocks and marginalization of SSF communities, generating further
11 livelihood and food sovereignty impacts (Harris, 2013).

12
13 Where fish depletion leads to poverty, this creates a two-way link in which poverty also leads
14 to fish depletion (Béné, 2006), highlighting the interdependencies of fishing communities on
15 local fishery resources. This poses further concern around food and nutrition security where
16 declines in fish catches poises a significant increase in the number of people who are poised to
17 become deficient in a selection of essential micronutrients such as zinc, iron and vitamin A.
18 (Golden et al, 2016), particularly where low-income households cannot afford to obtain these
19 micronutrients from other sources (Vianna et al, 2020). Furthermore, coastal fishing
20 communities who depend on marine resources for food, nutrition and livelihood are particularly
21 vulnerable to the risks and impacts associated with environmental degradation and climate
22 change (Allison et al, 2009; Sumaila et al, 2011).

23
24 Extensive research has been undertaken to evaluate the existing and potential future impacts of
25 climate change on global fisheries (both industrial and small scale) and consensus exists in the
26 literature that the catch potential will considerably decline particularly between tropical to
27 temperate regions (Cheung et al, 2010; Lotze et al, 2019). This is of particular concern for SSFs
28 in Africa as the continent lies entirely within these regions, which will thus disproportionately
29 affect African artisanal fishing communities. Similarly, the resilience to climate change of
30 many marine fauna has declined due to overfishing, further exacerbating the effects that SSFs
31 will undoubtedly face (Free et al, 2019). However, effective and timely improvements to the
32 management strategies of fisheries can contribute to maintaining the capacity of fisheries to
33 support livelihoods and food and nutrition security amidst ocean temperature changes (Free et
34 al, 2019; Bennett et al, 2021).

35
36 Initially, studies on developing SSFs in developing countries had a tendency to focus on how
37 the dependence of fishers on fishery resources, alongside the open access of management of
38 the fisheries has led to depleted stocks, poverty and vulnerability. Research and solutions often
39 emphasised the need to improve the economic efficiency of the fisheries while preserving fish
40 stocks, through minimising fishing activity either through access limitations or encouraging
41 fishers to abandon the practice. Furthermore, these prescriptions were based on matching
42 productive capacity of the fish stock with fishing capacity (equilibrium of achieving maximum
43 sustainable yield for example) (Alison, 2001). Such policy efforts failed to address the wider
44 economic role of artisanal fisheries but had instead a single-sector focus, using solely
45 traditional policy means to manage fisheries, often neglecting to consider alternative, systems
46 based and innovative policy and management options that incorporate wider activities and
47 community-based approaches such as those presented in this paper.

48 49 **3.1 Fisher migrations and impacts on livelihoods**

1 In recent decades, there has been a considerable increase in cross-border migratory flows to
2 and from coastal African countries (Binet, Failler & Thorpe, 2012) as well as within inland
3 fisher communities (Njaya, 2009). This is predominantly due to the depletion of fishery
4 resources in their traditional fishing areas (Bâ et al, 2016) and the changing oceans associated
5 with climate change (Failler et al, 2020). Further pressures engendering this phenomenon
6 include the restriction or enclosure of their fishing grounds due to other marine activities such
7 as oil exploration, aquaculture or conservation measures which restrict their activity (Bennett
8 et al, 2015). These unprecedented rates of migration have been driven by the need to adapt to
9 variations in fish stock abundance (Failler & Binet, 2010), the necessity to seek out further
10 sources of income, and the desire of young fishermen to escape the social pressures and
11 financial duties associated with family (Sall, 2006). The settlement of migrant fishermen and
12 the associated catches they make in host countries naturally creates impacts associated with
13 their economic inputs, socio-cultural differences and technological capacity. Their impacts and
14 the volumes of fish caught by migrant fishers has only in recent years gained attention by
15 researchers, and in many areas still remains unknown to policy makers (Failler et al, 2020).
16 Furthermore, the capacity to manage migrant fisher movements has been limited by
17 administrative boundaries (Wanyoni et al, 2016).

18 In Africa, major migratory fisher patterns are found across the continent. In West Africa,
19 Mauritania, Sierra Leone, Guinea, Guinea Bissau and Gambia have become important
20 production areas for Senegalese fishers (Failler et al, 2020). Between 2006 and 2010, the
21 catches by the Senegalese fishers in the EEZs of these countries was around 204, 300 tons
22 annually (Failler & Binet, 2010). In Central Africa, Gabon's artisanal fishing sector is made up
23 of predominantly migrant workers (Belhabib, 2015), many of whom are fishers from Benin,
24 Ghana, Togo and Nigeria (Sall, 2005). Based on the fact that Gabon only lands around 30,000
25 tons of fishery products per year, where estimated fish stocks are around 650,000 tons (only 3-
26 4%), the role non-native fishers play in the country's supply of fish products is critical.
27 Cameroon plays a similar role in hosting migrant fishers in the region (Njock & Westlund,
28 2010). East Africa sees a range of migratory fisher patterns between Kenya, Tanzania,
29 Mozambique, but more notably within national borders and from nearby islands such as Pemba
30 and Unguja (Wanyoni et al, 2016), all of which play important roles in social and economic
31 structures of these nations (Malleret-King et al, 2003). Further migrant fisher patterns exist
32 around the entire continent, including Madagascar (Muttenger, 2015), within the Great Lakes
33 up and down major river systems (Tweddle et al, 2015).

34 In most countries, migrant fishers live in relatively insecure conditions, where they rarely have
35 legal protection and conflicts with local fishers are often resolved to their detriment. They are
36 usually excluded from decision-making and local professional associations, but this lack of
37 social policies for migrants is a part of the wider issue of a lack of policies for managing migrant
38 fisheries (Failler & Binet, 2012). With such expansive migrant fisher situations across the
39 continent that have a range of positive impacts (especially associated with economic input and
40 food security), developing social management structures and understanding the movement
41 patterns of migrant fishers and their input and impact to local jurisdictions is a necessity for the
42 management of developing SSFs.

