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TECHNICAL AND SOCIO-ECONOMIC CHARACTERISTICS OF SMALL-SCALE COASTAL FISHING COMMUNITIES, AND OPPORTUNITIES FOR POVERTY ALLEVIATION AND EMPOWERMENT



Cover: Photo by SV Siar (FAO).

Fishing household removing catch from the net in Gujarat coast, India.

**TECHNICAL AND SOCIO-ECONOMIC CHARACTERISTICS OF
SMALL-SCALE COASTAL FISHING COMMUNITIES, AND
OPPORTUNITIES FOR POVERTY ALLEVIATION AND EMPOWERMENT**

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PREPARATION OF THIS DOCUMENT

FAO's Fishing Operations and Technology Branch (FIAO) provides technical guidance on the design, construction, operation and use of vessels and fishing gear, working with stakeholders involved with fishing and related activities at all levels. FIAO's work is focused, among others, on the provision of technical assistance to increase economic efficiency, reduce waste, and minimize environmental damage caused by fishing, as well as on the improvement of the socio-economic viability and livelihoods in small-scale fisheries (SSFs).

This desk study was undertaken to enable FIAO to provide appropriate interventions and technical assistance to improve the economic efficiency and socio-economic viability of SSFs. The findings from the desk study are being used to guide FIAO's work under FAO's Strategic Objective 2, Output 20101: Stakeholders supported to identify, assess and disseminate innovative and sustainable production practices, as well as under Strategic Objective 3, Output 30101: Support to strengthen rural organizations and institutions to facilitate empowerment of the rural poor. The information presented in this publication is useful to those working in government and non-government organizations and academic and research institutions.

The draft desk study report was peer reviewed by: Raymon van Anrooy, Fisheries and Aquaculture Officer of the FAO Subregional Office for the Caribbean; Rudolf Hermes, Chief Technical Advisor of the Bay of Bengal Large Marine Ecosystem Project; and Carlos C. Baylon, Professor and former Dean of the College of Fisheries and Ocean Sciences of the University of the Philippines in the Visayas. Susana V. Siar, Daniela C. Kalikoski and Robert Lee, Fishery Industry Officers, provided guidance during the conduct of the desk study and provided comments and suggestions to the draft and final versions of the document.

FAO 2016.

Technical and socio-economic characteristics of small-scale coastal fishing communities, and opportunities for poverty alleviation and empowerment, by Uwe Tietze. FAO Fisheries and Aquaculture Circular No. 1111. Rome, Italy.

ABSTRACT

The document provides an overview of the situation that small-scale fishers in developing countries face in terms of: financial and economic performance of fishery enterprises; vulnerabilities and poverty; adaptations to a changing environment including, climate variability and change; and access to technology, infrastructure, financial services and social protection schemes. It also gives due attention to the role of women and gender equality in small-scale fisheries (SSFs). The document also discusses SSF issues in a few selected developed countries, states and provinces in order to compare similar issues of importance in SSFs in developed and developing countries and to examine whether something can be learned from the comparison.

Most of the studies reviewed show that SSFs are generally profitable. However, many of the studies also point out that this does not mean that the earnings from fishing alone are sufficient to sustain households at a level above the poverty line or above a country's minimum wage level. Studies found that, particularly during bad fishing seasons and poor catches, households are very dependent on income from non-fishery-related activities and on government assistance.

Furthermore, more-recent studies have found that small-scale fishing operations take place in an environment where fishery resources are either heavily fished or overfished, and where coastal and riparian ecosystems are rapidly degrading. Studies further note that, in many cases, there are no adequate fisheries management mechanisms in place. Under these conditions, the sustainability and economic viability of SSFs become seriously threatened. Studies highlight the need for an integrated ecosystem-based management plan for fisheries and coastal zones, and for long-term management strategies that enhance ecological and economic sustainability.

Women play an active role in SSFs, particularly in the post-harvest and pre-harvest sector, including as financiers of fishing operations. However, globalization and regionalization of trade seem to threaten their role in fish marketing in some countries. Women also play a role in fish harvesting, particularly in lagoons and inshore areas, as well as in lake and riverine fisheries, often together with family or household members. They are also active in collecting shellfish and in the culture of other aquatic organisms in mariculture and aquaculture.

The challenges and barriers to poverty alleviation and empowerment of small-scale fishers identified can be grouped as follows: environmental challenges; challenges related to governance, management and conservation of fisheries and other natural resources; challenges posed by acquiring and improving fishing technologies and operations; challenges inherent in the present use of fishery and aquatic resources such as how they are handled, processed and distributed, in the present way of marketing and utilizing fishery products, and in the present socio-economic status of fishers. The literature also identifies many opportunities to overcome these challenges.

While many studies have been conducted on SSFs, particularly on socio-economic aspects as shown by this review, there is still a need for empirical studies in the following areas, among others:

- impact of changes of management and conservation regimes on livelihoods of small-scale fisherfolk and on poverty and vulnerability;
- impacts of land- and sea-based human activities on habitats, life cycles and food webs of species fished by SSFs;
- economic valuations of coastal and riparian ecosystems that host SSFs;
- case studies of successful diversification of small-scale fishing effort to offshore resources;
- case studies of successful occupational diversification of small-scale fishers' livelihoods;
- methodologies on how to calculate the balance between, on the one hand, fishing effort, and, on the other hand, food security and poverty alleviation.

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ABBREVIATIONS AND ACRONYMS

ACIAR	Australian Centre for International Agricultural Research
AI	Adaptive Capacity Index
APRACA	Asia and Pacific Rural and Agricultural Credit Association
BMU	beach management unit
BOBP	Bay of Bengal Programme
BOBLME	Bay of Bengal Large Marine Ecosystem
CARICOM	Caribbean Community
CBCRM	community-based coastal resource management
CFSMIA	China Fishery Shipowners Mutual Insurance Association
CGIAR	Consultative Group on International Agricultural Research
CIFE	Central Institute of Fisheries Education
CLME	Caribbean Large Marine Ecosystem
Code	Code of Conduct for Responsible Fisheries
COFI	FAO Committee on Fisheries
CRFM	Caribbean Regional Fisheries Mechanism
CRM	coastal resource management
Danida	Danish International Development Agency
EAF	ecosystem approach to fisheries
EI	Exposure Index
ENSO	El Niño / Southern Oscillation
FCA	fishers' cooperative association
FNFC	First Nations Fisheries Council
GDP	gross domestic product
GIC	General Insurance Corporation of India
GPS	Global Positioning System
HACCP	Hazard Analysis and Critical Control Point (system)
hp	horsepower
ICSF	International Collective in Support of Fishworkers
IDAF	Programme for Integrated Development of Artisanal Fisheries in West Africa
INFOFISH	Intergovernmental Organization for Marketing Information and Technical Advisory Services for Fish Products in the Asia Pacific Region
INFOPECHE	Intergovernmental Organization for Marketing Information and Cooperation Services for Fish Products in Africa
INFOPESCA	Centre for Marketing Information and Advisory Services for Fish Products in Latin America and the Caribbean
INFOSA	Marketing Information and Technical Advisory Services for the Fisheries Industry in Southern Africa
ITQ	individual transferable quota
IUU	illegal, unreported and unregulated (fishing)
LGU	local government unit
LVFO	Lake Victoria Fisheries Organization
Matsyafed	Kerala State Cooperative Federation for Fisheries Development Limited

MCS	monitoring, control and surveillance
MERC	Marine Extractive Reserve Corumbau
MFI	microfinance institution
MDG	Millennium Development Goal
MPA	marine protected area
MSY	maximum sustainable yield
NAArc	North Atlantic Arc
NABARD	National Bank for Agriculture and Rural Development
NCF	net cash flow
NGO	non-governmental organization
NPV	net present value
NSCS	Northern South China Sea
NVA	net value added
PICTs	Pacific Island Countries and Territories
ROI	rate of return on investment
SAP	Strategic Action Programme
SCED	sustainable community economic development
SFLP	Sustainable Fisheries Livelihoods Programme
SHG	self-help group
SI	Sensitivity Index
SICRMC	Southern Iloilo Coastal Management Council
SIDS	Small Island Developing State
SLA	sustainable livelihoods approach
SMEs	small and medium-scale enterprises
SO	FAO Strategic Objective
SPC	Secretariat of the Pacific Community
SSA	small-scale aquaculture
SSF	small-scale fishery
SSF Guidelines	Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication
TAC	total allowable catch
TE	total earnings
UNCLOS	United Nations Convention on the Law of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organization
VHF	very high frequency (radio)
VI	Vulnerability Index
WCR	Wider Caribbean Region

Exchange rates used in this publication (as at 16 September 2014):

BRL1 = USD0.425
 INR1 = USD0.016426
 JPY1 = USD0.009335
 KES1 = USD0.0113
 MYR1 = USD0.309895
 TOP1 = USD0.52
 VND21 000 = USD1

PART 1

1. INTRODUCTION

1.1. General characteristics and definition of small-scale fisheries

According to the FAO Glossary,¹ small-scale or artisanal fisheries are: “traditional fisheries involving fishing households (as opposed to commercial companies), using relatively small amount of capital and energy, relatively small fishing vessels (if any), making short fishing trips, close to shore, mainly for local consumption. In practice, the definition varies between countries, e.g. from gleaning or a one-man canoe in poor developing countries, to more than 20-m. trawlers, seiners, or longliners in developed ones. Artisanal fisheries can be subsistence or commercial fisheries, providing for local consumption or export. They are sometimes referred to as small-scale fisheries.”

Because of these differences, it is generally recognized that it is inappropriate to formulate a universally applicable definition for a sector as dynamic as and diverse as small-scale fisheries (SSFs).

Small-scale and artisanal fisheries contribute greatly to employment. More than 90 percent of fishers involved in capture fisheries operate in small-scale/artisanal fisheries. In 2012, the latest year for which figures are available from FAO, the total number of fishers was reported at 39 412 000 (FAO, 2014). Thus, it can be assumed that there were 35 470 800 small-scale fishers in 2012.

Most fishery resources show distinct seasonal cycles of abundance or availability. Many fishers participate in other economic activities outside these periods and are considered as part-time fishers. According to FAO, full-time fishers receive at least 90 percent of their livelihoods from fishing or spend at least 90 percent of their working time in that occupation. Part-time fishers receive at least 30 percent but less than 90 percent of their livelihoods from fishing or spend at least 30 percent but less than 90 percent of their working time in that occupation. Occasional fishers receive under 30 percent of their livelihoods from fishing, or spend under 30 percent of their working time in that occupation (FAO, 1996a).

Fishers may modify their fishing methods and gear throughout the year to follow a sequence of different species with different periods of abundance. Small-scale fishing is typically part of a livelihood. The family/livelihoods strategy tends to combine various ways of earning a living. The most dynamic livelihoods strategies rely on the largest possible range of approaches and available assets, thus reducing risks created by natural or market vagaries.

Advantages of small-scale/artisanal fisheries include lower running costs and fuel consumption. Small-scale fisheries tend to optimize human power and reduce fuel costs by using more passive gear and practices such as handlining, longlining, gillnets, fish traps and low-intensity light attraction. They also generally have a lower ecological impact than large-scale and industrial fisheries; however, this does not mean that they cannot overfish available localized resources. Being more labour-intensive than large-scale and industrial fisheries, SSFs provide employment in both urban and rural areas in harvesting, processing and trade of fish and fishery products.

In many countries, SSFs are still developing, are expanding markets including export markets and are adopting new technologies such as innovative fishing gear, echo sounders, satellite positioning systems, VHF radios and safety-at-sea equipment. An example is the adoption of longlining for large pelagic species destined for export markets by small-scale longline fishing vessels in the Eastern Caribbean (Berry and Tietze, 2012a, p. 51), where small-scale fishers undertake multiday fishing trips and supply export markets.

¹ Here and in the following, see: FAO. 2005–2016. Fisheries and Aquaculture topics. Small-scale and artisanal fisheries. Topics Fact Sheets. Text by Jan Johnson. In: *FAO Fisheries and Aquaculture Department* [online]. Rome. Updated 27 May 2005. [Cited 26 January 2016]. www.fao.org/fishery/topic/14753/en

However, in many other countries, SSFs are experiencing difficulties. The sector is generally not given priority consideration in a country's modernization and development process. Artisanal fisheries are often thought to be backward, sometimes because of a lack of data and understanding on real trends and socio-economic impact. Two major trends affect SSFs: decentralization and globalization. On the one hand, ongoing decentralization processes offer SSFs opportunities to control their own development through forms of community-based management or co-management, but with a lack of capacity to fully implement these opportunities. On the other hand, globalization and its political and economic consequences are affecting the lives of small-scale fishers and their communities such as through competition from imports of cheaper canned and processed fish from foreign industrial fisheries and strict food safety regulations that prohibit access to lucrative markets.

Other threats to the livelihoods of small-scale fishers are added by a myriad of coastal activities causing water pollution, destruction of fish habitats, human population growth and migration to coastal areas, and increasing competition for and high prices of coastal land. Pollution affects human health and safety as well as fish abundance and fishery product quality. Removal of coastal mangroves and other coastal habitats negatively affects fishery resources, especially during the most vulnerable life stages of many species. It also results in an immediate threat to coastal communities because of their high exposure to storms and floods.

1.2 Past and ongoing efforts for poverty alleviation and food security in small-scale fisheries

The FAO World Conference on Fisheries Management and Development of 1984 (FAO, 1984) recognized the role and importance of the SSF sector. The Strategy for Fisheries Management and Development adopted by the conference placed emphasis on providing assistance to SSFs with a focus on poverty alleviation, food security, sustainable management of fishery resources and environmental conservation.

Following the conference, considerable resources were allocated by donor and technical assistance agencies as well as national governments for regional and national projects as well as studies in support of SSFs and a better understanding of the working and needs of the sector. Examples are the FAO Bay of Bengal Programme (BOBP) for Fisheries Development and Management, the Programme for Integrated Development of Artisanal Fisheries in West Africa (IDAF), and the FAO/DFID Sustainable Livelihoods Programme, as well as national projects, which were implemented in the 1980s, 1990s and at the turn of the millennium.

These programmes and projects promoted the integrated development and management of SSFs and expanded the scope of previous technical assistance projects beyond mere technology transfer to include social, economic and ecological aspects. Socio-economic and educational needs of fishing communities were identified and addressed through: designing and implementing fisheries extension services; non-formal education and literacy programmes; promotion of alternative/supplementary income-generating activities with a special focus on women; empowerment of women through group formation and training; integration of coastal fishing communities into ongoing national rural development programmes; improving and introducing innovative fishing, aquaculture and post-harvest technologies and methods; designing and implementing innovative fisheries credit and microfinance programmes; and promoting the participation of fishing communities in community-based fisheries and coastal area management programmes.

These and other efforts were designed and carried out in close cooperation with national and regional organizations and institutions, and with the full participation of concerned fishing communities and fishers. However, despite these efforts and many achievements, a lack of institutional capacity to include the small-scale sector in many national and regional development policies continues to hamper the potential contribution of the sector. Since 2003, the FAO Committee on Fisheries (COFI) has therefore promoted efforts to further improve the profile of, and understand the challenges and opportunities facing, small-scale fishing communities in inland and marine waters.

The Global Conference on Small-Scale Fisheries – Securing Sustainable Small-scale Fisheries: Bringing together Responsible Fisheries and Social Development, Bangkok, Thailand, 13–17 October

2008 (FAO, 2009) identified several critical ways forward in securing sustainable SSFs that integrate social, cultural and economic development, address resource access and use rights issues guided by human rights principles, and recognize the rights of indigenous peoples. It suggested the need for a comprehensive and coordinated strategy to secure and expand the capabilities and freedoms enjoyed by fishing communities and indigenous peoples, including the civil and political freedom to participate meaningfully in processes that determine their lives. The conference reaffirmed that human rights are critical to achieving sustainable development.

In 2011, COFI recommended the development of international voluntary guidelines to complement the Code of Conduct for Responsible Fisheries (the Code) as well as other international instruments with similar purposes. In 2011–12, consultations were widely held at the regional and national levels on the content of the guidelines, which culminated into two sessions of the FAO Technical Consultation in May 2013 and February 2014 to agree on the final text. In June 2014, the Thirty-first Session of COFI endorsed the Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines).² The implementation of the SSF Guidelines is expected to contribute to policy development and have considerable impact on securing SSFs and creating benefits, especially in terms of food security and poverty reduction. The SSF Guidelines aim to promote good governance, including transparency and accountability, participation and inclusiveness, social responsibility and solidarity, a human rights approach to development, gender equality, and respect and involvement of all stakeholders (FAO, 2012, p. 17).

The Thirty-eighth Session of the FAO Conference held in Rome, 15–22 June 2013, reviewed FAO's Strategic Framework and identified FAO's five Strategic Objectives (SOs): (i) the eradication of hunger, food insecurity and malnutrition; (ii) the provision of goods and services from agriculture, forestry and fisheries in a sustainable manner; (iii) the reduction of rural poverty; (iv) more inclusive and efficient food systems at local, national and international levels; and (v) the resilience of livelihoods to threats and crises (FAO, 2013a). These objectives will guide the work of the organization until 2019.

Without a sustainable and resilient SSF sector, it will not be possible to fully achieve the SOs. The information and recommendations contained in this document aim to provide guidance as to how the SSFs sector can play a meaningful role, contribute to, and benefit from, the achievement of the SOs.