43

44 **3.2 Sustainable fisheries livelihoods program**

45 Since the mid-1990s the Sustainable Livelihoods Approach (SLA), made up of a framework
46 alongside a set of guiding principles, was gradually included in major institutions for adoption
47 as an approach to bring a fuller understanding of fisherfolk's adaptive strategies into the policy
48 arena of small-scale fisheries management in low-income countries. The concept of sustainable
49 livelihoods emerged as far back as 1987 with the establishment of the World Commission on

1 the Environment and Development (WCED, 1987), but was brought to light by Allison & Ellis
2 (2001) as an approach to small-scale fisheries management. It is a concept that aims to ensure
3 development accounts for communities that experience poverty and disadvantage through
4 participatory approaches based on the recognition that all people have abilities and assets that
5 can be built upon to help them improve their lives. Although not explicitly included in African
6 fishery policies, this concept engendered a shift in thinking whereby the SLA could be used to
7 better understand the adaptive strategies of small-scale fishers to create greater inclusion in the
8 policy arena, particularly in low-income countries. It focuses on the inventive and adaptive
9 solutions that low-income fishing communities already have that could be used to enhance
10 management strategies or as entry points for development intervention or policy support
11 (Allison & Horemans, 2006).

12 In the context of declining fish stocks and increasing pressures on artisanal and coastal
13 communities, the FAO developed the Sustainable Fisheries Livelihoods Programme (SFLP),
14 intrinsically based on SLA, in 1997 which sought to reduce poverty by improving policy
15 relating to artisanal fishing communities in West Africa. In this regard, the FAO Code of
16 Conduct for Responsible Fisheries (CCRF) and the SLA provided guidance for good practice
17 in fisheries resource use, and a framework for using grass-roots procedures to influence policy
18 issues, institutional environments and processes. The application of both SLA and CCRF and
19 the focus on human and social capital development, in particular by building capacities and
20 strengthening national institutions and communities rather than prescribing technical fixes or
21 concentrating on production methods, were the primary actions taken by the SFLP.

22
23 While the SFLP engendered positive achievements at varying levels in Côte d'Ivoire (Njifonou,
24 Satia & Angaman, 2006), Senegal (Failler & Kane, 2004) and other West African nations
25 (Horemans, 2004), its seven-year lifespan ended, along with similar projects following this
26 strategy. The lessons from various studies have shown that, despite the admirably ambitious
27 approach of projects such as the SFLP, familiar challenges for researchers and practitioners
28 remain including stakeholder conflict, corruption, lack of local capital assets and capacity and
29 weak governance structures and approaches. Whilst the SLA may improve understanding of
30 local-level dynamics within SSFs, more work is needed to address these recurring obstacles to
31 natural resource governance and poverty-alleviation schemes in developing nations.
32 Furthermore, there has been inadequate evaluation into the post-project impact of SSF
33 livelihood interventions, and despite the benefits the SLA approach offers, there exists a
34 consistent inability of fisheries institutions at the national level to facilitate alternative
35 livelihoods or SSF communities (Pomeroy, 2016). This work is, however, highly necessary not
36 only in combatting the obstacles themselves and diversifying livelihood opportunities, but also
37 to integrate into frameworks or projects, as such an approach appears to be diminishing in
38 recent literature and research despite its potential under the right conditions

39 **3.3 SSF Guidelines and the African Union PFRS**

41 Where previously not given much attention, the roles of both small-scale and inland fisheries
42 began gaining greater attention over the last decade (FAO, 2018). Two notable attempts at
43 more coherent management and governance of the SSF sector have been made within the last
44 decade. The first is the UN Food and Agriculture Organization's (UN-FAO) Voluntary
45 Guidelines for Securing Sustainable Small-Scale Fisheries grounded on the bases that
46 "Members of the FAO have been expressing an interest in better guidance on the governance
47 of small-scale fisheries since the mid-2000s, especially with regard to safety at sea since 2009
48 [...] The adoption of the human-rights based Voluntary Guidelines for Securing Sustainable
49 Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF
50 Guidelines) in 2014 has been hailed as a major leap forward in managing both marine and

1 inland small-scale fisheries. Members have also noted the SSF Guideline’s auxiliary role in
2 developing social policy and regulation on aspects closely related to small-scale fisheries”
3 (FAO, 2020, p99).
4 Essentially the Guidelines are designed to stimulate new legislation. Initiatives from
5 governments in this regard would indicate that they are willing to move from intent to action.
6 However, implementation is uncertain, especially considering that SSFs tend to be politically
7 charged (Sowman et al, 2013) and that outcomes can be highly unpredictable due to the
8 voluntary nature of the guidelines.
9

10 The second, developed in parallel with the intention to improve governance and management
11 of the SSF sector, and with specific mention of the SSF guidelines, is the African Union Policy
12 Framework and Reform Strategy (PFRS) for Fisheries and Aquaculture, which was also
13 adopted in 2014 (AUC-NEPAD, 2014). One of the main objectives of the pan African Policy
14 document is to improve and strengthen the contribution of SSF to poverty alleviation, food and
15 nutrition security and socio-economic growth especially for the fishing communities in Africa.
16 This was developed to address the lack of policy coherence across the continent that makes it
17 difficult to address the challenges of the sector. However, despite the participatory and strategic
18 approach taken, it has been weakly implemented with moderate success due to lacking or
19 inadequate institutional coordination mechanisms between the continental, regional, national
20 and local levels. Furthermore, the absence of a well-developed mechanism for the sharing of
21 information and decisions by the African Union with stakeholders for implementation has
22 hindered structured implementations (AU-IBAR, 2021).

23 The political relevance of the SSF Guidelines and the PFRS had the potential to lay the
24 foundation for comprehensive understanding by actors across the continent as to the potential
25 of SSFs and their role in sustainable resource governance. Nevertheless, without the political
26 will, investment and sufficient coordination for implementation, publishing policy documents
27 equates to little more than paper parks.
28

29 **3.4 Change needed in SSF research focus and governance**

30 While recent studies tend to focus more on concerns such as environmental impacts and climate
31 change, the importance of SSFs for livelihoods and income seems to be diminishing amidst the
32 literature in this focal area. In the face of increasing pressure on fisheries in Africa, the
33 situations in poorest countries are even more worrisome where fishing communities
34 experiencing declining stocks are bound in a poverty trap, resorting to higher fishing effort
35 systems with severe socio-economic implications (Cinner, 2011; Eriksson et al, 2021). There
36 is a critical need for SSF governance to be reshaped (Barnes et al, 2017) according to the
37 vulnerability and dependency context of the sector and its potential to generate economic
38 benefits beyond just the fishers in the fishery. A surge in case studies highlighting the food
39 security, economic and livelihood value of SSFs across the world emerged in the 2000s
40 (Neiland et al, 2000; Béné, 2006, Pauly, 2006), but the focus on African artisanal fisheries and
41 the challenges inhibiting their sustainable development in the last decade has met a shortfall,
42 especially where the benefits that SSFs provide are increasingly at risk, and rarely considered
43 in policy development (Mills et al, 2011). The latest African Union Blue Economy Strategy
44 (2019), despite its initial recognition of the importance of SSFs for livelihoods, trade, food
45 security and the economy, has been criticized by the African Confederation of Artisanal
46 Fisheries Organisations for the potential harm it might engender for SSF communities
47 (CAOPA, 2020). Where the strategy talks about the participation of coastal communities, the
48 drafting of the strategy inherently failed to include artisanal fishers, with no evidence of

1 community consultation (CFFA, 2020). It is argued that the strategy further marginalizes SSFs
2 by prioritizing fossil fuels, major infrastructure development, mining and international tourism
3 while neglecting independent social and environmental impact assessments, which is predicted
4 to generate disproportionate displacement of SSF communities and harmful effects on the
5 environment on which they depend. Furthermore, the strategy fails to acknowledge the existing
6 pressures on resources and disregards local potential for wealth creation opportunities to
7 improve livelihoods (COAPA, 2020).

8
9 SSFs lack sufficient data collection, community participation and management structures to
10 collect sufficient, reliable data on SSFs, resulting in a distorted view of the fisheries sector
11 (Mills et al, 2011), and the inability to apply meaningful Sustainable Livelihoods approaches.
12 This means that most countries do not sufficiently value artisanal fisheries or recognize the full
13 extent of their contribution to poverty alleviation, livelihood provision and food and nutrition
14 security. This lack of understanding, coupled with ineffective local-level governance systems
15 creates a vacuum of information which could be better used to sustainably develop SSFs for
16 not only its direct impacts the people who depend on them, but for the wider economic and
17 social benefits that SSFs provide.

18 **4. Best practices for sustainable development of SSFs**

19
20 While the social and cultural contributions of small-scale fisheries are invaluable, the
21 management objectives for SSFs are not too dissimilar from those of industrial-scale fisheries,
22 especially in terms of conserving fish stocks, minimising wasteful production processes and
23 preserving the health of ecosystems. Initially, in all cases there could be short-term trade-offs
24 between attempting to ensure meaningful employment opportunities to as many fishing
25 communities as possible, while trying to prevent the overexpansion of the fishing practices and
26 the associated environmental degradation and depletion of stocks. There exists a large number
27 of constraints to SSF development, and even further constraints associated with developing in
28 a sustainable manner. Without the sustainable development of SSFs, the livelihoods, income
29 and food security of coastal communities are at risk of collapsing under local and global
30 pressures, particularly where the impending impacts of climate change are likely to reduce
31 fishing opportunities (Gaines et al, 2018). The following examples examine ways in which
32 positive changes are being made in coastal communities for the development of the artisanal
33 fishing sector.

34 **4.1 Food and nutrition security focused initiatives**

35
36 Despite the heavy reliance of African nations on SSFs for their critical role in contributing to
37 food and nutrition security, the artisanal sector has been systematically neglected in terms of
38 management over the years in favour of the commercial fisheries sectors. A deeper
39 understanding of the factors that influence food security outcomes in the context of fishing
40 communities is beneficial as it can guide targeted research and initiatives that strengthen the
41 well-being of fisher communities. This subsection focuses on lessons learned at the local or
42 national level for improving food and nutrition security through sustainable SSF development.
43

44 **4.1.1 Angola's strategy for increasing contribution of SSFs to food security**

45 In Angola, small-scale fishers are recognized by law, with an allocated exclusive fishing zone
46 extending four nautical miles from the shore. SSFs make up the primary means of food
47 provision to a large portion of the population of Angola's coastal communities, for which there
48 are around 102 artisan fisher settlements (Cardoso et al., 2006). Most of the catches are

1 consumed by the fishing communities, although there is a small market for wholesalers. The
2 country and Ministry of Fisheries recognizes artisan fisheries as playing a critical role in
3 ameliorating hunger and poverty and ensuring food security. This is carried out by applying a
4 range of initiatives to sustainably develop the artisanal sector, including the incorporation of
5 the artisanal sector into national catch statistics and allocating a significant 35% of total
6 allowable catch to the artisanal sector. This sector is supported through a number of projects
7 which aim to improve food security and nutrition among artisanal fishing and fish farming
8 households while addressing climate change issues that affect fisheries and aquaculture sectors.
9 This is done through creating or improving relevant infrastructure, establishing mechanisms
10 for low interest micro-credit and conditional grants, increasing the number of vessels,
11 improving working conditions and security on board, strengthening the existing network of co-
12 operatives and improving the living conditions of coastal communities. As far as contributing
13 to food security is concerned, Angola's legislation has prioritised food and nutrition security
14 through adopting concrete steps to use marine fisheries to increase food and nutrition security
15 to both coastal communities and the country as a whole (Sowman & Cardoso, 2010).

16
17 Some key outcomes of these initiatives include the construction of over ten fisheries centres,
18 multiple fish markets and fish processing facilities including areas for boat launching or
19 maintenance as well as landing structures. The expansion of access to potable water and the
20 introduction of cooling and freezing equipment has greatly increased the capacity for hygiene
21 in landing and processing areas, minimising post-catch waste. Furthermore, the initiatives have
22 enhanced the capacity of fishers and associated communities by nationwide training and
23 education both in sustainable fishing activities and other environmental practices (IFAD, 2017)
24 and in business management and the use of credit. The nation has seen a notable increase in
25 the amount of fish being sold in markets and supplied to hotels and restaurants in major cities
26 (African Development Bank, 2011).