² The text of the SSF Guidelines is available in various languages at www.fao.org/fishery/ssf/guidelines/en

2. METHODOLOGY

2.1 Sources of information and geographic coverage

The material and publications used for this document were identified through searches of electronic databases and library catalogues. This work was carried out in the Suzzallo Library of the University of Washington, Washington State, the United States of America, by searching FAO and other databases and by searching the websites of well-established organizations that work with SSFs and aquaculture. In addition, individual experts and scientists, who work in the field of SSFs and aquaculture, were contacted and asked to provide material.

The material used for the document includes books, journal articles, doctoral dissertations, masters theses as well as websites. In terms of developing countries, a global coverage was attempted as far as possible. In terms of developed countries, countries from North America (Canada and the United States of America), Asia (Japan and the Republic of Korea) and the North Atlantic Arc (Iceland, Norway and Newfoundland [Canada]) were selected. The criteria for the selection of the developed countries were: (i) the existence of traditional coastal and/or indigenous fishing communities; (ii) the importance of fishing as national industry; and (iii) a relatively well-documented transition that the coastal SSFs have undergone or are undergoing in these countries, from which other countries might be able to learn.

2.2 Approaches

When analysing and presenting information, the following approaches and disciplines were applied, among other things:

- the ecosystem approach to fisheries management and development (FAO, 2003a) as an integral part of the Code;
- the precautionary approach to fisheries management FAO, 2005–2016;
- a sustainable livelihoods and participatory approach to local, national and regional governance and the management and conservation of natural resources (Ferrol-Schulte et al., 2013; FAO, 2013b);
- a gender-sensitive approach to SSFs and aquaculture management and development (FAO, 2007a; WorldFish Center, 2010; Weeratunge-Starkloff and Pant, 2011);
- microeconomic financial and economic analysis: net cash flow (NCF) is used as an indicator to measure the economic performance of a fishery enterprise; the financial performance is measured by the NCF/investment ratio, also referred to as the rate of return on investment (ROI); the socio-economic performance is quantitatively measured by the net value added (NVA), which is composed of net cash flow plus taxes plus remuneration of labour;
- supply and value chain approaches;
- ecological economics, i.e. the valuation of ecosystem services;
- sociological and anthropological analysis.

3. STRUCTURE OF THE PUBLICATION

Drawing on recent studies and publications, this document attempts to provide an overview of the situation that small-scale fishing households face in developing countries. The publication is divided into the following parts:

1. Introduction
2. The situation of small-scale fishers in developing countries
3. Issues in coastal communities in selected developed countries
4. Conclusions

While many studies, books and articles were reviewed for this document, the review does not claim to provide a globally or geographically representative picture. The reason is that while SSFs in developing countries have many common features, particularly regarding technological and ecological characteristics, situations vary considerably between different regions, subregions and even within countries, particularly as regards social, cultural as well as microeconomic and macroeconomic aspects. As is the case in other artisanal sectors, the situations and circumstances in which SSFs operate can be rather unique.

Many of the studies, books and articles reviewed for this publication, have different approaches, a different geographic and thematic focus and coverage, and they apply different methodologies. When selecting studies for inclusion in this document, consideration was given to covering a wide variety representing different aspects of small-scale fishers' livelihoods and situations. Readers are taken on a journey to a wide variety of countries and situations and ecosystems in which SSFs operate. Each review highlights the background as well as the major findings and conclusions of the studies. The length and depth of the reviews are deemed adequate for readers to reach their own conclusions in a transparent and participatory manner. At the end of each subchapter, a chapter summary is provided.

Part 2 looks at:

- financial and socio-economic performance and benefits of SSFs and their ecosystems: the case of SSFs harvesting;
- small-scale fisheries utilization and marketing;
- access of fishing communities to credit, microfinance, insurance, welfare, technology and infrastructure;
- poverty, vulnerability and adaptations of livelihoods to a changing climate;
- participation in governance and natural resource management and conservation;
- the role of women in SSFs;
- gender equality in fishing communities;

Part 3 attempts to describe the situation of coastal fishing communities in selected developed countries with the hope that lessons can be drawn from the transition and adaptations of SSFs in developed countries to a changing environment and circumstances. Part 3 consists of four subchapters:

- indigenous and coastal fishing communities in the Pacific Northwest, i.e. Washington State (the United States of America), and British Columbia (Canada);
- coastal fishing communities in East Asia, i.e. Japan and the Republic of Korea;
- coastal fishing communities in the North Atlantic Arc, i.e. Iceland, Norway and Newfoundland (Canada);
- an analysis and comparison between developed and developing countries.

Part 4 attempts to draw conclusions from Part 3 and identify opportunities on how the SSF sector can play a meaningful role, contribute to and benefit from the achievement of the SOs (above).

PART 2

4. FINANCIAL AND SOCIO-ECONOMIC PERFORMANCE AND BENEFITS OF SMALL-SCALE FISHERIES AND THEIR ECOSYSTEMS: THE CASE OF SMALL-SCALE FISHERIES HARVESTING

4.1 Benefits of small-scale fisheries ecosystems

Marine ecosystem services in Zanzibar (the United Republic of Tanzania)

Background

Lange and Jiddawi (2009) carried out an economic valuation of marine ecosystem services in Zanzibar (the United Republic of Tanzania). They note that, generally, marine ecosystem services are seriously undervalued, resulting in underinvestment in conservation and lost opportunities for economic growth and poverty reduction. According to the authors, economic valuation of ecosystem services provides a powerful tool for sustainable development by showing how dependent the economy is on a well-functioning ecosystem and what would be lost if the ecosystem were not protected.

Their study estimates the economic values generated by marine ecosystem services in Zanzibar, links these values to the national income accounts, and quantifies how the benefits from each ecosystem service are distributed among different stakeholder groups. The study also explores the incentives and disincentives created by the distribution of benefits for conservation of the marine ecosystem, especially among local communities that are stewards of the marine ecosystem.

Findings and conclusions

The study identified and quantified the economic values accruing from the following major ecosystem services:

- recreation and tourism;
- fishing and related activities;
- seaweed farming;
- mangrove harvesting;
- control of beach erosion;
- wastewater assimilation.

The study found that these marine ecosystem services in Zanzibar generate an economic value equivalent to 30 percent of the island's gross domestic product (GDP), 77 percent of investment, and a large amount of foreign exchange and employment. The study also found that, despite its economic importance, the marine ecosystem of Zanzibar is seriously degraded due to both human and natural causes. The study notes that the macroeconomic importance of tourism and the income it generates far surpass the value of other ecosystem services. Tourism has largely excluded local communities, even as it claims more and more of coastal and marine resources. Local communities obtain more income from fishing and seaweed than from tourism.

The study found that overfishing and destructive fishing practices are major reasons for the decline in Zanzibar's marine ecosystem, affecting both fish populations and coral reefs. The authors observe that, although local communities bear the long-term consequences of overfishing, these communities have little incentive to change their fishing practices under conditions of rapid population growth, open-access fishing grounds and the current low levels of income. The authors conclude that this situation is unlikely to change without greater involvement in, and income from, activities that depend on a healthy marine ecosystem.

The authors also provide an overview of responses to the degradation of marine ecosystem by government, local non-governmental organizations (NGOs) and international donor and technical assistance agencies. The responses consisted of promotion of more sustainable marine-based activities,

value-adding activities and alternative livelihoods, together with the establishment of marine protected areas (MPAs). The authors note that these efforts have not been successful. They further hold the view that in the long term, even with the best outcomes, these efforts are unlikely, on their own, to reduce poverty in Zanzibar substantially, or reduce pressure on fisheries and coral reef. This is because these efforts involve a limited number of people and the potential increase in income is relatively small.

The authors point out that the economic importance of tourism is five times the combined size of other ecosystem values. They suggest that although local participation in tourism is currently low, it is the only sector with the potential to employ large numbers of people and generate large amounts of revenue. They identify segments of the tourism sector such as ecotourism that should be promoted to achieve both poverty reduction and improved management of marine resources.

4.2 Global findings on techno-economic performance of marine capture fisheries and beach seining

Background and geographic coverage

From 1997 to 2011, FAO carried out four global studies covering the economic performance of marine capture fisheries, among other things. The first three studies (FAO, 1999, 2001b, 2005a) covered a wide spectrum of both large-scale and small-scale fishing technologies, while the fourth focused on beach seining (Tietze *et al.*, 2011). The countries covered by all four studies included Antigua and Barbuda, Argentina, Barbados, Benin, France, the Gambia, Germany, Ghana, India, Kenya, Mozambique, Norway, Peru, the Republic of Korea, Senegal, South Africa, Sri Lanka, Thailand, Togo, and Trinidad and Tobago.

The studies were carried out in close cooperation with national fisheries research institutes and focused on the microeconomic performance of individual fishing units. Two indicators were used to assess the economic and financial performance of fishing units (FAO, 2005a, p. 3). The NCF, commonly referred to as net profit of an enterprise, was used as the indicator to measure the economic performance of a category of fishing vessel. The NCF was calculated as the value of all landings minus all costs including the costs of depreciation and imputed interest. Another closely related indicator of economic performance is the NCF/total earnings (TE) ratio, which expresses the NCF as a percentage of the total earnings. This shows what volume of business is needed to generate a given NCF. A ratio of greater than 10 percent was generally considered as good. The financial performance was measured by the NCF/investment ratio, also referred to as the ROI. A level of 10 percent was generally considered a good result.

Findings of studies on techno-economic performance of marine capture fisheries

The most recent of the three studies covering both large-scale and small-scale marine capture fisheries (FAO, 2005a) was carried out in 2003 and 2004. It showed that all 95 types of fishing vessels studied had a positive gross cash flow and fully recovered their operating costs. When also considering capital costs, i.e. the costs of depreciation and interest, 88 of the types of vessels, or 94 percent, still showed a net profit after deducting these costs. The studies also investigated the impact of government financial transfers, also referred to as subsidies, on the financial performance of marine capture fisheries and concluded that transfers did not significantly contribute to profitability (FAO, 2001b, pp. 10–18).

When comparing the fishing fleets of countries studied in both 1999–2000 and in 2002–2003, significant improvements in financial and economic improvements were observed in the Republic of Korea, Germany and Argentina, partially because of the reduction and limitation of fleet capacity. In the other countries covered by the study, the overall picture remained similar, with some fleets improving their performance and others achieving less favourable results. The overall sustained positive earning situation in 2002 and 2003, as compared with 1999 and 2000, is to be seen against the background of an increase in fuel prices of about 9 percent between the two reporting periods, and a decline in fish prices of up to 5 percent (FAO, 2005a, p. iv).

As far as SSFs in developing countries are concerned, the latest of the three studies carried out in 2002 and 2003, produced the following findings.

Africa

Four types of small-scale fishing vessels were studied in Senegal and South Africa. The South African small-scale rock lobster fishing boats and the Senegalese multipurpose canoes fishing for cutlass fish, small tunas, grunt and other species performed very well (investment cost: USD7 000; ROI: 21 percent [FAO, 2005a, p. 58]) while the Senegalese handline vessels, catching snappers, seabass, jacks and horse mackerel, had only moderate but still positive results (investment cost: USD6 800, ROI: 9 percent [FAO, 2005a, p. 58]). The Senegalese surrounding gillnet boats, landing sardinella, bonga, and other species, had negative results, probably because of overfished resources and competition from purse seiners (FAO, 2005a, p. 7). The operating cost structure, total costs and NCF of the African small-scale fishing units studied are presented in FAO Fisheries Technical Paper No. 482 (FAO, 2005a, p. 23, Figures 5 and 6).

Caribbean

With the exception of the 10 m Antigua and Barbuda sloop, which had a negative cash flow, all other small-scale Caribbean fishing vessels showed very good or good financial and economic results. Very good results were achieved by the Barbadian day boats using gillnets, handlines and trolling lines to catch flyingfish and dolphinfish as well as large pelagics such as wahoo, billfishes, tunas and sharks (investment cost: USD12 810; ROI: 34 percent [FAO, 2005a, p. 61]).

The larger Barbadian cabin boat locally referred to as ice boat, using the same fishing method to catch the same species, only achieved moderate but still positive results because of the greater cost of operation (investment cost: USD19 450; ROI: 29 percent [FAO, 2005a, p. 61]). The launches of Antigua and Barbuda using traps to catch spiny lobster, snappers, groupers, parrotfish and other reef fish all had very good results (capital cost: USD22 880–30 150; ROI: 38–41 percent [FAO, 2005a, p. 61]). The operating cost structure, total costs and NCF of the Caribbean small-scale fishing units studied is shown in FAO Fisheries Technical Paper No. 482 (FAO, 2005a, p. 26, Figures 9 and 10).

Asia

The three types of Indian small-scale fishing boats, i.e. non-motorized and motorized kattumaram and dolnetter, all achieved very good financial and economic results (ROI: 61–163 percent; investment cost: USD610–6 100 [FAO, 2005a, p. 64]). Their operating cost structure and their total and NCFs are shown in FAO Fisheries Technical Paper No. 482 (FAO, 2005a, pp. 28–29, Figures 13 and 14, respectively). By far the best results were achieved by the non-motorized log rafts (locally known as kattumarams) because of their low investment and operating costs. These craft use gillnets and handlines for catching a variety of pelagic and demersal fishes. The dolnetters use bag nets for catching ribbon fish, catfish, shrimps, Bombay ducks and other species.

While the information on the economic and financial performance of individual fishing units generated by the three studies is useful for an understanding of the working of the fishing industry and for fisheries management and planning, the studies had limitations. The information generated by the studies does not contain information on the socio-economic situation of owners, operators and crew of fishing vessels nor on their livelihoods and the livelihoods and socio-economic situation of their households, families and broader communities.

The studies also did not investigate how and by whom the earnings generated by the fishing units were used. Theoretically, it is possible that even though a fishing unit has a high ROI and NCF, the net profit earned alone might not be sufficient to sustain the household of the owner or a crew member unless the household has other sources of income. It is also possible that even though the net profit could be sufficient to sustain a household, the money is actually not spent on food, housing, education, health care but for other purposes instead such as repayment of old debts, gambling, alcohol and the like, and that the household actually lives in poverty.

Findings of the FAO global study on fishing with beach seines

A global study carried out by FAO (Tietze *et al.*, 2011) in cooperation with the FAO/DFID Sustainable Fisheries Livelihoods Programme and others focused on a single, traditional small-scale fishing technology, i.e. fishing with beach seines, which is commonly used by fishing communities in developing countries.

Geographic and thematic coverage and focus

A total of nine beach-seine country case studies were conducted in four distinct regions. In the Africa region, case studies were conducted in Benin, the Gambia and Ghana in West Africa, and in Kenya, Mozambique and Togo in East Africa. The South Asia region studies came from India and Sri Lanka, and one case study was conducted in Latin America, i.e. Peru.

As in the case of the three global studies described above, the studies on beach seining generated information on operational and technical features of the fisheries and on economic and financial aspects. In addition, the studies on beach seine fisheries also attempted to cover legislation and management aspects, environmental impact of beach seines,³ conflicts with other fishing methods and uses of the shoreline as well as social aspects and characteristics of operators and owners of beach seines.

The social aspects included:

- sources of household income and employment;
- marketing links;
- use and sharing of income;
- access to social services and infrastructure;
- access to formal and informal credit;
- demographic characteristics;
- labour and kinship relations;
- vulnerability and food security;
- livelihoods strategies.

Conclusions

Financial and economic performance and poverty. Information generated by the study on beach seine fisheries suggests that small-scale beach seine fisheries, particularly non-mechanized ones, with a few exceptions, have favourable rates of ROI, also because the initial investments and subsequent annual depreciations are small (FAO, 2005a, p. 23–24). This confirms the findings of the earlier FAO studies that SSFs are quite profitable and generate substantial revenue for crew and owners.

Notwithstanding these findings, the case studies also revealed widespread vulnerability and poverty in the fishing communities where beach seining is carried out. When relating the positive economic and financial returns of beach seining and other artisanal and small-scale fishing methods to poverty in artisanal fishing communities, the study concludes that it should be kept in mind that both phenomena do coexist. Their coexistence is explained by the fact that even though artisanal fishing has a positive cash flow in most cases (otherwise people could not afford to be engaged in this activity in the long term), the income generated in cash and kind by artisanal fishing is often small and unevenly distributed over the year, owing to the seasonality of fishing.

The study further concludes that such income might not be sufficient to sustain households unless these have other sources of income and food. The study further highlights that income is only one, albeit important, aspect of poverty. Other aspects of poverty are: poor housing, health, sanitary and environmental conditions; inequality and exclusion; lack of infrastructure; and a lack of access to financial, social, health, educational and other services as well as a lack of political participation.

³ The impact of beach seines on aquatic resources and habitats is described in FAO, 2011, pp. 14–19.

Social benefits. In the case of beach seine fisheries, the beach seine and the boat used are generally owned by an individual or by a family. The study observed that these owners tend to be economically and socially better off than their crews and the many persons who assist in hauling the seine with the hope of receiving some fish to eat. The study considers the social capital of the owners to be quite high in that they provide employment and food to a large percentage of the residents in their community. Ownership of beach seines by groups of fishers was also observed by the study but was found to be less common.

Social and demographic characteristics and access to services and infrastructure. The study found that, in beach seine fisheries, kinship ties among crew members still play a strong role (Tietze *et al.*, 2011, pp. 19–22). Illiteracy is high among beach seine crews and educational achievements are low. Low levels of education and of literacy are one aspect of poverty and vulnerability found among those involved in beach seining, and this hampers their occupational and geographic mobility as well as their political participation and empowerment. In most of the countries studied, beach seine crews belong to the middle-aged group. However, in India and parts of Peru, crew members are either older people or very young, as most persons of middle age are involved in other types of fishing.