27 This case highlights that, given the importance and contribution that SSFs have towards a
28 nation's food and nutrition security, it is imperative to recognize and promote sustainable
29 small-scale fishing communities in national policy and legislation and position SSFs as a vital
30 resource for efforts to alleviate hunger and malnutrition (Bennett et al, 2021). The case of
31 Angola's SSF strategy can demonstrate the potential of these fisheries to enhance the
32 aforementioned efforts and encourage governments to invest in the sustainable development
33 and improved management of SSFs.

34 35 **4.1.2 Diversifying use of fish by-products to increase food and nutrition security in** 36 **Uganda**

37 Nile perch is the most valuable fishery product in Lake Victoria (Geheb et al, 2008), but usually
38 solely valued for the flesh or fillet of the fish. About 60-70 per cent of this fish ends up as a by-
39 product (carcass, skin, etc.) when processed, with only the remaining flesh being eaten as food.
40 However, the unused part of the fish considered to be by-products can constitute as much as
41 70 percent of the fish. Similarly, catches in Lake Victoria often contain a high proportion of
42 juvenile Nile perch as bycatch, which is usually discarded as waste (Wandera, 2005). Fish by-
43 products, when processed correctly, provide high levels of essential micronutrients such as
44 iron, zinc, selenium, calcium, vitamins A, B and D, alongside high-quality proteins and omega-
45 3 fatty acids (Kabahenda et al, 2011). Utilising processed nutrient-rich by-products from fish
46 can play a crucial role in improving nutrition security (Olsen et al, 2014), especially in areas
47 where malnutrition is present, as is the case in Uganda, where iron deficiency is particularly
48 high amongst pregnant woman, and children (Bongomin et al, 2021).

49 In light of this, the Ugandan Fisheries Department under the Ministry of Agriculture, Animal
50 Industry and Fisheries, alongside the Indian Ocean Commission (IOC) SmartFish project,

1 initiated an endeavour to increase nutrition security in the nation by processing the by-products
2 of perch. The initiative sought out research teams to develop simple and affordable methods to
3 transform the by-products into edible micro-nutrient rich powders using local hammer mills. A
4 step-by-step process was taught to the communities in which the processing takes place to
5 ensure food hygiene standards are maintained and the by-products do not go to waste due to
6 poor handling (FAO, 2016). The powder was tested in a range of applications, ultimately to
7 enhance food security by enriching local diets, school meals, and as an emergency food
8 supplement for refugees. Further studies were carried out to investigate the willingness of local
9 industrialists or entrepreneurs to invest in production activities for the powder. The public
10 acceptance of both the increased access to nutrients and the value added of the products has
11 been positive.

12 This case highlights the potential for the up-scaling of SSF practices to integrate nutrient-rich
13 fish by-products into local cuisine, promoting increased nutrition, which is especially important
14 in areas where starch-based staples result in decreased iron and zinc absorption. Furthermore,
15 this case demonstrates the dissemination of innovative means to ensure food and nutrition
16 security through diversifying processes used for fish products and the distribution of simple
17 hammer mill and vacuum sealing. The combination of low costs, high nutritional values, simple
18 technology and acceptability demonstrates potential for the expansion of this practice to other
19 regions (Kurien & Lopez-Rios, 2013).

20

21 **4.2 Livelihoods and income focused initiatives**

22 There is a need not only to enhance our knowledge about the correct extent to which small-
23 scale fisheries are important for livelihoods and income, but also to improve our understanding
24 of the various mechanisms through which small-scale fisheries do participate in poverty
25 alleviation and to the general socio-economic advancement of developing countries. This
26 subsection focuses on lessons learned at the local or national level for improving livelihoods
27 and income through sustainable SSF development.

28

29 **4.2.1 Generating social responsibility through co- management in Ngaparou, Senegal**

30 Ngaparou, a traditional fishing village on Senegalese coast, is renowned for its small-scale
31 fishing industry and related businesses. Years of open-access regimes to artisanal fisheries has
32 contributed to the depletion of fishery resources and increases in fish prices. The overexploited
33 stocks have pushed Senegalese fishers to extend their range, further from shore and often into
34 neighbouring countries of Mauritania and Guinea-Bissau (see section 1.3 on fisher migrations).
35 This further drives up the costs of fishing, leading to lower incomes and poorer livelihoods. In
36 an effort to ameliorate these pressures, in 2008, a co-management trial was initiated at four
37 pilot sites based on legal arrangements between the Government and local fishers' committees
38 (FAO, 2019a). A co-management agreement was signed by the Senegalese Government and
39 the Ngaparou fishers' committee. The Ngaparou committee represents all the sites' fisheries
40 stakeholders. The co-management agreement acknowledges the important role played by
41 traditional law, under which village communities have managed fish resources, which
42 legitimises the local fisheries management system set-up. It provides a legal basis for local
43 sustainable management initiatives developed by the community itself to attempt to solve the
44 issues of resource scarcity and decreasing local fishing yields (Sy et al, 2019).

45

46 This co-management arrangement has provided some significant results in advancing the
47 sustainable management of the SSF in Ngaparou including improved management of the local
48 lobster species through bans and restrictions; the setup of a protected fishing area; installing
49 artificial reefs and fish aggregating devices in the buffer zone of the protected fishing area; and

1 increased compliance to fisheries legislation. This arrangement also suggests a number of
2 lessons learned (FAO, 2019a). First, that empowerment of fishing communities is a prerequisite
3 for improving small-scale fisheries governance. The major change was that these management
4 measures were defined independently by the communities, while the government's role was
5 simply to approve them and give them full legal force. This engendered a sense of collective
6 responsibility for the resources and development of the local fishing industry. It furthermore
7 strengthened the capacity for resource management as the Senegalese Government (which
8 previously focused on regulating fisheries operations through a central management system)
9 now had further human resources from the community and could prioritise their efforts where
10 needed by having support through participatory monitoring and community development
11 fundraising. Moreover, through solidarity, the fisheries committee generated financial backup
12 for the fishing households most affected by the changes to fishing system (Sy et al, 2019).
13 The case of Ngarparou highlights the importance of social responsibility in implementing SSF
14 governance strategies. The underlying solidarity of many Senegalese, and other African small-
15 scale fishery communities favours the emergence of social responsibility for the sustainability
16 of artisanal fisheries.