Women are involved in many aspects of beach seining and in shore-based activities. These activities include: financing and management of beach seine units; receiving and sorting catch; preparation and provision of food and water for crews for pay; and collection of in-kind remuneration. This means that women fish on behalf of husbands, hauling of beach seines or in post-harvest activities such as the auctioning, processing and marketing of fish.

The study estimates that, with the exception of Peru and Togo, beach seine operators spent between one-third and two-thirds of their working time on this type of fishing. In Peru, beach seining is mostly an occasional and sometimes part-time occupation, while in Togo it seems to be a full-time occupation for most beach seine fishers. The rest of the time, not spent on beach seining, is spent on a number of other activities, both within and outside fisheries. Other fisheries and fisheries-related occupations of beach seine fishers include fishing with gillnets, longlines, handlines, traps, cast nets, boat seines and purse seines, industrial fisheries and oyster cultivation, as well as fish marketing and processing.

Beach seine fishers are also involved in a number of non-fisheries-related activities such as transportation, construction, carpentry, masonry, services, crop cultivation, coconut cultivation, animal husbandry, and repair of engines and vehicles. In addition to their involvement in fisheries, women work in the service sector, transportation, construction, crop cultivation and animal husbandry, as well as making and selling handicrafts, preparing and selling food items, making salt and coconut oil, and similar activities.

The considerable occupational diversity of beach seine fishers is also reflected in their relative dependence on beach seining as the source of household income. Regarding the sources of income, most of the households earn between one-third and two-thirds of their income from employment in beach seining. The exceptions are Mozambique and Togo, where fishing households depend almost fully on beach seining for their income, and Peru, where beach seining accounted for less than one-third of household income.

With regard to the economic status of households, poverty as well as absolute poverty is widespread among households involved in beach seining, both in monetary terms as well as in wider terms, which take into consideration standards of housing and sanitation, health, education, access to infrastructure and services, and other factors. Poverty is less common among beach seine fishers in Peru, where 25 percent of all fisher households are considered to be poor while two-thirds are above the poverty line.

In addition to poverty, households involved in beach seining have a high degree of vulnerability. Vulnerability is defined as a condition arising from the interaction of three factors: (i) risk exposure or the nature and degree to which a household (or community) is exposed to a certain risk such as natural disasters, conflicts and macroeconomic changes; (ii) sensitivity to this risk, measured for instance

through the dependence of the household (or community) on fishing activity for food security or income generation; and (iii) adaptive capacity of the household (or community) to deal with risk, i.e. its ability to cope with negative impacts (FAO, 2005b, p. 6).

The case studies identified a number of factors that contribute to the vulnerability of households, to beach seining as an important occupation, and to sources of income. Most of these factors apply to most of the countries studied. They include among other factors: reduced access to beaches because of urban sprawl, industrial development, aquaculture development and conservation measures; resource depletion by purse seining, trawlers and other fishing activities including beach seining itself; growing pollution of near-shore and coastal waters; natural calamities including tsunamis; coastal erosion; conflicts with other fishers; government bans on beach seining; outbreak of diseases such as cholera, malaria, AIDS; sudden price hikes for fishing inputs; destruction and damage of fishing gear by industrial fishing vessels; and low and irregular incomes.

All country case studies emphasize that beach seining makes a very important contribution to food security. First, beach seine fisheries contribute to the food security of beach seine fishers and their households, both through remuneration in cash and through remuneration in kind in the form of fish, which is used for their daily consumption. Second, beach seine fisheries function as a social safety net for the absolute poor, older people, disabled, widows, orphans and other destitute villagers, as it is customary in most places that anyone who is present at the time of hauling a seine and appears to lend a hand is given some fish in return. Third, the major parts of catches of beach seines are consumed in rural areas with high levels of poverty and, thus, contribute importantly to the food security protein supply of these areas.

Participation in governance mechanisms and the management and conservation of natural resources. The beach seine case studies found that all of the countries had fisheries regulations with implications for beach seining, such as regulations on registration and licensing, regulations on vessel safety inspections and insurance, zoning regulations, and regulations concerning fishing seasons and fishing grounds (FAO, 2005b, p. 24). In many cases, these regulations were ignored. Examples include the lack of registration of beach seine boats, lack of enforcement of inshore fishing zones reserved for small-scale fishing activities (resulting in encroachment by industrial fishing vessels), and the overfishing of inshore fishery resources, which could otherwise be fished by beach seines.

Many countries had specifically regulated beach seine fisheries in their national waters and regulated mesh sizes, dimensions of fishing gear, fishing craft and gear to be used in beach seining, including limiting fishing seasons and areas, as well as banning certain operations such as mechanized beach seining. Bans on mechanized beach seining have reduced this activity to some extent in Peru and perhaps in Mozambique, and general bans on beach seining have slowed it down on Lake Victoria. There are other cases, such as the case of the Kenyan coast, where such bans have not worked, and the case of Ghana, where beach seining has even increased after a ban was proposed in a fisheries management act. In the case of Ghana, this might indicate a lack of political will and enforcement to implement the proposal of the fisheries management act.

Concerning regulations on mesh sizes and dimensions of the gear, the case studies observed that these regulations were also ignored. In the case of Sri Lanka, and perhaps in other cases, there is a need to update existing regulations to account for technical changes that have taken place in the craft and gear over time.

In some countries, fishers organizations and traditional fisheries management mechanisms exist. However, these are rarely, if at all, consulted when national management regulations are formulated. These traditional fisheries management organizations include beach management units (BMUs) in Africa, fishworkers associations and fisheries cooperatives in India and Sri Lanka, as well as traditional village-based fisheries management mechanisms such as the village councils (panchayats) in Andhra Pradesh and Orissa. With the exception of the latter, other traditional fisheries management mechanisms mentioned above are enshrined in the legal framework of the countries concerned.

Beach seine fishers in the countries studied were often unaware of regulations. In cases where beach seining had been banned, fishers complained that they could not comply with the ban as most lacked sufficient alternative employment opportunities and would have been left without food and livelihoods had they obeyed the ban. The study showed that, overall, fisheries regulations that directly or indirectly affect beach seine fisheries have not been effective. The study concluded that it might be beneficial to strengthen substantially the already ongoing efforts towards fisheries co-management and the involvement of beach seine fishers and other stakeholders in the process of formulation of policies and regulations as well as their implementation and monitoring.

4.3 Vietnamese longline and gillnet fishery in the South China Sea

Vietnamese longline fishery

Background

Fishing is an important economic sector in Viet Nam. The standing stock of marine fish is about 3.1 million tonnes not taking into account migratory pelagic species. The potential sustainable yield is almost 1.4 million tonnes (Long, Flaaten and Anh, 2008, p. 296). In Viet Nam, the fisheries industry employs about 3.4 million people, 10 percent of the country's labour force. The fishery and aquaculture sector accounts for 10 percent of Viet Nam's export earnings. Viet Nam's marine fish production has rapidly increased in the last two decades. Eighty-eight percent of the marine fish catch comes from coastal fisheries, and most fishers are considered poor (Long, Flaaten and Anh, 2008, p. 296).

Fishing is thus concentrated in coastal waters, and this has resulted in heavy pressure on inshore resources. There has been a recent decline in catch per unit of fishing effort, which indicates the increasing resource problems facing coastal fisherfolk. Since the mid-1990s, the Government of Viet Nam has made efforts to develop the offshore fisheries of the country with two broad policy objectives: to expand marine fish production for domestic consumption and for export; and to reduce the pressure on coastal fishery resources and provide new income and employment opportunities for coastal small-scale fisherfolk.

A recent study carried out on the coast of southern central Viet Nam in the South China Sea region (Long, Flaaten and Anh, 2008) examines the performance of longline vessels, which fish offshore, the crews of which are largely from traditional small-scale coastal fishing communities. The study determined the economic benefits derived by crew members and vessel owners.

Findings and conclusions

The study concludes that the efforts to divert fishing effort from inshore to offshore have been quite successful. Its findings are based on data collected through a representative sample of 32 registered offshore longliners operating in the South China Sea, representing about 16 percent of such vessels in Khanh Hoa, Viet Nam. The empirical results suggest that the average annual crew remuneration equals 93 percent of labour earnings in the most productive sectors in Khanh Hoa. The owner of an average longliner has a profit margin of 12.1 percent.

A regression analysis of annual vessel performance, represented by gross revenue and income after deduction of variable costs, showed that a vessel of hull length of 15–16 m maximizes gross revenue and income. The study also observed that overinvestment in vessels may lead to inefficiency. The study found that most longline fishers have good fishing experience and often come from traditional small-scale fishing households. These fishers were found to have high incomes compared with labourers working in other fisheries in the province of Khanh Hoa (Long, Flaaten and Anh, 2008, p. 303).

However, the findings do not suggest moving all small-scale fishers in Viet Nam offshore, as this would certainly lead to overfishing.

The Da Nang gillnet fishery

Background

The above findings regarding the positive economic performance of longline vessels fishing offshore are in line with findings of a study by Pham, Huang and Chuang (2013) of the Da Nang gillnet fishery. The authors obtained data using questionnaires from 45 gillnetters in Da Nang, fishing in the South China Sea as well as in the Gulf of Tonkin during the major fishing season.

The Da Nang fisheries is carried out by 1 875 fishing vessels with a total engine capacity of more than 73 000 hp (Pham, Huang and Chuang, 2013). Twelve percent, or 229, of these vessels are gillnetters, which record a total catch of more than 9 000 tonnes per year. Of these gillnetters, 104 are pelagic gillnet vessels. These can be further categorized into small-scale (45) and large-scale vessels (59). The main target species of these vessels are tuna, including longtail tuna (*Thunnus tonggol*), bigeye tuna (*T. obesus*), striped tuna (*Sarda orientalis*), skipjack (*Katsuwonus pelamis*), and yellowfin tuna (*T. albacares*). Mackerel (*Acanthocybium solandri* and *Scomberomorus commerson*), sailfish (*Istiophorus orientalis*) and common dolphin fish are part of the bycatch.

The main fishing grounds are located in the South China Sea. Some gillnetters operate in the Gulf of Tonkin during the major fishing season (January–July) targeting tuna species (60–70 percent of the total catch), and in the waters southeast of the Paracel Islands during the secondary fishing season (August–December) targeting mackerel (50–60 percent of the total catch).

The crew size ranged from 9 to 11. The number of days at sea ranged from 154 to 232. The average number of days per trip was 9.6 for small-scale vessels and 18.6 for large-scale gillnetters.

Findings and conclusions

The study found that, on average, the gillnetters had positive gross cash flows and profits. The authors note that, from the points of economic indicators, this implies that the owners not only covered operating costs but also turned a good profit for the operating year. In line with the findings of the study of the longline vessels fishing offshore, the study of gillnetters in Da Nang also found that larger gillnetters with engines of more than 90 hp, fishing farther offshore and undertaking longer fishing trips, were economically more efficient and had better results than smaller vessels with engines of 90 hp or less, fishing nearer inshore and undertaking shorter fishing trips.

More specifically, larger vessels had average gross revenue flows of VND1 346.7 million while smaller gillnetters had average gross revenue flows of VND750.7 million. Moreover, the larger vessels had average profits or net revenue flows equivalent to 15 percent of gross revenue while the net revenue percentage of the smaller vessels was basically neutral (0.4 percent of gross revenue). However, the authors highlight that the differences in the net revenues between smaller and larger vessels seem to be partly due to external factors and accounting rules rather than to actual economic performance and to the size of the vessel. When discussing the differences between smaller and larger vessels in net revenues, which take into consideration the cost of depreciation and interest, the authors point out that because the smaller vessels in the Da Nang gillnet fleet are older than the larger vessels, when calculating depreciation based on adjusting inflation, those vessels could not cover all of their expenses because Viet Nam's recent consumer price inflation increased significantly due to the effects of the world economic crisis of 2008–09.

The authors offer the following explanations for the better economic performance and gross revenues of the larger vessels. First, larger vessels with larger engines can go farther out to sea, where fish stocks are more abundant, while smaller vessels are restricted to inshore fishing grounds, which results in lower catches. In addition, the authors point out that coastal fishing grounds are more crowded with other fishing boats, which restricts operations and catches.

It could also be possible that smaller vessels operating more inshore of the Da Nang gillnet fisheries are less viable because they are catching smaller tuna, and higher proportions of immature fish. There

is a need for better catch and length frequency data from these fisheries in order to answer this question.

Second, regarding marketing aspects, buyers of fish were present and available in offshore fishing grounds and bought wholesale from larger fishing boats while providing supplies such as ice, freshwater and other provisions to the skippers of the boats. As a result, the larger vessels used their time more efficiently as they could spend more time fishing rather than transporting their catch to land for sale.

Third, the authors observed that larger vessels were better equipped than smaller vessels with fish-finding, navigation, communication and safety equipment. Moreover, larger vessels had more modern and efficient equipment for handling and storing the catch, which resulted in better quality and higher value and prices. Smaller vessels often had second-hand engines and equipment, resulting in higher maintenance and repair costs.

4.4 Small-scale fisheries in Sabah, Malaysia

Background

Teh, Teh and Sumaila (2011) observe that small-scale fishers in Sabah, Malaysia, are removed from mainstream society due to the mainly rural and poor socio-economic backdrop of coastal fishing communities. Sabah's marine capture fisheries were mainly small-scale until the introduction of commercial trawlers in the 1960s. However, SSFs continue to provide the main source of income and animal protein for a large proportion of Sabah's rural coastal communities.

The authors further explain that SSFs in Sabah are concentrated in inshore areas, targeting mainly reef and reef-associated estuarine species and small pelagics. Fishing is done for both subsistence and commercial purposes, using a variety of manually operated gear, including hook and line, gillnets, traps, spears and spear guns. The authors point out that Sabah's inshore fishery resources are extensively fished, with signs of overfishing of reef fish in some parts of Sabah. Destructive fishing techniques using dynamite and cyanide are still common and have damaged or destroyed unprotected reefs throughout the state. There is a strong case for more effective MPAs in addition to those already introduced.

While small-scale fishers have historically played a vital role in contributing to food security, trade and economic activity in Sabah, their economic contribution has not been explicitly quantified. With a view to correcting this situation, the authors used a previously reconstructed time series of Sabah's small-scale catches for estimating the economic value of these fisheries. The authors defined profitability as the ratio of net monthly fishing income to monthly fishing revenue. Estimates were based on information gathered from semi-structured interviews of 75 small-scale fishers in 11 fishing villages from 2 different geographical areas, i.e. Pulau Banggi, a large island group off the north coast of Sabah, and the Semporna islands off the southeast coast of Sabah.

Findings and conclusions

The findings of the study show that the socio-economic contribution of SSFs to Sabah society has been substantially undervalued, or was even unaccounted for historically, as well as in present fisheries statistics. The authors estimate that, since the early 1990s, SSF catches in Sabah may have been undervalued by as much as 225 percent. They also found that the number of fishers employed by Sabah's SSF sector was 4.7 times higher than the number of traditional fishers reported in the official fisheries statistics, accounting for 1.5 percent of Sabah's population. The authors further estimate that, currently, SSFs may be supporting an additional 3.5 percent of Sabah's population than previously assumed. The study also found that previously unaccounted economic value generated by the SSF sector in 2009 potentially generated MYR1.36 billion in output to Sabah's economy, equivalent to 4 percent of Sabah's 2009 GDP.

As far as profitability of SSFs in Sabah is concerned, the study found that fishing was the only source of income for the majority (75 percent) of respondents. The average net monthly fishing income was

estimated at MYR442, and the profitability, defined as the ratio of net monthly fishing income to monthly fishing revenue, was 0.45. Fuel was the largest cost component, accounting for 73 percent of all operating costs on average. The authors found that, although small-scale fishing appeared profitable, the monthly net fishing income was still below the 2004 Sabah poverty line income of MYR704.

The mean monthly household expenditure of SSF households was estimated to be MYR 276. The authors concluded that, in most cases, fishers were making just enough money to meet household living expenses. Seventy-five percent of fishers did not have savings. Regarding poverty alleviation, the profitability analysis undertaken by the study shows that SSFs in Sabah prevent further poverty rather than alleviating it. Although SSFs generate positive profits and the average monthly income from SSFs is sufficient to cover household expenses, it is still below the official Sabah poverty line. However, SSF incomes help to sustain livelihoods and prevent fishing households from falling deeper into deprivation. The authors note that this aspect of SSFs' contribution is very important given that Sabah is one of the poorest Malaysian states and social welfare options are limited.

The authors conclude that the undervaluation of the economic importance of the SSF sector in Sabah implies that fishing pressure on Sabah's inshore marine resources is probably much higher than currently perceived. This raises concerns about the long-term sustainability of these fishery resources and the capacity for Sabah's inshore fisheries to support coastal livelihoods into the future. Therefore, there is a strong need for more-encompassing fisheries monitoring and data collection methods that target the large population of small-scale fishers whose catch is largely unreported.

4.5 Seaweed farming in Calatagan, Province of Batangas, Luzon, the Philippines

Seaweed farming in the Philippines seems to be an opportunity to successfully diversify SSFs livelihoods.

Background

A study carried out in Calatagan, Batangas, the Philippines (Espaldon *et al.*, 2010) aimed to assess the contribution of seaweed farming to the livelihoods of small-scale fishing communities. It did so using an indicator system formulated at the FAO Expert Workshop on Methods and Indicators for Evaluating the Contribution of Small-scale Aquaculture to Sustainable Rural Development held in Viet Nam in November 2008 (Bondad-Reantaso and Prein, 2009). The sustainable livelihoods approach (SLA) was adopted as the study methodology. It considered five basic forms of capital: natural, physical, human, financial and social. Small-scale aquaculture (SSA) was defined as an aquatic farming system whose ownership is typically family and/or community-owned, with relatively small landholdings and often limited access to resources.