17 18 **4.2.2 SmartFish community videos for sustainable practice and minimizing post-** 19 **harvest losses** 20

21 Post-harvest losses in SSFs are a major threat to food security and livelihoods. Poor handling
22 of fish and poor hygiene are the primary causes of spoilage in fish, resulting in post-harvest
23 losses (SmartFish 14, 2013). The lack of knowledge and understanding that is evident in many
24 fishers, processors and traders as to the causes of the deterioration and the consequences of
25 poor hygiene and handling on fish quality and food security, is one of the underlying reasons
26 of these losses.

27 To combat this, the EU funded project SmartFish (managed by the Indian Ocean Commission
28 and co-implemented by the Food and Agricultural Organization, FAO) saw the development
29 of an education and awareness campaign. Titled "Clean fish, Better life". The project adopted
30 a participatory video (PV) approach to disseminate information around post-harvest hygiene
31 and good practices from harvest to sale. The PV approach, initiated along the shores of Lake
32 Victoria, saw fit application based on its ability to be watched by people of varying age groups
33 and literary abilities; deliver educational messages in an accessible manner and in the local
34 context; and be disseminated easily and repeatedly, thus affecting many beneficiaries at a low
35 cost. It is a participatory campaign that involves a community, or small group thereof, in the
36 creation of its own educational film in order to promote exchanges, both between people and
37 with other communities. The PV approach is based on the premise that the filming of the video
38 is relatively easy and accessible, as well as a process which brings communities together
39 through a stimulating process to take initiative to communicate their needs and pressing issues,
40 express their ideas and ultimately solve their own problems. The PV experience enhances the
41 learning process and a sense of community ownership over their resources as those involved
42 in the filming are engaged and fulfil the role of protagonist rather than that of an object of
43 study. This has the potential to reinforce attitudes and the motivation to take action. (SmartFish
44 14, 2013

45
46 The first SmartFish PV produced, entitled Usafi Ni Pesa (Hygiene saves money)¹, was
47 disseminated in many communities along the shores of Lake Victoria during a touring film
48 campaign which started in Kenya, and was continued in Uganda and Tanzania. The campaign

¹ Available for viewing here: https://www.youtube.com/watch?v=Ffqf_o4Xxak&ab_channel=SmartFish

1 was presented over 6000km, organizing traveling cinema screenings in 44 landing sites and
2 fishing communities. The first post-campaign impact assessment carried out in Kenya and
3 Uganda confirmed that the use of video was successful in conveying the right messages to
4 communities. Due to the video actors being of similar communities and backgrounds as the
5 target audience of the campaign, the educational message was conveyed in an accessible form
6 of “edutainment”, in accordance with local socio-cultural contexts targeted by the project.
7 During public talks held before and after each traveling cinema session, the audience, with a
8 trained facilitator, was given opportunity to analyse, describe and classify new information,
9 thus creating an important link between practices with which they are accustomed, and the new
10 practices proposed by the videos (SmartFish 14, 2013).

11 This programme highlights the innovative way in which valuable information and education
12 can reach communities which may otherwise not have access due to financial arrangements or
13 illiteracy. It is a diversified, community-based approach to encouraging sustainable practices
14 and development of SSFs. While this specific example focused on increasing the value of fish
15 and cutting losses in the supply chain, further activities in this manner could take place to
16 engender sustainable change around the control of illegal fishing, the importance of respecting
17 fisheries laws, good environmental management, diversification of livelihoods and other
18 necessary topics for dissemination.

19

20 **4.2.3 Co-management and Knowledge Exchange between community fishers of** 21 **Madagascar and Mozambique**

22 In 2004, the Vezo community of fishers in Andavadoaka created a locally managed initiative
23 that addressed the need for a sustainable octopus fishery, as a result of an ongoing decline in
24 catches (Dewar, 2015). The establishment of locally managed marine areas (LMMAs) was
25 supported by government policies which allowed local communities to use traditional laws and
26 indigenous knowledge to govern temporarily through measures such as permanent closures
27 which resulted in the recovery of octopus stocks (FAO, 2019a). This endeavour is heavily
28 supported by Blue Ventures, the Wildlife Conservation Society, World-Wide Fund for Nature
29 and the Madagascan Marine Research Institute for the necessary technical and material support
30 to enable local management. The Velondriake LMMA is managed at the local level, with an
31 elected association of village representatives responsible for all rule-setting and enforcement
32 (Andriamalala and Gardner, 2010).

33 The octopus closures have seen a significant increase in octopus landings in the annual month
34 following its reopening by over 700 percent, significantly boosting individual fisher catches
35 and associated income (Oliver et al, 2015). However, the sustainability of this practice has not
36 yet been evaluated. Furthermore, the management practices have evolved to include two
37 mangrove reserves and five coral reserves and various other temporary closure measures. The
38 coral reserves have seen a 189% increase in fish biomass within six years of implementation
39 (Gilchrist et al, 2020). The socio-economic impacts have been notable moreover through the
40 development of social capital (Barnes et al., 2015) and improved health, increased income and
41 smaller families associated with the access to better health services to accompany increased
42 income. Moreover, the community reports that the livelihood interventions associated with the
43 LMMA have increased the establishment of small business and reduced reliance on fishing,
44 thus decreasing the pressure on the relevant ecosystem structures (Gardner et al, 2020).