This study focused on seaweeds, particularly, on *Kappaphycus* spp. Seaweed farming in the Philippines accounts for 69 percent of the total aquaculture production. According to the authors, Palawan was the top producing province where seaweed farmers harvested 444 355.44 tonnes in 2008. A high price and an assured market motivated farmers to grow it. The study observed a growing popularity of seaweed farming in the Philippines as a good source of income that involves only small capital investments and a modest amount of labour. The study further observed that while many communities benefited from seaweed farming, there was a lack of data, particularly regarding the small-scale sector, to show the benefits of small-scale seaweed farming, both qualitatively and quantitatively.

According to the authors, SSA can be divided into two types. Type I refers to aquaculture systems involving limited investment in capital assets and small investment in operational costs. Labour is largely contributed by family members and not remunerated. Type II aquaculture systems are defined as systems where aquaculture is the principal source of livelihoods and in which the family/operator has invested substantial livelihoods assets. According to the study, seaweed farming is classified as Type II aquaculture system as it requires some level of investments and technology.

The following indicators were used:

- Natural capital/benefits: efficient use of materials and energy saving; types and number of nutrient flows; efficient use of water; number of farm production uses of water.
- Physical capital/benefits: build-up of SSA farms and farm assets in rural areas; number of SSA farms and farm areas increased over three years in the study area; build-up of rural physical assets; types and number of rural infrastructure investment induced by SSA; more efficient use of built physical assets in rural areas; types and number of rural infrastructure; investments induced not purposely for SSA but which benefit SSA.
- Human capital/benefits: food and nutrition security; per capita annual consumption of fish in SSA household from own SSA harvest; seasonal food security.
- Financial capital/benefits: household cash income; percentage of cash income from SSA to total household cash income (contribution of SSA to economic security); economic return from SSA to household; contribution to provincial economy.
- Social capital/benefits: social participation/membership in SSA programmes, associations and organizations; percentage/number of SSA farm activities in which women play the major decision-making role; female empowerment; role in community and community organizations; number of SSA households that share fish products and other farm resources; fostering social harmony; number of activities in which farmers work together to improve the shared resources in the community such as water system, road and reservoir; provision of social safety net; ratio of family labour who previously worked solely or mainly in non-SSA (including off-farm) jobs but now work in SSA to total family labour.

Findings and conclusions

The study found that seaweed farming contributed significantly to household incomes. A considerable increase in livelihoods assets of rural households was observed using the above indicators.

Natural capital

Seaweed farmers in Calatagan used groundwater for their household and livestock needs. For seaweed farming, they used water from the sea and lakes. Households commonly knew that seaweed farming depended significantly on the quality of marine water. Perceived threats to the quality of marine water and to small-scale seaweed farming included adverse impacts of mariculture as well as the operation of a large hotel and restaurant in the vicinity. The study found that it is commonly observed by seaweed farmers that *Kappaphycus* spp. seedlings are destroyed when shrimp ponds and swimming pools release waste water into the coastal area. For *Caulerpa lentillifera* seaweed (known locally as lato), the main threat is the siltation of the sea bed.

Physical capital

The study found that after the introduction of seaweed aquaculture, the number of producers and farms increased to 122. The seeming profitability of seaweed farming, however, did not result in increased property or other investments in rice fields, orchards or vegetable farms. The study found that seaweed farmers, who are also fishers, would rather invest in livestock and poultry.

Rural assets such as roads, markets, energy systems and water systems benefited seaweed culture. There were no indications that rural assets and infrastructure were created because of the spread of seaweed culture. In terms of more efficient use of built physical assets in the rural area, the construction of the barangay (village) road and the provision of electricity has benefited seaweed culture as it provides convenient transport of the products (dried *Kappaphycus* spp. and fresh *Caulerpa lentillifera*) to the market. A trader or collector buys the produce from small producers in the barangay, and then these are transported to Manila by truck and go from there to Cebu or Japan.

Human capital

The study found that farmers did not rely on seaweed as a source of food but rather as a source of income. All *Kappaphycus* spp. producers sell their harvest to traders. The income they derive from seaweed is used to buy food, medicine and other necessities.

Financial capital

The study found that income from seaweed farming constituted as much as 47 percent of total household income. Regarding inputs and the cost of seaweed farming, the study observed that there were no costs for land or water as seaweed was grown in coastal waters. However, farmers had to pay a permit fee equivalent to USD3.8 per unit of 2 000 m² to the municipal government.

Major inputs in seaweed farming were seedlings, bamboo poles, sticks, plastic straw and labour (66 days per year), 73 percent of which is family labour, for gathering seedlings, planting, harvesting and drying. The study found that the production cost of growing seaweeds amounted to the equivalent of USD812. The value of family labour was equivalent to 32 percent of the total cost.

The annual gross income per unit (2 000 m²) in the case of one harvest per year was found to be USD4 490 and the annual net income was found to be USD3 935. As a seaweed farmer can harvest at least two times a year, the total net income for a year would be equivalent to USD7 357. According to the study, this income is sufficient to meet the entire annual expenses of a household.

Social capital

Regarding social capital, the study found that small-scale seaweed farmers in Calatagan had formed their own organizations, although women were in need of more empowerment rather than only looking after their family. Sharing knowledge in the production of seaweeds as well as seedlings was found to be common among neighbours and friends.

Findings and conclusions

The study also found that there is a need for more data collection to generate a clear picture of the value chain and supply chain and to measure the contribution of seaweed aquaculture to the municipal and provincial economy. The study reaffirms the need for sustained support to SSA as a poverty alleviation strategy because it is significant for securing livelihoods and food security of low income households. The intervention of the Bureau of Fisheries and Aquatic Resources of the Philippines and other development-oriented agencies was found to be highly relevant to the sector. Providing investment and credit, technical knowledge and quality seedlings were identified as relevant undertakings, as noted throughout the study. Expanding the market for seaweed products was seen as imperative if good farmgate prices are to be sustained and small-scale enterprises are to remain viable.

If these conditions can be met, seaweed farming might offer an opportunity of occupational diversification for small-scale fishers and their households in the Philippines.

4.6 Small-scale fisheries in Lebanon

A study analysed the socio-economic performance of SSFs in Lebanon and showed a positive economic and financial performance, notwithstanding the finding that Lebanese fisherfolk belong to the poorer and disadvantaged sections of society.

Background

The study was carried out within the framework of the project Scientific and Institutional Cooperation to Support Responsible Fisheries in the Eastern Mediterranean, executed by FAO. The project supports the development of regional cooperation and the further development of multidisciplinary expertise necessary to formulate appropriate management measures under the Code and the principles of the ecosystem approach to fisheries (EAF) to ensure rational, responsible and fisheries management.

The study “Socio-economic analysis of the Lebanese fishing fleet” was split into two phases. In the first phase, information on the technical characteristics of the most recent fleet was obtained. The second and main phase consisted of a socio-economic sample survey and analysis of costs and revenues of Lebanese fishing vessels. In total, 389 owners/skippers were interviewed, which represented 27 percent of the total fleet (Pinello and Dimech, 2013).

Findings and conclusions

Technological and socio-economic features

The study shows that the Lebanese fleet is small-scale and artisanal in nature. The length of vessels ranges from 6 to 12 m. The number of licensed vessels in 2011 was 1 460. The most typical gear types encountered were fixed nets, longlines and purse seiners. More than 75 percent of the vessels were registered in the northern part of Lebanon, which includes Beirut.

As far as the post-harvest sector is concerned, auction markets at the ports of Dora, Ouzaii, Saida, Tripoli and Sour were the main fish marketing channels. Local cooperatives of fishers were responsible, in part, for the marketing of the fish. Most landing sites had at least one local cooperative. The government has no involvement in fish auction markets and only supports the infrastructure of the harbours.

Besides auctions, fish is also marketed through stalls at 16 harbours, by licensed and/or unlicensed shops and fish stalls, directly by fishers as well as by street vendors. In 2005, there were fish halls for sorting, packing, selling and icing fish at 16 port/landing sites along the Lebanese coast. The study observed that there were no data on fish processing and highlighted the need for further and in-depth study of the whole value chain.

The Lebanese fishery is a family-based fishery, where the owners of the vessels are directly involved in the fishing activity and are assisted by family members. Fishing is generally the main source of income. The study found that the average age of a skipper was 48 years and that of fishers was 35, which are both comparable with other Mediterranean countries. Fishers have a lower educational level than their children, who however have the minimum educational level as obliged by law.

Economic performance

The study found that the economic indicators showed a good profitability for the Lebanese fishing fleet sector. It points out that the gross cash flow is a good short-term indicator in fisheries. A positive gross cash flow means that a vessel is capable of paying for all its operational costs. Net profit can be viewed as a measure of the return to vessel owner's equity. The gross value added is the value of landings minus the cost paid to other (supplying) industries. The remaining amount is the reward for labour and capital employed in fisheries.

According to the study, in 2011, the Lebanese fishing fleet generated a gross cash flow of USD7.8 million, a net profit of USD6.4 million, and the gross value added was USD18 million. The net profit of about USD6.4 million amounted to 24 percent of the revenue earned and is comparable with other fleets in the Mediterranean of similar characteristics. The ROI was 50 percent. The annual average annual net profit of an individual fishing vessel was USD4 500.

The study further found that the annual income of fishers, who are also owners of the fishing vessel, was USD7 400 and the income of crew members was USD3 000. This is 20 and 70 percent, respectively, less than the national GDP per capita. Forty-five percent of fishers were also owners of a vessel. The study also found that a fisher earns about 25 percent less than the minimum wage of the country. As far as their income is concerned, fishers in Lebanon belong to both the lower-middle class, in the case of boat owners, and the lower class, in the case of crew members, the latter being a part of the poorest section of society.

The study concludes that despite the positive financial and economic performance, the fishing community in Lebanon is still relatively poor. Fishers generally do not pay social security and are not

eligible for pensions. The study suggests that appropriate action should be taken in order to improve the livelihoods conditions of this part of society.

The study also suggests several ways of how the salary of the fishers could be increased in Lebanon, including both through socio-economic measures and through more efficient harvesting of the resources. The suggestions include an exploration of the possibility to support fishers through social security contributions, an increase in the added value of fishery products; an increase in the quantity of production by adjusting the fishing effort in order to fish at the maximum sustainable yield (MSY) or one of its proxies, an examination of the possibility to use fish aggregating devices, and an exploration of the possibility to shift part of the fleet to new fishing grounds, in deeper and offshore waters for the fishing of large pelagic species.

4.7 West African fleets targeting Atlantic billfish

Recent studies, carried out on the economic performance of artisanal fishing fleets targeting Atlantic bill fishes, swordfishes and tunas off the Ghanaian coast and on recreational fishing boats targeting the same species off the Senegalese coast also showed positive profits of both types of fishing vessels in spite of open-access fisheries and declining resources.

Background

Brinson *et al.* (2009) studied the socio-economic performance of West African fishing fleets that target Atlantic billfish. Two quite different types of fleets were studied: artisanal fishers, many of whom belong to fishing communities where poverty is widespread; and recreational fishing enterprises catering to wealthy foreign tourists.

The objective of the study was to compare the socio-economic performance of two fleets that target billfish in the eastern Atlantic Ocean, one in Ghana (artisanal fishers) and the other in Senegal (recreational fishing). The two fleets were chosen because each country is a member of the International Commission for the Conservation of Atlantic Tunas, which is the primary regional fisheries management organization in charge of managing large pelagic fishes in the Atlantic Ocean. The Ghanaian fleet targeted billfish, particularly sailfish, as well as tunas using 10 m long motorized canoes and drift gillnets. The fleet comprised about 240 vessels and 1 700 fishers.

In Senegal, there were six towns that hosted recreational fishing centres, located in the regions of Dakar, N’Gor and Saly. About eight recreational fishing enterprises that target billfish operated in these three areas. All enterprises belonged to the Federation of Senegalese Sports Fishing (Fédération Sénégalaise de Pêche Sportive). This federation recommended different rules to its members and oversaw recreational fishing within Senegal.

Each of the sports fishing boats had three to four people on board, i.e. the skipper, the mate, the client and sometimes the owner. The boats were equipped with two 270 hp outboard engines and targeted sailfish, swordfish and dolphinfish on 8 hour trips.

Interviews were conducted with artisanal fishers that target billfish in Ghana and with recreational charter boat anglers that target billfish in Senegal. Data from the survey were used to compile financial performance indicators that describe the sustainability of the operations. In addition, social and resource management perception data were collected in each location. Four performance indicators were chosen for the study: gross revenue, net revenue, financial profit, and economic profit.

The Ghanaian analysis is based upon the entire fleet’s monthly performance because the harvest database is based upon the entire fleet’s monthly landings. Therefore, the performance results are for the entire fleet, not for an individual vessel. Median vessel owners’ survey responses were used for estimation of costs in the performance indicators’ calculations. The Senegalese data are based upon individual vessels’ performance during the year of the survey.

Findings

Socio-demographic results

According to the study, artisanal billfish fishers in Ghana tended to be older than recreational fishers in Senegal (medium age: 48 years), were head of a large household, lacked formal education and had limited access to infrastructure, such as running water or sewer systems. In the fishing communities, polygamy was common practice and most fishers had two wives and six dependants. Most fishers had fewer than 6 years of formal education and fewer than 30 percent of the fishers could read or write. The infrastructure in fishing communities was limited. Less than 40 percent of the respondents had running water, and less than 20 percent had a functional sewer system in their households. However, 95 percent of respondents had electricity in their homes.

The Ghanaian artisanal billfish fishers were very experienced and dependent upon fishing for their livelihoods. Ghanaian artisanal fishers had a median of 21 years of fishing experience. They were at least third-generation fishers. Only 19 percent had another occupation besides fishing. Most boat owners had two canoes, a crew of eight men, and made three and a half trips per week on average.

Owners and crew in the Senegalese recreational fishery had different demographic profiles depending on their position (skipper, mate or owner). Crew members had larger households with more dependants than the skipper or owner. Crew members did not have the same level of access to services as skippers and boat owners. Skippers and owners all had running water, electricity and sewer systems in their households. More than 14 percent of crew members did not have running water or electricity, and 27 percent had no sewer system in the home.

Economic and financial performance

The results of the study indicate that both fleets exhibit positive profit levels. The median monthly gross revenue for the Ghanaian artisanal fleet was estimated to be USD750 253. The median annual gross revenue for an individual vessel in the Senegalese recreational charter fleet was estimated to be USD160 191. Regarding net revenue, the monthly net revenue in the Ghanaian artisanal fleet was USD272 100 when accounting for running costs. In Senegal, the median vessel earned an annual net revenue of USD73 791.

As far as financial profit is concerned, the monthly financial profit for the Ghanaian artisanal fleet was USD208 632. In Senegal, the median vessel's annual financial profit was USD66 459. The definition of financial profit used by the study does not take into account opportunity costs of capital or labour. The monthly economic profit for the Ghanaian fleet, which takes into account the opportunity costs of capital and labour, was USD249 866.

Although fishers in both study locations perceived a declining billfish resource, they were largely unwilling to accept management measures to improve the resource.

Conclusions

The study concludes that although the Ghanaian artisanal billfish fishers earn positive economic profits, poverty is still widespread in their communities. This is similar to that observed by the global study on beach seine fisheries carried out by FAO and by other studies reviewed in this document.

The authors state that it is unclear whether increased income or earnings will necessarily move these fishers or owners out of poverty. They try to explain the coexistence of economically and financially profitable fisheries and poverty with a number of possible causes, such as lack of access to drinking-water, sanitation and other services and with the lack of banking institutions or savings habits in artisanal fishing communities.

The study concludes that, if management measures were to be considered for the artisanal fleet, fisheries managers should simultaneously introduce mechanisms to improve the storage capacity for

harvested fish and training on saving schemes for artisanal fishers. Managers should also monitor the number of recreational vessels and their effort in Senegal.

4.8 Sea cucumber fisheries on the south coast of Kenya

Background

The sea cucumber fishery is an important source of livelihoods for many households on the coast of Kenya (Ochiewo, De la Torre-Castro and Muthama, 2010). As a result of overfishing, sea cucumber catches declined by more than half from about 62 000 tonnes to 28 376 tonnes (dry weight) between 1984 and 2004, after reaching a peak in 1992. This peak was associated with the introduction of scuba gear to harvest sea cucumbers, which rendered deep-water stocks, previously inaccessible to the local fishers, vulnerable to overfishing.

Fishers also caught smaller and reproductively immature individuals of at least two commercial species (*Holothuria fuscogilva* and *Holothuria scabra*) at the main landing sites in Kenya. The authors note that there is a concern that Kenya's sea cucumber fishery may be on the verge of becoming economically unviable and that current regulations are insufficient to ensure its future sustainability.

In order to address these concerns, the authors conducted a socio-economic assessment at the villages of Vanga, Shimoni, Majoreni and Gazi on Kenya's south coast with a focus on sea cucumber fishing patterns, social and economic characteristics of fishing communities, the contribution of sea cucumber to the local livelihoods, and analysis of the management systems.

Findings and conclusions

The study (Ochiewo, De la Torre-Castro and Muthama, 2010) found that sea cucumber fishers are mainly men. For about two-thirds of respondents, sea cucumber fishing was a full-time occupation, while about one-third considered it a part-time activity. Fishing is done in subtidal and intertidal areas depending on the species targeted.

The study found that those who fish in subtidal areas do skin diving without using scuba gear. There was an attempt to ban the use of scuba gear in intertidal areas in 2003 and to promote the use of snorkelling gear instead. However, it seems from the study that scuba gear is still used in some locations. Sea cucumbers are picked by hand from their habitats. On average, full-time sea cucumber fishers land 16 pieces of sea cucumbers per person per day. Fishers use traditional fishing vessels to reach the fishing grounds, including traditional canoes (dau/mtumbwi), wooden-planked boats (mashua) and outrigger canoes (ngalawa). Most of these fishing vessels are owned by entrepreneurs, who rent them out to the fishers at a fee. Some of the boats are motorized, others are propelled by sails and oars.

The main sea cucumber fishing season is the northeast monsoon season from September to April, when the sea is calm and the water is clear. About one-third of sea cucumber fishers also collect other marine products such as octopus. Sea cucumbers are sold fresh to local intermediaries, who process the sea cucumbers and sell them to other intermediaries and exporters in Mombasa. Fishers occasionally borrow money from local intermediaries, especially when they fail to catch sea cucumbers. This was found to create conditions of dependence and possible exploitation.

The authors found that sea cucumber fishers do not wish to make sea cucumbers part of their daily diet. The authors found that it was extremely difficult to estimate the economic value of the sea cucumber production, as prices between species vary substantially and also because of the differences between wet and dry weights. They observed that the situation is the same for the rest of East Africa and the global market. Nevertheless, the authors roughly estimated that the average monthly revenue for dry sea cucumbers in the area studied was USD8 000. Profit margins of intermediaries were found to be considerable and to differ depending on the product.

The study does not provide information on income or revenues of sea cucumber fishers, boats or households. It mentions that full-time sea cucumber fishers also engage in farming, octopus and finfish

fishing, and small informal businesses to supplement their income, while these activities are the main source of income for part-time fishers. The relatively highest profits were derived from juvenile species. This was seen by the authors as an economic incentive hindering local stocks from reaching sexual maturity, which in turn was seen as creating a situation in which recruitment success is highly dependent on faraway sea cucumber populations.

Regarding the management and regulation of the sea cucumber fishery in Kenya, the authors observe that the present management system falls under the general fisheries regulations and is weak. The study also observed that, since their establishment in 2007, most BMUs have been successfully operating as community-based fisheries management organizations, and that the Fisheries Department is providing support to them in terms of training to enable them to understand their roles effectively and to build their capacity in management. The authors suggest that BMUs could therefore provide a mechanism for the fishers to participate in managing the sea cucumber fishery, provided a special management plan and regulations were prepared and put into force.

As far as the livelihoods of sea cucumber fishers are concerned, the study concludes that there are strong indications that the fishers are exploited by local intermediaries as they often do not have a say over prices and do not have the time to process their catch themselves. It is therefore suggested that training be provided to fishers in sea cucumber processing. The authors further suggest that sea cucumber fishers form an association for marketing their catch. The association could negotiate competitive prices with the buyers and undertake sea cucumber processing on behalf of the members when necessary.

Last but not least, the authors suggest building a reliable database on the sea cucumber fishery and making it mandatory for licensed owners of sea cucumber fishing vessels to provide data on catch and fishing effort, fishing grounds, where sea cucumbers have been harvested and the number of fishers who have used the boat. Moreover, a special arrangement should be made with sea cucumber exporters to provide accurate data on the quantity of each species exported, the duration taken to accumulate the quantities, the destination of each consignment, and the price offered for each species.

4.9 Small-scale fisheries in Madagascar

Background

Barnes-Mauthe, Oleson and Zafindrasilivonona (2013) studied post-landing trends of SSFs and attempted to estimate the total economic value of the fisheries, including both commercial and subsistence fishery activities, in a remote rural region in Madagascar.

The authors highlight the fact that Madagascar is one of the poorest countries in the world and that more than 75 percent of all households live below the poverty threshold. Political instability and economic decline have intensified poor socio-economic conditions. Nationwide, most households rely on the exploitation of natural resources to support their livelihoods. More than half of the population lives within 100 km of the coast. Madagascar's SSF sector is highly significant and has the potential to both feed people and support livelihoods. This is particularly the case along the west coast, where agricultural production is largely infeasible and employment options are limited.

The study site, Velondriake, lies in the arid Toliara province of southwest Madagascar, where twenty-four villages supported by NGOs and the National Marine Sciences Institute are trying to collaboratively manage a complex array of islands, mangroves and coastal ecosystems. Velondriake currently supports a population of more than 7 500 people and is home to the Vezo ("fishing people"), whose cultural identity is tied to the marine environment.

The locally managed marine area was established in 2006 in response to concerns over resource depletion. Since then, various management measures have been enacted, including a temporary octopus fisheries closure and bans on destructive fishing practices. Small-scale fisheries in the region still face substantial threats from population growth, increased migration to the coast, environmental degradation and climate change, and competition with offshore commercial fleets.

The authors provide information on annual landings, describe gear and habitat use, and analyse post-landing trends, fishing revenue, total market value, costs and net income, profitability, employment and dependence on SSFs.

Findings and conclusions

The study finds that the SSF sector of Velondriake employs 87 percent of the adult population, generates 82 percent of all household income, and provides 99 percent of protein. In 2010, small-scale fishers in the region harvested 5 524 tonnes of fish and invertebrates, primarily from coral reef ecosystems, of which 83 percent was sold commercially, generating fishing revenues of almost USD6 million. When accounting for subsistence catch, total annual landings had an estimated value of USD6.9 million. The study demonstrates the importance of SSFs for food security, livelihoods and wealth generation for coastal communities. It also highlights the need for long-term management strategies that aim to enhance ecological and economic sustainability.

4.10 Artisanal fishing in South Pacific Islands

Traditional fishing on the coral coast in Fiji

Background

Teh *et al.* (2009) reviewed the socio-economic and ecological context of Fiji's reef fisheries. The review was considered necessary because an improved understanding of the state and trends of Fiji's coral reef fisheries was required for designing an effective management plan for the country's inshore reef fisheries. The authors observed that in Fiji, as in other South Pacific islands, the marine ecosystem is an integral part of coastal life, forming the foundation of traditions and culture, including a customary marine tenure system. Fiji's coral reef fisheries are mainly inshore small-scale subsistence and artisanal fishers.

The authors further point out that rising demand for fish from a growing population and the introduction and expansion of coral-reef-associated trade because of increasing external demand have contributed to excessive fishing pressure on Fiji's coral reefs. Of the country's about 400 traditional fishing grounds, 70 are considered overfished. Many of its inshore reef fisheries are threatened from overfishing, destructive and illegal fishing, and pollution. The authors observe that a decline in reef fish catches brings socio-economic hardship to coastal communities, including loss of income and changes of diet. Excessive removal of food fish species from coral reefs results in significant ecological changes to coral reef communities.

The authors also note that Fiji has become a popular site for coral-reef conservation-driven initiatives led by various institutions, several of which conduct socio-economic surveys of marine resource use. They observe, however, a lack of coordinated effort in synthesizing the accumulated knowledge and applying it to manage Fiji's inshore fisheries resource.

Findings and conclusions

The review finds that, despite numerous studies of Fiji's reef fisheries, the current status of reef-associated fisheries at the national level is still uncertain due to the lack of dependable data on subsistence fisheries. This in turn leads to uncertainty about how the continuation of fishing, in particular, fishing focused on target species for the coral reef resources trade, will affect fishing communities and the ecosystem.

As far as the economic performance of Fiji's SSF sector is concerned, Teh *et al.* (2009) made assumptions that the largely undocumented economic contribution of SSFs in other Pacific island States has been underestimated by a factor of five. Despite limited economic valuations of Fiji's small-scale reef fisheries, which all produced very different results and large variations, the authors assume

that SSFs make a significant economic contribution to coastal communities in Fiji. However, no reliable quantitative estimates seem to be available.⁴

Tonga's artisanal fishery sector

Background

As the above study, this study is an example of a socio-economic assessment of the SSF sector of a Small Island Developing State (SIDS). Societies in the South Pacific and in other SIDS are undergoing a transition from reciprocity exchange and direct sustenance systems into cash-based economies. Kronen (2004) selected Tonga to represent this socio-economic change and assess the economic viability of Tonga's subsistence and small-scale artisanal fisheries and marketing of reef and lagoon fish. Case studies were selected for this purpose to represent three major geographical regions (Ha'apai, Vava'u and Tongatapu) and four major fisher groups, which used simple to specialized and multigear fishing systems. The cost of motorized boat transport, operating costs and fish prices were also studied as were marketing operations such as the operations of agents, intermediaries and shop owners.

As a measure of economic performance, net present value (NPV) was used. The assessment of the economic viability of fishery and marketing systems was based on a comparison with alternative income sources. Simple, risk-free paid employment and net income from mixed crop production were the alternatives selected. The NPVs for the four fisheries were calculated taking into account major investment, maintenance and operating costs. Revenues were assumed by setting the value of the total catch equivalent to the average local or regional market price.

Findings and conclusions

The study highlights the limitations of conventional economic analysis. The author points out that while NPV is a useful instrument for comparing fisheries and alternative sources of income, it does not assess social and traditional values that determine the rather non-economic and non-rational subsistence and SSF systems in the Tongan and South Pacific context. The study concludes that the conflict between applying mainly non-valorization of societal and traditional values and underlying normal market behaviour rendered most fishing operations economically not viable or less attractive than agricultural production schemes and salaries from low-skilled labour.

The author concludes that under these conditions, most Tongan fisheries do not meet the following suite of parameters required to make an operation economically attractive: minimum catch volume of 90–100 kg/week; a catch per unit effort of ≥ 5.8 kg/hour; lowest possible operational cost; and easy access to market selling prices of at least TOP5/kg fish. The author also found that productivity increases from spear fishing to handline and multigear fisheries. Regarding small-scale fish marketing strategies, the author found that selling fish as a complementary activity to normal shop operations seems to be more lucrative than using agents and intermediaries.

The study shows that the occupational behaviour and choices of Tongan fishers extend well beyond the modern economic and rationale framework. Major economic parameters such as labour and time are not accounted for in the traditional social environment. The study concludes that traditional social considerations function as impediments to a modern economic rationale as they do not aim at catch maximization, risk minimization and innovation but rather serve the need to satisfy subsistence, social obligations and networking for societal resilience and mutual support.

However, this is not seen as a negative scenario. The subsistence and small-scale artisanal Tongan fishery and its associated marketing networks are assessed by the author as being sophisticated. The behaviour and attitudes of the fishers aim to satisfy social networking values and obligations, fulfil traditional principles and accommodate changes that accompany a society in transition to a cash-based

⁴ For an attempted economic valuation of a traditional fishing ground on the coral coast of Fiji, see: O'Garra, T. 2012. Economic valuation of a traditional fishing ground on the coral coast in Fiji. *Ocean & Coastal Management*, 56: 44–55.

economy from an exchange system based on reciprocity and a direct sustenance system. The study found that, for coastal rural people in Tonga, fishing is still part of a way of life, and concludes that Tongan fishers do not fish for economic returns but for food, social support, subsistence requirements and traditional values, and therefore they cannot be regarded as pursuing an occupation of last resort.

The study further concluded that coastal SSFs will continue to be essential to the livelihoods of rural people in Tonga and the South Pacific. Regarding ecological and environmental considerations, the study points out that, due to their relatively low efficiency and productivity, the fishing pressure generated by Tonga's artisanal fisheries is low and beneficial to the fish stocks. Regarding future research, the author suggests that it may be worth investigating how far non-profit and non-catch maximizing fishing strategies can be maintained to mitigate the negative impacts of a cash economy based resource exploitation, with the ultimate objective to achieve long-term sustainable and equitable use of coastal marine resources.

4.11 Small-scale estuary fisheries in Brazil

Background

Using a custom-designed fisheries census methodology, FAO carried out an assessment of SSFs of the Patos Lagoon estuary in Brazil (Kalikoski and Vasconcellos, 2012). Complementary information was sourced from a literature review, secondary data and in-depth semi-structured interviews. The assessment provides information of the technical, environmental and socio-economic conditions of these fisheries, including information on the number of fishery-dependent people, fishing effort, technologies and practices, trends in production and resource abundance, income and market, livelihoods strategies, community-based organizations, formal institutions established by co-management, and access to public policies.

The study aimed to contribute to an improved understanding of the current status and vulnerabilities of local SSFs and to recommend strategies to enhance livelihoods security and sustainable use of resources. Lessons learned using the study methodology are presented, foreseeing its application and adaptation to assess small-scale lagoon fisheries in other locations. The study explains that coastal lagoons are among the most productive ecosystems in the world and function as important nursery, feeding and reproduction areas for a variety of species. At the same time, coastal lagoons are highly stressed by anthropogenic inputs and human activities. Artisanal fisheries in coastal lagoons provide livelihoods for many thousands of people worldwide.

The estuarine region of the Patos Lagoon is located in the southern Brazilian coastal zone in the state of Rio Grande do Sul. The lagoon is a UNESCO Biosphere Reserve. With an area of about 10 000 km², the lagoon is recognized as the world's largest choked lagoon, stretching from near the city of Rio Grande to the Atlantic Ocean. To assess the economic and financial performance of fishers, the following indicators were used: net profit (value of landings minus all costs); net profit/total earnings; ROI (ratio of the net profit and the invested capital); and the rate of economic dependence on fishing, calculated as the ratio between the total earnings from the fishery and the total earnings from all economic activities in the household.

Findings and conclusions

A census carried out as part of the study enumerated 3 259 fishers residing in 153 localities in the 9 municipalities bordering the estuary. The number of fishery-dependent people was enumerated as 4 089. This total includes the fishers as well as family members, who perform other duties in the fishery such as fish processing, commercialization, gear maintenance and cleaning. A common characteristic of artisanal fishing vessels was that they were all constructed of wooden planks and without cabins. Tents and removable decks were used as shelter. The motorized boats were propelled by inboard diesel motors. Canoes were also used for fishing. The most common gear for catching finfish were gillnets, i.e. fixed gillnets, drift gillnets, surrounding gillnets and trammel nets. Beach seines were also used. Fyke nets, stow nets and various types of trawl nets were used for catching shrimps and crabs. Longlines were also used for catching crabs.

The total value of fisheries production in a good fishing season was found to vary from about BRL23 million to BRL46 million per year, depending on the first-sale prices used in the calculation. This represented less than 1 percent of the total GDP of the municipalities in the region. The study found that fish is an important source of animal protein to artisanal fishers and plays a crucial role for their food security. The estimated annual average fish consumption per capita was found to be 52.8 kg/person in artisanal fishing communities of the estuary of the Patos Lagoon – among the highest in Brazil.

Socio-economic aspects

The study found that a combination of activities and other sources of income was commonly employed by fishers as part of their livelihoods strategies. These included fishing year-round, receiving unemployment benefits, maintaining gear, and performing occasional jobs. Agriculture appeared as an important option in some rural localities. Data also showed that there were relatively low percentages of fishers who relied exclusively on fishing as a source of income. In almost all localities, unemployment benefits during fishing closure were frequently pointed out as a main source of income.

Fishing was carried out both by men (85 percent) and women (15 percent). The participation of women was more significant in fish processing activities, where they represented half of the total workforce. Women also processed fish for household consumption and local industries. Fish processing also involved women not belonging to fisherfolk households. There were very few young fishers engaged in artisanal fisheries. The low recruitment of individuals to the fishery, associated with the overfishing of resources, was seen by the authors as representing a threat to the continuity of fisheries in the lagoon estuary in the medium and long term.

The illiteracy rate among fishers was found to be high (10.9 percent) and well above the state average (3.1 percent). With few exceptions, the access of fisherfolk households of the lagoon to basic infrastructures and services was found to be reasonably good compared with other areas in Brazil. There are various sources of credit and microfinance available, both formal and informal. Government aid programmes including unemployment benefits were also operating in the Patos Lagoon region, which the study assessed as important and inclusive.

In the last decade, some associations and cooperatives have been formed in the region. These originated from community initiatives and have been supported by government programmes at the municipal, state and federal levels. The study found that, despite the challenges facing associations and cooperatives, these organizations represent a seed for transforming social relationships within communities with the potential to address some of the major socio-economic threats to artisanal fisheries livelihoods.

Techno-economic performance of artisanal fishing units

The study compared the economic performance between good and bad fishing seasons. The dependence of fishers on fisheries and on other household incomes, including government aid and contributions from other household members, was also compared during good and bad fishing seasons. The authors found that the economic performance of fishing units in a good fishing season scenario, measured by the ratio of net profit to total earnings, varied from 21.6 percent to 67.3 percent. The financial performance measured by the ROI varied from 16.7 percent to 92.7 percent.

The household economic dependence on fishing was found to be high, representing at least 65 percent of the total household income in a good fishing season. The importance of government aid varied from insignificant (in a family where nobody receives unemployment benefits) to 28.9 percent of total household income. The contribution of income from family members working outside the fishery varied from zero to 34.4 percent of total household income. The study concluded that government aid and additional family income have a complementary role in household income during good fishing seasons, when fishing is highly profitable and accounts for the bulk of family earnings.

The study shows further that a bad fishing season can have a drastic impact on income and performance indicators. It was estimated that total earnings can be reduced by 65–90 percent during a bad fishing season. Government aid, especially unemployment benefit, played a fundamental role in the household income in this situation, becoming the source of all the household income in families without alternative sources of income. In households with alternative sources of income, the contribution of earnings from family members working outside the fishery varied from 42.1 percent to 84.1 percent of total household income. Regarding income levels, the study found that the income earned from fisheries by a considerable number of estuary fishers in the Patos Lagoon is below the minimum national wage.