45 The evident successes of Velondriake LMMA have led to a large number of other communities
46 to take similar action (Gardner et al, 2017). This was based on the methods of learning
47 exchanges developed by Thomson et al. (2013) focusing on ‘Fishermen Learning Exchanges’
48 (FLEs). FLEs are organized gatherings where fisheries stakeholders from different
49 communities openly exchange information and experiences surrounding fisheries challenges
50 and solutions. The most notable case of FLEs in this instance is that which was arranged with

1 a Mozambican delegation of two coastal villages (Quirindi and Quiwia) to learn about the
 2 system of closures at Velondriake, including the challenges and successes associated with their
 3 establishment (Dewar, 2015). Subsequent to the FLE, Quiwia village was the first to implement
 4 its premier octopus closure, which has become the model and base in the region for further
 5 FLEs. Today, fishing community delegations from other parts of Mozambique travel to
 6 Quiwia, to learn about the closure model. Currently, around 200 LMMAs have been
 7 established, many with octopus closures. Together, these areas now cover roughly 15% of
 8 Madagascar’s coastal areas and exist as the primary form of marine resource management in
 9 the country (FAO, 2019a). Moreover, around 200 octopus fishery closures have been
 10 implemented in Madagascar since the case of Velondriake, and activities such as this have
 11 dispersed to Mauritius, Mexico, and Tanzania (Gardner et al, 2017). This proliferation can be
 12 significantly attributed to the FLEs. This work is primarily supported by the Zoological Society
 13 of London, among other international agencies and organisations. The unusual and significant
 14 amount of support provided to this project extended its capacity and likely played a defining
 15 role in its success.
 16 This case study highlights not only the importance of investing into community empowerment
 17 and stewardship through co-management, but more importantly that bringing different fishing
 18 communities together alongside resource managers through FLEs creates a deepened
 19 understanding, which results in more successful inclusive and participatory management
 20 systems (Gardner et al, 2017) which can be shared with wider communities for the dispersal of
 21 best practices.

22 4.3 Summary of case studies

24 The case studies identified represent only a small proportion of activities and initiatives that
 25 have taken place across the continent’s shores, but provide valuable insights from which
 26 lessons can be drawn and applied to SSFs throughout Africa. The key outcomes and lessons
 27 learned are described in Table 1.

28 **Table 1.** Summary of case studies’ key outcomes, associated enabling factors and lessons
 29 learned to inform best practices for the sustainable development of SSFs.

Case Study	Focus point	Key outcomes	Lessons learned
Angola’s strategy for increasing contribution of SSFs to food security	Food and nutrition security (contributes to livelihoods and income)	Construction of multiple fisheries centres, fish markets and fish processing facilities has contributed to improved post-harvest waste management. Enhanced capacity and increased marketable fish products from SSFs.	Including SSFs in national food systems thinking can increase food security and resilience.
Diversifying use of fish by-products to increase food and nutrition security in Uganda	Food and nutrition security (contributes to livelihoods and income)	Increased access to nutrients and value added for fish diversified products. Minimization of waste from by-products.	Utilizing existing mechanisms and local resources for diversified activities can increase food and nutrition security. Investing in low cost innovation provides alternative means for income and improved access to nutrition.
Generating social responsibility in Ngaparou, Senegal	Livelihoods and income – (contributes to food and nutrition security)	Increased compliance to fisheries legislation. Management measures developed by the community itself with the support for the	Empowerment and social responsibility have as much of an important role to play as economic measures for SSF management. The underlying solidarity of many African small-scale fishery communities favours the emergence

		government in applying and implementing them. Improved management of resources under agreeable conditions, and financial support to those most affected by agreed changes.	of social responsibility for the sustainability of artisanal fisheries.
SmartFish community videos for sustainable practice and minimizing post-harvest losses	Livelihoods and income (contributes to food and nutrition security)	Improved education and awareness around post-harvest practices to increase market value of fishery products. Easily accessible communication of good practices that can be expanded to other areas of sustainability.	Community leadership and education plays a considerable role in the broader marine conservation movement. Culturally appropriate knowledge transfer can improve value added of catch and awareness around sustainable practices.
Co-management and Knowledge Exchange between community fishers of Madagascar and Mozambique	Livelihoods and income (contributes to food and nutrition security)	Successes of the first LMMA (such as increased landings, improved individual fisher catches, increased fish biomass within the reserves, increased social capital, improved access to health services and reduced reliance on fishing in some cases) have been conveyed to hundreds of other SSF communities and over 200 more LMMAs following similar structures have been developed to duplicate this arrangement.	Cross pollination of existing practise and initiatives through knowledge transfer to other communities can engender meaningful change and the implementation of sustainable practices. Ongoing support and investment is needed to ensure the longevity of processes that would otherwise not be able to take place within the communities without sufficient resources.

1

2 While these outcomes and lessons can instigate meaningful discourse regarding the
3 development of SSFs, it is important to note that there are elements and challenges
4 associated with any new practice that is put in place. These could include *inter alia* ensuring
5 the participation of marginalized groups, ensuring gender equity, resistance to initiatives,
6 managing power relations, and ocean grabbing. These factors should be accounted for when
7 considering any approach to management of SSFs.

8 **5. Discussion on best practices and ways forward**

9 The need for sustainability of SSFs to secure their success and the food and livelihoods security
10 they provide requires pragmatic prioritisation of management objectives and the assessment of
11 their relevance to the specific context of the small-scale fishery of a country or region. There
12 are a number of existing successful strategies in place in this regard which provide SSF
13 communities with a better way of life, as highlighted in the preceding section. From these cases,
14 five key elements are determined as a set of good practices to be used in future development.
15 These are:

- 16 (1) Supporting local or community governance
- 17 (2) Develop integrated, system-oriented policies which focus on the role SSFs play in food
18 and nutrition security
- 19 (3) Investing in low cost innovation
- 20 (4) Diversifying fishing practices and livelihood opportunities
- 21 (5) Supporting and cross-pollinating existing infrastructure and initiatives

1
2 From these a range of lessons for the future can be drawn to facilitate collaboration, empower
3 fishing communities, encourage active participation in decision making around fisheries
4 policies and management, and encourage investment and trade. Although not an exhaustive
5 list, these cases and associated lessons learned provide valuable insight into manners of
6 sustainably developing SSFs and their communities in Africa.
7

8 **5.1 Supporting local or community governance**

9

10 Governance and management for the sustainable development SSFs in Africa is particularly
11 heterogeneous due to the diverse political and social systems that determine the institutional
12 landscapes both at the national and regional levels. At a national level most SSFs in Africa are
13 managed by a top-down resource management system (TBTI, 2018). However, with growing
14 cases as described in the previous section, communities in this region are increasingly
15 empowered with the ability and responsibility of working with governments to make decisions
16 about the marine resources on which they depend. In decentralized co-management
17 arrangements, these improvements are reflected in an increasing percentage of co- management
18 governance modes and additionally, community-based management and self-governance are
19 increasing in representation (Quimby & Levine, 2018).