Environmental aspects and fisheries governance

The study also provides an overview of the failure of past institutional arrangements to sustain artisanal fisheries and highlights the benefits of a new policy of mainstreaming fisheries co-management initiated in the 1990s. The authors point out that, in line with this policy, alternative institutional arrangements were made to co-manage the local resources in the Patos Lagoon estuary, and the Forum of Patos Lagoon was established to:

- organize the artisanal fisheries sector and link it with the fisheries administration;
- create partnerships within the sector to implement action plans and rebuild the productive capacity of the fishery resources in the Patos Lagoon;
- establish criteria that control fishing effort as a mechanism for rebuilding fishery resources;
- encourage organizational support of local artisanal fishing communities.

The authors observe that, since the establishment of the Forum in 1998, fisheries regulations have been debated, redefining rules and rights to local resource use in the estuary of the Patos Lagoon. Measures such as fishing effort limits, minimum mesh sizes and closed seasons were discussed and agreed as a first initiative of the new co-management arrangement.⁵ The authors further suggest that in order to be effective, the co-management regime has to find ways to protect not only the fish stocks but also their habitats. The study finds that existing fisheries management institutions pay little attention to this aspect when defining rules for the conservation of fishery resources. Efforts for the management and conservation of coastal habitats through their federal and state institutions have narrowly defined goals and indicators that disregard the impacts of coastal activities on fisheries and other living resources. The authors concluded that there is a need for an integrated ecosystem-based management plan for fisheries and coastal zones in the Patos Lagoon.

4.12 Summary

Table 1 summarizes the major findings on the financial and socio-economic performance and benefits of SSFs and their ecosystems from the harvesting stage.

⁵ Nunes, Hartz and Silvano (2011) carried out a study in a southern Brazilian conservation unit to examine the question of which ecological variables were linked to resource use and fishing strategies of different groups of fisheries in terms of four niche dimensions: fishing gear used, species caught, fishing strategies, and fishing spots used. An understanding of these factors is found to be important for defining rules and rights to local resource use.

Table 1

Financial and socio-economic performance and benefits of small-scale fishery (SSF) ecosystems

Subsector / study area	Findings
<i>Benefits of SSF ecosystems</i>	
<ul style="list-style-type: none"> • Economic valuation of marine ecosystem services in Zanzibar (United Republic of Tanzania). 	<ul style="list-style-type: none"> • Economic benefits accrued from ecosystem services such as recreation and tourism; fishing and related activities; seaweed farming; mangrove harvesting; control of beach erosion and wastewater assimilation • Ecosystem services in Zanzibar generate an economic value equivalent to 30 percent of the island's GDP, 77 percent of investment, and a large amount of foreign exchange and employment.
<i>Small-scale fisheries harvesting</i>	
<ul style="list-style-type: none"> • Global techno-economic features of marine capture fisheries, technical and socio-economic characteristics of beach seining; • Longline and gillnet fishery in the South China Sea; • SSFs in Sabah, Malaysia; • Seaweed farming in the Philippines; • SSFs in Lebanon; • West African fleets in the Atlantic ocean; • Sea cucumber fisheries in Kenya; • SSFs in Madagascar; • Artisanal fishing in South Pacific islands; • Estuary fisheries in Brazil. 	<ul style="list-style-type: none"> • Small-scale fisheries are generally profitable, both in terms of covering their operating costs and generating a positive ROI. • Vietnamese longline and gillnet fishery in the South China Sea and on the Da Nang gillnet fishery are examples of a successful diversification of fishing effort from heavily fished inshore waters to less-fished offshore waters. Fishing operations seem to be profitable and fishers earn higher incomes than labourers in other sectors of the economy of the same province. • Small-scale fisheries in the state of Sabah, Malaysia, are generally profitable and contribute to the local economy to a much greater extent than previously believed. • Small-scale fisheries in Lebanon are profitable, as are West African fleets targeting Atlantic billfish. • Small-scale fisheries in Madagascar are important for food security, livelihoods and wealth generation for local communities. • Men account for the majority of fish harvesters, but women also are part of fishing crews, in many cases together with relatives or household members. They play an active role in the hauling of beach seines as well as in the collection of shellfish and other aquatic organisms. • Most small-scale fishing operations take place in an environment where fishery resources are heavily fished or overfished and where coastal and riparian ecosystems are rapidly degrading. The most important reasons are pollution from land- and sea-based sources, urban development, coastline erosion and siltation, degradation/destruction of estuaries, mangroves, coral reefs, climate change and variability, ocean acidification, reduction of survival space, deforestation and modification of fish habitat in inland waters, reduction of biodiversity and changes of trophic webs. • In many cases, fisheries management mechanisms have not been able to stem the tide of overcapacity of fleets and to regulate fishing effort at sustainable levels. Under these conditions, the sustainability and

Subsector / study area	Findings
	<p>economic viability of SSFs is seriously threatened. There is a need for integrated ecosystem-based management planning for fisheries and coastal zones and for long-term management strategies that aim to enhance ecological and economic sustainability.</p> <ul style="list-style-type: none"> • While most small-scale fishing operations are profitable, this does not mean that the earnings and profits from fishing alone are sufficient to sustain households at a level above the poverty line. In some cases, SSFs prevent further poverty rather than alleviating it. In other cases, while SSFs generate positive profits and the income is sufficient to cover household expenses, the income is still below the official poverty line and the national minimum wage. Particularly during bad fishing seasons, households depend on income from non-fishery-related activities and on government aid. • Seaweed farming in the Philippines can contribute significantly to household incomes, securing livelihoods and food security of low income households. However, there is a need for sustained support to small-scale aquaculture. Provision of credit, technical knowledge, quality seedlings as well as expanding the market for seaweed products are imperative if farmgate prices are to be sustained and small-scale seaweed farming enterprises are to remain viable. • Artisanal fishers in the South Pacific islands suffer from socio-economic problems, including loss of income and change of diet caused by overfishing and the degradation of the reef fish ecosystem. Nevertheless, SSFs make a significant and previously underestimated economic contribution to the coastal communities of the country. • Occupational behaviour and choices of Tongan fishers extend well beyond the modern economic rationale and framework, and social networks and social capital are highly important. Traditional social considerations function as impediments to a modern economic rationale as they do not aim at catch maximization, risk minimization and innovation. However, they serve the need to satisfy subsistence, social obligations and networking for societal resilience and mutual support.

5. SMALL-SCALE FISHERIES UTILIZATION AND MARKETING

5.1 Findings of studies from Asia, Africa and Latin America on present and future markets for fish and fish products from small-scale fisheries

Background

At the Twenty-sixth Session of COFI (held in Rome in 2005), FAO was requested to identify how trade in fish and fish products could further benefit SSFs and generate additional income and employment within the sector. Following this request, case studies were carried out in selected Latin American, African and Asian countries to study the importance of SSFs trade and identify opportunities for better integration of SSFs into regional and international fish trade. The organizations involved in this work were: Intergovernmental Organization for Marketing Information and Technical Advisory Services for Fish Products in the Asia and Pacific Region (INFOFISH), Intergovernmental Organization for Marketing Information and Cooperation Services for Fish Products in Africa (INFOPECHE), Centre for Marketing Information and Advisory Services for Fish Products in Latin America and the Caribbean (INFOPECSA), and Marketing Information and Technical Advisory Services for the Fisheries Industry in Southern Africa (INFOSA). The findings and recommendations of the case studies were presented and discussed at the tenth session of the FAO Sub-Committee on Fish Trade, held in Santiago de Compostela, Spain, in 2006. Case studies were carried out in Asia (India, Malaysia, Thailand), Africa (Ghana, Senegal, Mozambique, the United Republic of Tanzania) and Latin America (Mexico, Peru, Brazil).

Findings and conclusions

In the countries studied, the contribution of the SSF sector to the total marine catch was significant and ranged from 70 to 95 percent (INFOFISH *et al.*, 2008). The studies show that products from SSFs are largely focused on the domestic market, although they also play an important role in regional trade in some African countries. The studies found that the processing and trade of products from SSFs are important not only because these provide income and employment for many women and men in fishing and fish farming communities but also because the nutritional status of domestic and regional populations depends on these fishing, processing and trading activities.

Women's involvement

Women are actively involved in fish processing and marketing. They also participate in capture fisheries in coastal areas and estuaries as well as in other forms of harvesting of aquatic organisms. Women are also employed in large-scale fish processing plants. In India alone, it is estimated that about 700 000 women and youth (INFOFISH *et al.*, 2008, p. 15; FAO, 2007b, p. 3) are employed as labourers in the fish processing industry. Women's involvement results in increased well-being of their households, as women's income is largely spent on food and children's education (INFOFISH *et al.*, 2008, p. iv). Study findings suggest that women can gain from increasing trade opportunities through their involvement in value adding activities and enterprises.

In the Asian countries studied, women are mainly involved in shore-based activities, such as fish marketing, fish handling, net making/mending and processing, i.e. sorting, grading, weighing, gutting and filleting of fish. Women compare these income-generating activities with their home-making responsibilities. Generally, women are disadvantaged compared with men in that they tend to receive lower pay and are usually employed in so called "unskilled jobs". However, in the Asian countries studied, women also play various roles in fish marketing as agents, auctioneers, retail stall holders and fishmongers, working individually, as a family unit or in some cases as members of cooperatives or associations.

As far as the African countries studied were concerned, women play an important role as wholesalers and retailers, locally called "fish mummies". They handle, distribute and sell 90 percent of the SSFs' production as well as part of the medium- and large-scale production from larger commercial vessels. Most of the fish mummies operate as selling agents and also provide informal credit to fishermen.

They are also involved in fish processing, i.e. smoking, drying and salting, for domestic as well as local and markets in neighbouring countries.

In Senegal, women carry out 97 percent of fish processing and marketing. Many of these women are organized in local associations, some of which are federated in regions. In Mozambique, it is estimated that 20 percent of all people involved in the SSF industry are women. Women are mostly involved in processing and marketing as well as in the harvesting and collection of aquatic organisms such as mussels, oysters and other shellfish. It was found that 71 percent of registered shellfish collectors were women.

Women are also actively involved in aquaculture such as seaweed farming. Of all people involved in aquaculture, it is estimated that 70 percent are women. In some cases though, women also participate in fishing activities together with men, often husbands and family members, particularly in estuaries and coastal areas when fishing for shrimps and small pelagics as well as in beach seine operations. In the United Republic of Tanzania, women play an important role in the onshore and post-harvest sector as fish processors and traders.

In Brazil, women are actively involved in fish processing and marketing, and they are often organized in women's associations. In Peru, women of fisherfolk families are involved in local retailing. They usually gut and clean the fish, and shuck shellfish. They also prepare and sell local fish-based dishes and thus contribute significantly to household income. Women are also employed by fish processing plants. During the tourism season, women from fisherfolk families also make handicraft items from shells and sea lions' teeth, and rent accommodation to tourists.

Constraints and opportunities

The case studies identified several avenues for better integration of SSFs into regional and international fish trade. Among them were product diversification, value addition, improvement of product quality and access to new markets. However, the studies point out that a number of constraints need to be overcome before this can be achieved. Post-harvest losses due to poor infrastructure and lack of storage and transportation facilities need to be reduced, and knowledge of proper fish handling methods needs to be improved. While products for export are required to meet high quality standards, products for domestic and regional markets are often processed using substandard hygienic methods, leading to lack of market access and concerns for national public health and food safety in general.

The studies observed that SSFs are also excluded from international markets because of the costs and difficulties encountered when trying to comply with international standards and those imposed by supermarket chains and other customers. The studies suggest that efforts should be aimed at improving facilities for preserving fish onboard, establishing hygienic fish landing sites, and increasing storage facilities and the supply of ice as well as improving roads, which connect fishing communities to markets. Equally important are the improvement of technical support and extension services to enable fishing communities to access appropriate technologies and information, and training on quality improvement, proper fish handling procedures and storage, product diversification, value addition and adequate and hygienic packaging.

The studies further suggest that fishing communities should be assisted in assessing their fisheries and aquatic resources and identifying those that have potential for trade in the domestic, regional and international markets. Small-scale fishers and processors can obtain better prices for their products by shortening the fish supply chain and increasing their bargaining and lobbying power. In this regard, the formation of marketing cooperatives should be encouraged and existing associations of small-scale fishers and processors should be strengthened by providing support for institution building. There is also a need to raise awareness among microfinance institutions regarding the needs of the SSF sector for credit and savings services.

5.2 Fisheries post-harvest and market supply chains in Nias, Indonesia

Background

Nias is located about 60 nautical miles off the west coast of North Sumatra Province of Indonesia and has a land area of 5 320 km². Nias consists of 131 small islands. The main island has a coastline of about 400 km. The Fisheries Post-Harvest and Marketing Systems for Fisheries Products Project in Nias was implemented by FAO. It focused on improving the livelihoods of the fishers and traders involved in post-harvest and marketing activities on Nias. The project carried out a post-harvest study to support the long-term planning and development processes on Nias (Salagrama and Salka, 2010).

The fisheries sector contributes significantly to the local economy, livelihoods and food security. The sector accounts for 6.5 percent of the GDP. Nias is a net exporter of fish. About 60 percent of the fish landed in Nias is consumed locally in fresh condition and another 10 percent is consumed as dried/smoked product. Altogether, about 6 550 people residing in 126 coastal fishing villages depend on marine fisheries.

The average incomes earned from fishing, post-harvest and ancillary activities in Nias are low, and the majority of people involved in fisheries are poor. People depend on alternative sources of income and non-monetized common property resources as well as on strong family- and kinship-based traditions of social support to survive rather than on income from fishing alone. In many fishing villages, public amenities such as freshwater, electricity supply, healthcare facilities and roads are not well developed.

Fishing in Nias was traditionally done by one or two fishers in dugout outrigger canoes of 4–7 m in length propelled by sails and oars. Over time, motorization has taken root and larger boats with larger crews are increasing in numbers. The total number of boats in Nias was about 3 500, of which 51 percent were non-motorized canoes dugout and planked boats. Because of their size, the catches that can be caught and landed are rather limited.

In spite of the existence of diverse fishing methods in Nias, hook-and-line remains the predominant fishing method, accounting for 60 percent of the fishing gear used. Marine fish production in Nias has been growing since 2003 and stood at 19 060 tonnes in 2007. The study estimates that the production would probably be higher if the fishing operations by boats from mainland Indonesia and elsewhere and transfers at sea of fish caught by local fishers to mainland and foreign boats were taken into account. Currently, there is no effective programme for fisheries management in place.

Findings and conclusions

The study identified three main fish supply chains: the local fresh fish supply chain; the distant and export market supply chain; and the processed fishery product supply chain.

Local fresh fish supply chain

The local fresh fish supply chain is the most important supply chain in Nias. Sixty percent of the catch passes through this supply chain. Thus, this chain is very important from the local food security and livelihoods perspective. The supply chain has shown a growing trend over the years. The local fresh fish supply chain includes retail sales at daily and weekly markets, bicycle fish sellers (men and women), motorcycle traders (covering up to 30 km radius), and a few traders carrying fish for sale from door-to-door on foot.

The most serious post-harvest and market-related problems identified by the study related to the local fresh fish supply chain were:

- spoilage of fish due to lack of appropriate insulated containers for carrying fish on bicycles and motorbikes and for storage of fish at the markets;
- lack of access to ice in rural areas, especially on the north and west coasts;
- distress sale (at a discount of up to 25 percent) of fish at the end of the day owing to lack of overnight preservation and storage facilities;

- lack of working capital to purchase fish when competing with other buyers at fish landing centres;
- lack of access to credit from formal and informal sources.

Distant and export market fish supply chain

The distant market and export supply chain covers both fresh and live fish that are sent to Sibolga, Padang and Medan as immediate destinations, finally reaching Jakarta and other urban centres within Indonesia as well as Singapore, Malaysia and other countries. Thirty percent of total landings pass through this supply chain. In terms of revenues and profits, the study found that this is the most lucrative fish supply chain. However, the study also found that participation in this supply chain requires high capital investment and strong market linkages as well as a consistent and sufficiently large supply base, which is currently not available to most people.

The study suggests that, in the short term, there is potential for marginal increases in quantity and significant increases in value through better post-harvest systems. Sizeable increases in quantity of fish passing through this supply chain need large production increases. There is an increasing tendency among boat owners to target species in high demand for these more distant and export markets. Cage culture for grouper and other reef fish shows promise as a potential area for increasing exports from Nias, but the study observes that this will require time and further investments.

The study identifies a number of post-harvest and marketing problems in the distant (export) supply:

- an estimated 20 percent of spoilage and quality loss of fish occurs along the supply chain, both at sea and in transit to the export traders' sheds;
- many intermediaries in the supply chain reduce the producers' share in the final value of fish passing through this marketing channel;
- lack of capital for scaling up or for improvements;
- lack of access to market information for the traders;
- lack of adequate supplies of fish in terms of quality and quantity.

Processed fish supply chain

The study found that only 10 percent of all fish passed through this supply chain. The processed fish products included salted and dried fish, smoked fish and small quantities of boiled fish. Pulau Batu is the main area of production in Nias, but large quantities of dried fish are also imported from Sibolga and Padang.

The main post-harvest and market problems in the processed fish supply chain are:

- poor quality of products due to the use of semi-spoiled fish for processing;
- losses in production due to rain and insect infestation;
- usage of hazardous materials to reduce infestation posing potential health hazards;
- low efficiency of smoking techniques;
- low purchasing power of poor consumers resulting in a low market incentive for scaling up or improving quality.

Support systems for post-harvest and marketing

The study found that most fish is landed on the beaches. While new fish landing centres and two ice plants have been established, lack of proper management and maintenance have constrained their full operation and thus their usefulness. Consequently, there has been a lack of ice for preservation of catches. There has also been a lack of boat-building and repair facilities where more adequate boats with better hygienic and storage systems could be built.

Transport systems within the island are not adequately developed for rapid transport of fish from the landing centres to markets or exporters' sheds, leading to high costs as well as significant quality losses. Electricity remains a major problem on the island. The study further observed that, while Nias Island is well supplied with banks, the fisheries sector has not gained much access to institutional credit because fisheries is considered a "high risk, low return" investment, and past experience of fishers with bank financing has not been positive (and vice versa).

Key conclusions

The study arrives at the following key conclusions.

The fisheries sector including post-harvest and marketing in Nias is in need of a major overhaul. The process of reform will be a long and costly affair involving major investments in basic infrastructure, capacity development and technologies, not only in fisheries, but at the wider societal level. Given the nature of activities into which investments will need to be made, there may not be much private-sector contribution and investment to the reform process itself, although this could change as the basic conditions in the sector improve alongside opportunities for investments.

Suggested actions for fisheries development in Nias include interventions in a range of activities covering: socio-economic development; fisheries management; improving the technology of fishing and post-harvest, which are contingent upon a strong fisheries management system being in place; human resource development; community organization development; infrastructure development; development of access to credit and investment; and development of market access and information.

5.3 Fish marketing in Viet Nam

Background

Since the early 1980s, exports of fish from Viet Nam have increased significantly while the improvement of domestic marketing and utilization of fish has not received sufficient attention. It was estimated that one-third of total production (2 226 000 tonnes in 2001), both from capture fisheries and fish culture, was exported while two-thirds were consumed domestically. Improving supplies of better-quality and safe fish and fish products for urban and rural populations, to ensure food security, particularly for disadvantaged and vulnerable parts of the population, are important concerns that were addressed by studies carried out by FAO with financial support from Danida in the framework of the project Fish Marketing and Credit in Viet Nam (MTF/VIE/025/Misc).

Findings

Operators and marketing channels

The study found that most fish market operators were small-scale, basically organized at the family and household level. Fisherfolk, fish farmers, wholesalers, and retailers were the major operators in fish production and fish marketing in Viet Nam. Fish processors and exporters were more often organized as larger enterprises. Fisherfolk and fish farmers produced fish products for both domestic consumption and for export (FAO, 2004).

Fifty-seven percent of fisherfolk involved in inland capture fisheries sold their products to local wholesalers, a few sold to local retailers. However, almost half of the fisherfolk often acted as retailers, selling fish directly to final consumers in local markets. In the case of marine fisherfolk fishing both inshore and offshore, the study found that as many as 44 percent processed their fish before selling it. Eighty percent of the fisherfolk kept several species (grouper, swimming crab and lobster) alive to sell at much higher prices compared with the same species sold in the form of fresh fish.

The study distinguishes three separate marketing channels for capture fisheries products, aquaculture products and shrimps (FAO, 2004, pp. 63–66) and four main stages, i.e. the producer stage, the wholesaler stage including processing, the retailer stage, and the consumer stage including the export,

institutional and final household consumer markets. The study also found that fish marketing channels are more complicated in reality, as market operators may perform more than one marketing function.

Distribution of value along the horizontal marketing chain and competition

The distribution of sales value among the marketing agents operating at the same level in the marketing chain was measured by the Gini coefficient, which measures the share of an individual or a group of agents compared with the total sales value of the same level of marketing. The analysis showed a great variation in sales values across the country. The Gini coefficient reached about 0.8 (FAO, 2004, p. 81) for the group of processors and wholesalers. This indicated that these groups accounted for a very large proportion of sales value of the marketing segment horizontally. The concentration in total sales value usually leads to a concentration in market power, especially in shaping marketing channels and in terms of impact on the formation of market prices.

Market competition was measured by the number of marketing agents operating in the same category and by examining whether one business may affect the performance of others, regardless of spatial aspect. It was found that each marketing agent has about 10 competitors on average; however, the processors had more than 30 competitors. This may reflect fish exporters competing when expanding to foreign markets, especially in Asia. The study concluded that except for fish processors, the numbers of other marketing agents doing the same business does not indicate a highly competitive market. Another indicator of competitiveness examined by the study was the degree of competition in the market as perceived by the marketing agents. The findings confirmed the above figures. Most wholesalers and retailers perceived that the degree of competition in the market was at a medium level. The processors and the large consumers, however, saw higher degrees of competition in the market.

A study on value chains conducted in the Mekong Delta (Loc *et al.*, 2010) on the structure, function and wealth distribution within the high value *Pangasius hypophthalmus* chain, which is export-oriented, and the low-value *Henicorhynchus* spp./ *Labiobarbus* spp. chain, oriented towards the domestic market, investigated the form and function of these value chains, their contribution to the livelihoods of farmers and fishers, the effectiveness of government policy and the potential for value chain governance mechanisms. Regarding added value and profits, the study found that the average total net added value in the *Pangasius* chain was USD0.29/kg. The percentage net added values between actors in the export and domestic channels were found to be relatively similar. Traders contributed the lowest net added value at 17.5 percent. Producers and retailers/processors in both import and export channels had a similar contribution of net added value, i.e. 41.3 and 40.1 percent in the export channel and 46.9–53.1 percent in the domestic channel.

Overall, farmers' profit was similar in both chains at USD0.12/kg. However, the share of profit and income was found to differ greatly by size of farm. Small-scale fish farms with a pond area of less than 0.5 ha make up 89 percent of all farms, however they receive only 11 percent of the income and only 4.8 percent of the profit from the export value chains.

The study also found that actors in the high-value *Pangasius hypophthalmus* export chain have a higher potential income, but face considerably higher economic vulnerability from global markets. Low value chain *Henicorhynchus/Labiobarbus* spp. fishers are severely constrained in their ability to negotiate higher prices for their fish but appear to be less vulnerable to economic and environmental change. The authors conclude that, in order for value chain governance to improve the livelihoods of fishers and farmers in both high and low value chains, new arrangements are needed that better accommodate customary institutions and informal market relations.

Constraints

As far as the perceptions of fisherfolk and other operators of difficulties in marketing their fish are concerned, the study found that half of the fisherfolk interviewed in the north of the country did not perceive any difficulties. Others mentioned low prices and fluctuation of prices, more so in central and in southern Viet Nam, where lack of market information was seen as another major problem. The lack

of fish product collection services was mentioned in central and southern Viet Nam, whereas poor infrastructure was mentioned in central and northern Viet Nam.

Selling and purchasing prices combined with strong competition, capital shortage and poor infrastructure are the concerns most frequently mentioned by wholesalers as well as by processors, who also pointed to unstable raw material supply and lack of output markets. Prices and competition were negatively perceived factors by retailers, together with shortage of capital, too many taxes and poor infrastructure.

Opportunities

The study also investigated the perceptions of operators related to opportunities to improve their marketing and processing activities and to make them more profitable. Fisherfolk and fish farmers mentioned most frequently better price and market information. Other improvements are expected from the establishment of fish collection services and fish wholesale markets as well as selling under contracts.

Wholesalers indicated that they hoped for more stable supplies to improve business and, to a lesser extent, that better market information would help improve business. Improvements in market infrastructure and facilities, i.e. wholesale markets and transport, were also mentioned by many. Stability of product markets and of raw material supplies were the main expectations of fish processors for improving their business. About half of them also mentioned market information as an expected improvement, as well as having sufficient capital.

More than two-thirds of fish retailers identified stable supplies as the main opportunity for improving their business; more than half referred to market information, and almost half said they expected product safety to improve. About one-fifth of the respondents expressed the expectation that fishery product information might become available, which would support product traceability. The establishment of more fish wholesale markets and better transport were also mentioned by 20 percent of the retailers interviewed. Product safety was a main concern for institutional buyers, as were stable supplies.

Conclusions

These findings of the FAO supported study (FAO, 2004) suggest that domestic consumption of fish in Viet Nam is probably higher than previously assumed. Given the projected strong economic growth for the coming years, it must be expected that local consumer demand will continue to expand. At the same time, the export-oriented fish processing industry will result in increased demand for raw materials.

This substantial future demand for safe and high-quality fish products can only be met if efficient marketing arrangements are in place. The findings of the studies identify a number of constraints in the present domestic fish marketing channels, which form the basis of recommendations for the improvement of the present marketing arrangements. These include the establishment of fish wholesale markets in large urban areas, establishment of well-functioning assembly markets at important fish landing sites, improvement of the legal/regulatory framework for the operations of fish wholesalers, establishment of fish market price information systems, promotion of contract farming/trading systems among fish market operators certified by local authorities, improvement of fisheries statistics systems for better fish market planning, the promotion of a domestic fish market strategy complementing the export-oriented development strategy, and the development of a coordination mechanism for the public sector for fish marketing and fish market management. Perhaps, social media and information and communications technology tools can effectively facilitate sharing of market information and linking suppliers with distributors, processors and exporters and traders

5.4 Value chains⁶ for sea cucumbers in the Philippines

Background

Brown *et al.* (2010) carried out a value chain analysis of the distribution/marketing chain for sea cucumbers in the Philippines. The study, conducted on behalf of the WorldFish Center, aimed to contribute to the objectives of the project (funded by the Australian Centre for International Agricultural Research [ACIAR] and the Consultative Group on International Agricultural Research [CGIAR]) on developing sea ranching and pond culture of sandfish as alternative livelihoods for marginalized people in coastal communities in the Philippines.

Value chain analysis is defined as a sequence of related enterprises, in this case, operators in a distribution or marketing chain that carry out functions to add value to a product, from primary production, processing and marketing up to the final sale to the consumer of the product. Similar to conventional marketing and distribution chain analysis, which also takes into account margins and added values throughout the distribution, processing and marketing process, value chain analysis aims to identify constraints to industry growth and competitiveness that include both product and factor markets and other market-related issues. Value added is defined as the amount of wealth created by an operator in the value chain and is equal to net sales minus the costs of bought-in goods and services.

The geographic coverage of the value chain study included Pangasinan, Palawan and Davao, as supply sources, and Metro Manila, as the main trading destination. In Palawan, gathering of sea cucumbers, particularly during spring tide, is an activity carried out by groups of women. The Philippines is a major player in the global trade in sea cucumbers. According to the authors, exports of sea cucumbers from the Philippines amounted to 1 155 tonnes in 2007, valued at USD6 million and accounted for 10 percent of the global trade value in 2007 (Brown *et al.*, 2010, p. 7). Major export destinations are China, Japan, the Republic of Korea, and Singapore.

Since 2007, catches in the Philippines and elsewhere have dramatically declined. A particularly overfished species of sea cucumber is the sandfish (*Holothuria scabra*), which is easily harvested from inshore waters. In response to this situation, ACIAR implemented projects to grow sandfish in hatcheries and release them in the wild. One objective of the projects, which have also been implemented in Viet Nam and Australia, is to test a new livelihoods option for coastal populations by releasing the sandfish into well-managed inshore habitats and allowing their capture after three years.

Primary processing of sea cucumbers involves gutting, brushing, boiling, smoking and sun drying. The aim is to achieve low moisture content and to ensure that the dried skin does not separate from the flesh of the sea cucumber. Key operators in the production and marketing chain are divers/collectors, local assemblers/processors, local traders, buying stations and exporters in Metro Manila and other key cities, and importers, processors and distributors in importing countries.

Findings and conclusions

The study concludes that despite high market premiums for species, size and quality, the sea cucumber industry in the Philippines operates in the absence of officially formulated grades and standards that could guide the transactions along the value chain. Government efforts to improve primary processing of sea cucumbers are recent and limited. The study also observed that despite its reputation as a high-value export industry, the sea cucumber industry is actually merely an incidental catch-based industry. In general, divers find and collect sea cucumbers in the course of fishing activities. This finding suggests that marginal returns from fishing are still higher than plain collection of sea cucumbers. Moreover, sea cucumber collection is only a seasonal occupation. The study concludes that this has implications for sea ranching of sea cucumbers as fishers might want to go fishing rather than

⁶ The concept of value chain originates from business management. A value chain is understood as a chain of activities that a firm operating in a specific industry performs in order to deliver a valuable product or service for the market. Although commonly associated with export-oriented trade, value chain analysis has more recently been employed in the development sector as a means of identifying poverty reduction strategies by upgrading along the value chain (Russel and Hanoomanjee, 2012).

spending their time guarding sea ranches unless alternative livelihoods or income sources can be provided for them.

As far as the distribution of value along the value chain is concerned, the study found that there are many upstream operators and only a few downstream operators such as buying stations and exporters. This suggests that control of the industry is in a few hands that assimilate much of the value generated by the industry. Similarly, information asymmetry is common along the value chain as far as information on prices, costs, demand and margins are concerned.

The study also found that the marketing chain for sea cucumbers is multilayered. There are many instances where the product moves through two or three additional layers involving local traders and commission agents, which are redundant and contribute to marketing inefficiency rather than adding real value to the product. The lack of regulations regarding minimum sizes as well as the open-access nature of the fishery is seen by the study as an indication that the sea cucumber industry is doomed to fail.

Nevertheless, the study suggests several key measures to upgrade the sea cucumber value chain. These include upgrading primary processing as well as the formulation of grades and standards to guide transactions along the value chain. The study also recommends function upgrading by removing local traders and agents, who thrive because of information asymmetry and lack of transparent pricing, demand and market information along the value chain. Other measures suggested by the study are product upgrading and development, regulating catch sizes and introduction of sea cucumber farming.

5.5 Fish traders in artisanal fisheries on the Kenyan coast

Background

Marine fisheries are one of the few economic activities present everywhere along the Kenyan coastline. The local population is involved mainly in artisanal fishing, which uses small non-motorized craft that stay close to shore. Some of the catch is destined for consumption by fishers and their families and friends, and the rest is sold. Degen, Hoorweg and Wangila (2010) examined whether fish traders in artisanal fisheries along the Kenyan coast earned enough money to support a household from fish trading only. Fish traders were surveyed at two landing sites at each of five coastal tracts. Structured questionnaires, informal interviews and participatory observations were used in collecting data.

Findings and conclusions

The study found that the average income of households of fish traders from only fish trading was KES1 268 per week. At this income level, only 20.3 percent of the households surveyed would have been at or above the poverty line. There was a large difference between the income earned by male and female traders. Men earned KES1 693 per week, while women only earned KES795 per week. Similarly, 30.8 percent of male trader's households, only counting the income from fish trading, would have lived above the poverty line compared with only 8.8 percent of the female trader's households.

However, when earnings other than income from fish trading, earned by the fish trader or combined with someone else in the household, were added to the income earned by fish trading, 27.4 percent of all households lived above the poverty line. In the case of male traders, 54 percent of the households lived above the poverty line. In the case of female traders, this percentage was only 15 percent. The study concluded that livelihoods diversification could greatly help to improve the income of households involved in artisanal fish trading on Kenya's coast.

The gender differences regarding income from fish trading are to be seen against the background that male traders were from mixed ethnic backgrounds and that many bought fish at more than one landing site from an average of 11 fishers. Male traders also bought all types of fishes as well as large quantities and sometimes offered incentives to fishers. They sold in various places including nearby villages and urban centres, and they transported the produce by mechanized vehicle. Half of the men

were small-scale traders, more than one-third operated as intermediaries, and 10 percent were large-scale traders. Women operated almost exclusively as small-scale traders or fishmongers, who bought and processed mostly small fish and sold locally. They were typically of Mijikenda origin and had not been in the trade for very long. They frequented only one landing site and dealt with a few fishers that supplied them. Women typically bought smaller quantities of fish than men and did not offer incentives to fishers except for, occasionally, food. Almost all women traders fried the fish they purchased and did not use any other means of preservation or storage. They sold their fish only in locations that could be reached on foot.

These gender differences point to the need for projects and activities that intervene in fish trading and value chains to integrate a gender dimension for better equity and improved livelihoods for both men and women.

5.6 Regional fish trade in Africa

Background

Lake Victoria and the other major lakes in the region are important sources of supplies of fish for the entire region and for other destinations in the world. The artisanal fisheries sector is the main supplier of fish. Current landings from Lake Victoria amount to about 1 million tonnes, while other major lakes contribute from 100 000 to 200 000 tonnes annually. In recent years, Lake Victoria has faced serious problems of overfishing, characterized by landings of undersized fish, especially Nile perch. This has affected the stocks, and unless successfully addressed, the problem will endanger the entire fishery and thereby the livelihoods of thousands of people around the lake. Hempel and Karluki (2011) reviewed the trends in regional fish trade in the Democratic Republic of the Congo, Kenya, Rwanda, the Sudan, and Uganda.

Findings and conclusions

The authors found that, while initiatives have been taken to eliminate the use of undersized fish in the modern processing (filleting) industry on Lake Victoria, there is still a lot of trade in illegally caught fish from Lake Victoria as well as the other lakes in the region. The fish traded in the riparian countries of Lake Victoria is typically fish that is rejected by the export processing industry. This fish is then dried and/or smoked by small-scale processors. It is then handled by traders, who often combine many small consignments, which are then transported on trucks mainly to the Democratic Republic of the Congo, where prices are higher and profits are more attractive.

The study found there is little reliable information about this informal trade today. However, according to surveys of the informal cross-border trade undertaken by Rwanda and Uganda at irregular intervals, there are indications that the volume traded informally (and presumably also illegally) may amount to USD120 million per year or more.