20 Fisheries co-management in places like Ngaparou, Senegal, as well as many other examples in
21 Côte d'Ivoire (Njifonjou et al, 2006), Kenya (Cinner et al, 2009) and other regions has proved
22 to increase the sense of ownership and empowerment amongst fishers, as well as contributed
23 to the enhancement of sustainable livelihoods especially in poverty-ridden situations (Cinner
24 & Aswani, 2007). Fisheries co-management has the potential to produce positive outcomes for
25 societies and ecosystems, but successful co-management will likely require investing in
26 institutions and building leadership capacity at local scales. Moreover, existing co-management
27 structures lack consideration for migrant fishers, their influxes into fishing communities, issues
28 of conflict, and their use of resources (Wanyoni et al, 2016). This paucity of information about
29 the status of relations and resources, alongside the lack of inclusion of migrant fishers despite
30 their role, generates a limited ability to make informed decisions. In cases where migrant fishers
31 are prevalent, their involvement in co-management requires urgent consideration to enable
32 them to play their roles effectively. Ultimately, empowerment of fishing communities is a
33 prerequisite for improving SSF governance, but it cannot play a successful role in SSFs without
34 the right legal frameworks to allocate management rights to all actors involved.
35

36 **5.2 Developing integrated, system-oriented policies which focus on the role of SSFs play** 37 **in food and nutrition security**

38

39 Strengthening international, regional and national policies that support SSFs presents further
40 opportunity to improve their development as well as meet poverty alleviation and food and
41 nutrition security goals. Development policies, such as that demonstrated in Angola, need to
42 include SSFs and should be formulated and implemented with particular consideration for on
43 building resilience and reducing vulnerability to climate change. Given the prevalence of
44 migrant fishers across Africa and the transboundary nature of their involvement, system-
45 oriented policies would need to include the development of a regional approach to fisheries
46 management, stressing the need for collaborative transnational research projects.

47 Furthermore, it is important that wider social development policy priorities consider fisheries
48 policies to ensure that the social benefits that SSFs provide can be harnessed sufficiently
49 (Farmery et al, 2020). By focusing on systemic issues, such as improving education or
50 empowerment of communities (as in the case of the participatory videos along Lake Victoria

1 or improving social responsibility and empowerment in Nangaparou) and integrating migrant
2 fishers into policy discourse given their roles in SSF development (Binet et al, 2012), the power
3 of SSFs to meet food and nutrition security goals can be harnessed (Béné, 2003). This can be
4 applied through better integrating SSFs into food system perspectives to recognise that fisheries
5 go beyond just fish production and touch virtually every part of a socio-economic system
6 (Arthur et al, 2020). This involves considering processing, distribution and consumption as
7 equally important to ensuring food security and providing livelihoods income (Ingram, 2011),
8 (where for example, certain types of processing such as producing fish powder in Uganda, can
9 increase the nutritional value and shelf life of products), and becoming cognisant of the fact
10 that the absence of SSFs might collapse entire food security systems in Africa. Moreover,
11 recognising SSFs (including inland fisheries, which are often largely disregarded when it
12 comes to policies and agreements) as an integral component of food systems provides more
13 opportunity to produce food, through synergies with agriculture and aquaculture with varying
14 ecological niches, that is increasingly resilient to local shocks and more adaptive to the
15 increasing pressures of climate change.

16 **5.3 Investing in low cost innovation**

17
18
19 Boosting the incomes, livelihoods and food security of SSFs through sustainable development
20 depends on resources mobilised for investment into innovative technologies or supply chain
21 practices that can be sustained by artisanal fishing communities (AU-IBAR, 2019 Annex 1).
22 In the case of Uganda, the use of simple hammer mills to produce fish powders from local by-
23 catch has allowed fishers to fight malnutrition and increase their incomes. This highlights the
24 importance of using low-cost technology to foster innovations that can increase product value,
25 improve the efficiency of supply chains, and address inequities in food and nutrition flows.
26 Low-cost products with a high concentration of essential nutrients can easily be made from fish
27 by-products. If traditions and acceptability for such products allow for this, fish by-products
28 (which can be further diversified, as detailed in Section 5.4 Diversifying fishing practices and
29 livelihoods opportunities) can play an important role in combatting micronutrient deficiencies,
30 boosting decreasing wages and overcoming issues of food security. Other incentives may
31 include investing in simple technological innovations to support livelihoods and efficiency,
32 particularly with regards to increasing the value of products. Overfishing and the effects of
33 declining catches associated with climate change can be compensated somewhat by higher
34 prices of products. In this regard, low cost innovations to increase fish quality could be as
35 simple as providing ice to boats and landing sites, or improving landing site and processing
36 facilities with simple technology (as is demonstrated by the SSF development programme of
37 Angola). This would further allow for the set-up of small businesses for producing and selling
38 the likes of ice locally, or the management of processing sites, contributing to job creation and
39 diversification. However, such strategies have been at the forefront of fisheries development
40 for decades, thus such interventions would need to be strategic in their planning to make
41 meaningful impact as opposed to the long history of failed fisheries infrastructure investments.
42 It is important also to acknowledge innovation in the form of education (as demonstrated by
43 the participatory videos) to reduce post-harvest losses and add value to small-scale fisheries
44 production. Lastly, innovation should also be sought through fisheries management systems
45 and policy frameworks.

46 **5.4 Diversifying fishing practices and livelihood opportunities**

47
48 Given the fishing pressures and external stressors such as climate change, coastal development
49 and pollution events that threaten the longevity and sustainability of SSFs, diversifying fishing
50 practices and livelihood opportunities could alleviate the pressure on fish stocks and artisanal

1 communities (Allison and Ellis, 2001). This could occur through the use of new gear and
2 fishing techniques, targeting previously unexploited or climate resilient species (Monier et al,
3 2020), or the introduction of new commercial species, including popularising edible invasive
4 species (Vergés et al, 2019). Building adaptive capacity through diversifying food resources
5 minimises coastal communities' food security vulnerability. When incorporated with a more
6 system-based approach as earlier mentioned, diversified harvests in line with agriculture and
7 aquaculture sharing can further enhance the resilience of communities. Particularly, there may
8 be cases where ecological systems are unable to continue to provide the resources previously
9 supplied to coastal communities, thus diversified communities become less susceptible to local
10 shocks or climate change impacts.

11
12 Emphasising that the main product of fishing is the fish itself, it is thus vital to strengthen the
13 various means of using fish, using by-products to generate other marketable products such as
14 fishmeal (noting that fishmeal is a controversial topic, in this instance the authors are referring
15 to local use of by-products and not intensive production). This depends on the active promotion
16 and investment support into the diversification of fisheries in terms of the marketing and
17 processing of local fish products. Similarly, marine aquaculture (when managed sustainably
18 and undertaken in a non-intensive, supplementary manner) is compatible and complementary
19 with coastal fishing in the outermost regions, therefore diversification can be supported through
20 the development of sustainable farming and varietal-selection techniques.

21 Ultimately, the development of sustainable SSFs, resilient to climate variability depends on the
22 support and investment into the diversification of the fisheries sector through the development
23 of complementary activities and the versatility of careers in fisheries, including investments in
24 vessels, safety equipment, training, environmental services in the fisheries sector activities, and
25 cultural and educational activities, with particular emphasis on protecting the environment and
26 promoting sustainable growth. A key objective should be to fund activities that are socially,
27 environmentally and economically viable and capable of creating employment, particularly for
28 young people and women. However, all such interventions depend on the motivation,
29 commitment and capacities of implementing agencies and have to be grounded in the support
30 of local governments to be effective (Hahn, 2021).

31 32 **5.5 Supporting and cross-pollinating existing infrastructure and initiatives**

33 Given the extensive systems that already exist among coastal communities, significant
34 potential lies in seeking opportunities to utilize local resources and existing infrastructure and
35 systems. Again, the Ugandan case of using an already existing by-product and local hammering
36 plants represents a double win for livelihood generation and nutrition security. In terms of
37 existing SSF systems, governments and development partners should recognize the traditional
38 forms and structures of fishing communities and promote their adequate organizational and
39 capacity development in all stages of the value chain in order to enhance their income and
40 livelihood security in accordance with national legislation. Additionally, support should be
41 developed to ensure culturally appropriate technology transfers. This would also include co-
42 creation of knowledge, evaluating the field knowledge developed by fishers. This could be
43 supported by a dialogue that supports permanent communication among institutions, in
44 addition to maintaining proposals and firm actions over time. Initiatives of fishers should be
45 supported and collaboration mechanisms improved, including cases of effectively integrating
46 migrant fishers into communities to share their external knowledge. In the case for introducing
47 new technology or techniques to fishing communities from others (which often results naturally
48 through fisher migrations), sharing of knowledge is essential in supporting change and reform
49 processes, and aids in building on existing infrastructure that has evident success. The case
50 studies in the previous section document and encourage good practices of knowledge sharing

1 and information dissemination for the implementation of sustainable development in SSFs.
2 Therefore, for future development of sustainable SSFs, it is necessary to invest in and support
3 learning exchanges that would otherwise not be able to take place by small coastal communities
4 without consistent external funding and capacity support. Through the likes of knowledge
5 sharing such as Fishermen Learning Exchanges, communities can learn from one another,
6 which often results in increased willingness to participate, having insight from people in real-
7 world situations very similar to their own. The approach of participatory videos and
8 community-led education has a similar effect, while also instilling a sense of ownership and
9 proactivity and offering the ability for awareness-raising around environmental issues that
10 threaten SSFs. Both of these examples, alongside a wide range of other available knowledge
11 sharing and dissemination approaches (eg. Ngulube, 2000; Hakkarainen, Daw, & Tengö 2020;
12 Petrik & Raemakers, 2018), act as integral tools for the diffusion and adoption of fisheries
13 management strategies that have seen success in their delivery.
14
15

16 **6. Conclusion**

17
18 A growing population with limited livelihood and work alternatives poses threats to both the
19 sustainability of marine resources and the livelihoods, food and nutrition security of poor
20 coastal fishers and communities. Marginalization of SSFs that occurs due to focuses on
21 industrial fisheries and international fishing and development agreements only exacerbates this
22 issue. The need for the sustainable development of the artisanal sector is evident particularly
23 in the face of a changing global climate. In some cases, and in line with the Sustainable
24 Livelihoods Approach (Allison and Ellis, 2001), the sustainable development of artisanal
25 fisheries may involve changing target species, fishing locations and practices all together to
26 contend with shifts in species distribution, a decline in overall catches and deterioration of
27 ecological condition. In severe instances, it might even be necessary to turn away from fishing
28 entirely and focus on other means for food security and livelihoods. However, a broad range
29 of options exists for the implementation of development initiatives that can mitigate these
30 challenges. The cases illustrated in this article attest to that and constitute a rich selection of
31 experiences. The potential that a continent with sustainably developed SSFs that are well
32 integrated into systems approaches holds is invaluable. While most of this potential lies with
33 marine fisheries, it is imperative to recognize diversification into small-scale aquaculture and
34 inland fisheries for their contribution to the livelihoods, food security and climate resilience of
35 inland communities. The major challenge lies in developing and implementing enabling
36 projects, policy and legislation to operationalise and protect the fishing rights of SSF
37 communities. The approach of the SFLP aimed to do specifically this, and although it has been
38 since abandoned, should be revisited to overcome the obstacles it faced, as well as tackling
39 issues around newly developed policies for the development Africa's Blue Economy. The
40 sustainable development of this sector in this regard will require sufficient and maintained
41 technical and financial support from development agencies and governments. In that regard,
42 the mobilisation of human and material resources is necessary to fulfil the needs of SSF
43 development across Africa.

44 Finally, local, as well as migrant social and ecological thinking has the potential to inform a
45 multitude of approaches for sustainable development of SSFs, however, translating this from
46 knowledge to action requires active participation and involved engagement with diverse
47 stakeholders to initiate meaningful change. Wider processes and systems for participatory
48 management are needed for implementing effective measures, particularly focusing on lessons
49 learned and best practices that have resulted in better social and ecological outcomes, especially
50 given the high importance of SSFs and the dependent communities across the continent.

1
2
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4

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8

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