The authors tried to follow the fish products along the value chain, i.e. from the fishers via landing sites to processors, traders, transporters and importers. They found, however, that once the fish enters the Democratic Republic of the Congo, there was very little chance of following it further as security and other conditions in the country were very difficult at the time of the study. Consequently, their study focused on the stages before the fish enters the Democratic Republic of the Congo. Towards the end of the study, a workshop for various stakeholders from the countries involved was conducted in Entebbe, Uganda. The purpose was to provide information on the situation, to provide a platform for exchange of ideas and opinions on what needs to be done, and, finally, to develop an action plan with the purpose of gaining control over regional fish trade.

The action plan developed during the workshop focused on those sections of the value chain that consisted of the fewest players, so that it would require fewer resources to monitor and control these players. This could mean that sections of value chains in which artisanal fishers, fish traders and fish processors are involved are probably neglected by the action plan even though they might eventually benefit, both directly and indirectly, from the implementation of the action plan. The authors observe

that in the processing sector, which consists of 35 companies, this has already been done by the processors associations through their own initiatives and through legal support by fisheries-competent authorities in the region. In the fish trade, it was suggested that the larger traders should be monitored, i.e. those operating trucks carrying 10 tonnes or more. According to information obtained during the field visits, these traders numbered only a handful at each major border point.

The study also looked at the instruments of monitoring and inspection as well as law enforcement. These vary from country to country, but in general the instruments available and the resources at the disposal of these institutions/agencies were found to be inadequate. Lack of government funding is a major problem, but there are also a number of issues that may be solved through regional cooperation and the existence of the proper regional institutions, such as the Lake Victoria Fisheries Organization (LVFO).

The action plan identifies the most important common challenges as:

- lack of information and lack of exchange of information;
- lack of harmonization of laws, regulations and management procedures in the various countries;
- inadequate laws and weak law enforcement;
- lack of coordinated inspection and enforcement, both within individual countries and between countries;
- porous borders and weak monitoring, control and surveillance (MCS) of trade.

A number of activities were identified to address these challenges:

- information collection, handling and dissemination;
- harmonization of laws, regulations, management procedures and MCS procedures;
- formalizing trade by registration of traders and transporters and registration of all transborder shipments, whether or not subject to duties and fees;
- securing adequate resources for inspection, control and law enforcement;
- building or mandating a regional institutional framework that can take on the task of implementing these interventions on a permanent basis;
- planning and preparation for the implementation of the action plan.

5.7 Value chains of coral reef fish in Zanzibar, the United Republic of Tanzania

Background

Thyresson (2013) examined the reef-associated fish value chain in Zanzibar, the United Republic of Tanzania, with the intention to identify socio-economic drivers behind fishing that uphold key ecosystem processes and the scales at which they operate. Value chains were identified with links to functional groups (families) of fish and maturity stages of fish within these groups. The authors consider their study and its findings critical for the successful management of coral reef ecosystems. The study methodology consisted of semi-structured interviews with 188 respondents (fishers, traders and hotel staff) involved in the fisheries and trade with reef-associated fish in Zanzibar and participatory observations.

Findings and conclusions

The study shows that the trade in reef fish in Zanzibar is a complex involving many different agents. The study further finds that these different agents show different preferences regarding fish functional groups and/or maturity stages within these groups. Consequently, both high and low trophic species as well as small and large fishes are fished and sold, which leaves no refuge for the fish assemblage from fishing.

As far as marketing chains are concerned, piscivores, such as grouper, trevally, kingfish and mackerel, are generally more frequently sold to town markets and hotels compared with lower trophic-level fish, which are more often sold to local consumers and small-scale traders. Prices for fish differ depending on which category of intermediary it is sold to or bought from. Prices for piscivores are consistently higher than prices for the lower trophic-level fish. Prices are lowest when traded to local consumers and significantly higher when traded to agents further up the value chain.

The authors concluded that when market agents other than fishers have high influence within the market chain and the fishers have few alternative income-generating activities, all of the burden related to austerity and compliance should not be placed on the fishers alone. Management measures that extend upwards in the value chain to include all market agents, as well as their links to ecosystem processes, are thus likely to be needed in order to reach the target of sustainable fisheries.

5.8 Value chain of Kenyan Nile perch

Background

Lake Victoria is the world's second-largest freshwater body by surface area and home to one of the most dramatic speciation of indigenous cichlids in the world (Johnson, 2010). Bordered by Kenya, the United Republic of Tanzania, and Uganda in East Africa, the Lake Victoria Basin provides food, water and livelihoods for more than 30 million people around its shores, with 10 million engaged in the fisheries sector. The author observes that the colonial-era introduction of the invasive Nile perch (*Lates niloticus*) in the 1950s, combined with the introduction of industrialized fish processing in the 1980s, transformed fishing throughout the basin. The introduction and commercial harvesting of the Nile perch, subsequent human population growth, and the looming problems of climate change continue to compromise the health of this important fishery.

Findings

Johnson (2010) applied a global commodity chain framework with an ethnographic approach to the case of the export-oriented Nile perch from the Kenyan island of Mfangano in July 2007. The author found that, in 2007, prices paid to local Kenyan fishers, boat owners, and agents represented about one-quarter of the total value from the fishery. Boat owners received the largest share, i.e. 14 percent. Agents received 4 percent while fishers received 3 percent. Three-quarters of the total value accrued to Nile perch processors (36 percent) and international seafood wholesalers and retailers (39 percent).

5.9 Summary

Table 2 summarizes the benefits from SSF utilization and marketing.

Table 2

Benefits from small-scale fishery utilization and marketing

Subsector / study area	Findings
<ul style="list-style-type: none"> Regional studies from Asia, Africa and Latin America by INFOFISH, INFOPECHE, INFOSA and INFOPESCA on present and future markets for fish and fish products from SSFs. Studies on marketing and value chains of various countries carried out at the national level in Indonesia, Kenya, the Philippines, the United Republic of Tanzania, and Viet Nam. 	<ul style="list-style-type: none"> Products from SSFs are largely focused on the domestic market although they also play an important role in regional intercountry trade in some African countries. Processing and trade of products from SSFs are important because they provide income and employment for many women and men in fishing and fish farming communities. Trade is important in that it supplies nutritious fish and fishery to domestic and regional populations and the fishers themselves. Women are actively involved in fish processing and marketing and also participate in capture fisheries in coastal areas and estuaries as well as in other forms of harvesting of aquatic organisms. Others are employed in the fish

Subsector / study area	Findings
	<p>processing industry.</p> <ul style="list-style-type: none"> • There are several avenues for better integration of SSFs into regional and international fish trade: product diversification, value addition, improvement of product quality and access to new markets. • A number of constraints need to be overcome such as post-harvest losses due to poor infrastructure and lack of storage and transportation facilities, and lack of knowledge of proper fish handling methods. • Small-scale fisheries are also excluded from international markets because of the costs and difficulties encountered when trying to comply with international standards and those imposed by supermarket chains and other customers. • Efforts should be aimed at improving facilities for preserving fish onboard, at the establishment of hygienic fish landing sites, increasing storage facilities and the supply of ice as well as improving roads, which connect fishing communities to markets. • There is a need to improve technical support and extension services to enable fishing communities to access appropriate technologies and information and training. • There is a need for quality improvement, proper fish handling procedures and storage, product diversification, value addition, packaging, shortening the fish supply chain and increasing small-scale actors' bargaining and lobbying power. • The formation of marketing cooperatives should be encouraged and existing associations of small-scale fishers and processors should be strengthened by providing support for institution building. • Gender differences point to the need for projects and activities that intervene in fish trading and value chains to integrate a gender dimension for better equity and improved livelihoods for both men and women. • In East Africa, there is considerable lack of transparency and information necessary for better management of intercountry trade. • Regarding value chains for sea cucumbers in the Philippines, there are many upstream operators and only a few downstream operators such as buying stations and exporters. This suggests that control of the industry is in a few hands, which assimilate much of the value generated by the industry. Similarly, information asymmetry is common along the value chain as far as information on prices, costs, demand and margins are concerned. • Key measures to upgrade the sea cucumber value chain include process upgrading, particularly in the field of primary processing; the formulation of grades and standards to guide transactions along the value chain as well as function upgrading by removing local traders and agents who thrive because of information asymmetry and lack of transparent price, demand and market information along the value chain.

6. ACCESS OF FISHING COMMUNITIES TO CREDIT, MICROFINANCE, INSURANCE, WELFARE, TECHNOLOGY AND INFRASTRUCTURE

This chapter reviews the access of fishing communities and fishery enterprises to credit and microfinance facilities and services. The chapter also provides an overview of access of fishing communities and fishery enterprises to accident and life insurance programmes and other risk mitigation and social protection schemes including those which protect and provide support in the event of natural disasters and unemployment.

The chapter further reviews the access of fishing communities and fishery enterprises to both community and fisheries infrastructure and technology such as drinking-water, sanitation, electricity, transport, health and educational facilities, landing sites, boat building/repair facilities, fish storage/marketing/processing/transportation facilities, vocational training facilities and other infrastructure and facilities. Based on the overviews provided in this chapter, needs and opportunities are identified for strengthening and improving fisheries and community infrastructure as well as access to technology, capital, financial services and risk mitigation and insurance programmes.

6.1 Credit and microfinance

Past and present work of FAO and others to facilitate the access of small-scale fisheries to credit and microfinance

The lack of access of SSFs to formal credit facilities and financial services was globally acknowledged by the FAO World Conference for Fisheries Management and Development, held in 1984 (FAO, 1984). The Strategy for Fisheries Management and Development adopted by the conference stated in paragraph xii of Chapter IV: “Attention should be given to making available credit facilities to small-scale fishermen on terms and conditions in keeping with their general weak economic position.”

In addition to rural credit, microfinance has been recognized during the last three decades by FAO and others as a tool for poverty reduction. Microfinance was officially recognized by the United Nations in its General Assembly Resolution 52/194, passed on 18 December 1997, which acknowledged the important contribution of microfinance to poverty eradication, empowerment of women and social elevation. These commitments were reiterated by the World Summit on Sustainable Development, held in Rome in June 2002, which called for stepped-up investments in fisheries and increased productivity and access to productive resources.

Following the 1984 World Conference (above), FAO increased its involvement in credit initiatives for SSFs, consistent with its mandate of raising living standards and improving the conditions of rural populations. Based on FAO’s experiences gained through FAO field projects⁷ and through the cooperation with national financial institutions and their regional associations such as the Asia and Pacific Rural and Agricultural Credit Association (APRACA), and NGOs, guidelines were prepared and widely distributed on the management of revolving funds and credit programmes for fishing communities (FAO, 1992), for microfinance in fisheries and aquaculture⁸ (FAO, 2003b) and for credit and microfinance needs in inland capture fisheries development and conservation in Asia (FAO, 2007c).

⁷ The FAO Bay of Bengal Programme for the Development of Small-scale Fisheries demonstrated how non-subsidized and non-collateralized fisheries credit can be successfully provided by national financial institutions, used and repaid for/by impoverished artisanal fishing communities living along the coastline of the Indian State of Orissa. Key to success were appropriate lending policies and procedures for loan applications, technical/financial appraisal, disbursement and loan supervision as well as training and cooperation with a well-functioning marine fisheries extension service (Tietze, 1987).

⁸ These guidelines contain case studies from the Philippines and Viet Nam that show the workings and results of projects implemented with technical support from FAO. The case studies demonstrate how microfinance can be successfully provided to groups of women in small-scale fishing communities in support of aquaculture and various other income-generating activities.

The 2008 Global Conference on Small-scale Fisheries recognized that fishers organizations such as cooperatives could improve the resilience and stability of fishing communities (FAO, 2009). Cooperatives can: (i) increase fishers' price-negotiating power with market intermediaries, help stabilize markets, improve post-harvest practices and facilities, provide marketing logistics and information, and facilitate investment in shared structures such as ice plants and fish processing facilities; (ii) increase market competition by setting up auctioning systems; (iii) use their greater negotiating power to make cost-saving bulk purchases of fishing gear, engines, equipment and fuel, and to advocate with government; and (iv) facilitate microcredit schemes for fishers, to reduce their dependence on intermediaries and give them greater freedom in selecting buyers.

Credit needs

As any other small-scale economic sector, small-scale fishers have a need for credit, microfinance, savings and money transfer facilities and services to meet their production, post-harvest and domestic household needs in order to reach their full potential in terms of economic and social performance. Small-scale fishers need loans for acquisition, repair and operation of fishing vessels and gear and equipment for fish handling, processing and marketing. However, governments also need credit facilities for larger sectoral capital investments for construction of marketing facilities, for the protection and restoration of marine and inland aquatic habitats and ecosystems, and for improvement of schools and education, housing, road networks and public health among others.

These are particularly true in countries where poverty is widespread and the capacity to generate capital through savings from productive activities hardly exists or is very limited. Similarly, savings and money transfer facilities are needed, so that earnings accumulated during peak fishing seasons can be saved and used for consumption or other purposes during lean seasons. Moreover, through the provision of savings facilities, members of small-scale fishing communities can acquire savings and financial planning and management skills and habits, with benefits in the development of other economic activities and microenterprises.

Access of small-scale fisheries to institutional credit

Global findings

FAO organized a number of regional and national workshops in Asia and the Pacific, Eastern and Southern Africa, Central Africa and for Small Island Developing States to review and facilitate the access of SSFs to institutional credit and to microfinance. A complete list of references is provided by FAO (2003b, p. 1, footnote 1). The reviews found that the access of small-scale fishers in most countries to banks and other formal financial intermediaries has been very limited. In the past, institutional rural credit through banks, cooperatives and fisheries administrations was only available to a minority of small-scale fisherfolk in Asia and the Pacific, Africa and Latin America and the Caribbean. Despite ongoing financial and rural financial sector reforms in many developing countries, the situation has not changed much, with the notable exception of microfinance services and the involvement of NGOs.

The vast majority of fisherfolk still depend on informal sources of credit such as fish merchants, boat owners, professional money lenders, intermediaries, relatives and friends, whose ability to provide medium- and long-term credit for capital investments is limited. Other disadvantages of some of these informal intermediaries (e.g. moneylenders) are the high costs and unfavourable terms attached to credit, which in many cases result in borrowers' long-term indebtedness.

In some regions, particularly in West Africa, fisherfolk participate in localized traditional credit and savings groups. However, their role is mainly limited to the financing of working capital requirements and meeting domestic and consumption needs. Moreover, there are few links between these types of groups and the formal financial sector, a fact that has contributed to the segmentation of rural financial markets.

In many cases, where banks and other sources of institutional finance have entered the scene, the results have rarely been encouraging. Credit programmes, often subsidized, have been poorly designed

and in many cases have not reached their target group as they have been collateral oriented and therefore only reached more affluent groups, rather than those actually in need of credit and with the capacity to use loans for intended purposes. Consequently, loan recovery has been poor and often discouraged by local politicians, who have advertised credit programmes as welfare for which they are to be rewarded by the loan recipients during the following election cycle.

Although there have been notable exceptions, many credit programmes have been characterized by long-winded procedures for loan application, appraisal and disbursement. Appropriate procedures for financial and technical appraisal of loan applications have been lacking or not adhered to. Credit programmes for SSFs have often designed to meet the disbursement targets of financial institutions rather than credit needs and absorption capacity of borrowers. As a result, many financial institutions have withdrawn from the scene not long after entering it.

In addition to rural credit, microfinance programmes have become accessible to some extent for small-scale fishing communities, both implemented through NGOs and financial institutions and through cooperation of both. Microfinance can involve group formation and the adoption of group lending procedures. Capacity strengthening, training and networking plays an important role. Experiences with microfinance programmes in Asia are described by FAO (2003b, pp. 23–90), including two case studies of successful microfinance programmes in support of fish farming and income-generating activities for women in fishing communities in Viet Nam and the Philippines.

While microfinance programmes have been generally more successful than traditional rural credit programmes in terms of generating economic and social benefits and loan repayment, they also have their limitations. Microfinance is generally defined as provision of a range of financial services such as deposits, loans, payment services, money transfers and insurance. Loan amounts are usually small and lending periods are short term with very high interest rates. While microcredit can be an important tool for fighting poverty and vulnerability in fishing communities by providing loans for microcapital investment (such as small pieces of equipment, working capital, repairs and maintenance of equipment working capital and domestic needs), it is quite limited in meeting other important credit needs of SSFs.

Credit systems, other than microfinance, with sufficient funding are extremely important for capital investments for the protection and restoration of marine habitats and ecosystems, infrastructure development such as hygienic ports, acquisition of appropriate fishing vessels and fishing gear to divert fishing effort from overfished inshore resources to less-fished offshore resources, where they exist, and for value addition through improved fish handling, processing and marketing facilities, etc.

Vipinkumar *et al.* (2013) assessed the extent of indebtedness among marine fisherfolk in mechanized, motorized and traditional fisheries sectors and the impact of microfinance institutions (MFIs) and associated self-help groups (SHGs) on coastal indebtedness in Tamil Nadu, India. The study showed that the level of indebtedness of members of MFIs was clearly lower than the level of indebtedness of fisherfolk who were not members of MFIs and associated SHGs. The level of loan/debt repayment was also found to be significantly higher in the case of MFI/SHG members than in the case of non-members. The authors further compared the perceptions of fishers of different sources of loans. They found that stakeholders ranked MFIs higher than banks and informal credit sources for most of the attributes of lending. The authors concluded that there was a strong need to strengthen and expand the operation of MFIs in coastal areas.

A national workshop on best practices in microfinance programmes for women in coastal fishing communities in India, jointly organized by FAO and the National Bank for Agriculture and Rural Development (NABARD) in Panaji, Goa, India, from 1 to 4 July 2003 (FAO, 2003c), acknowledged past achievements of microfinance programmes for women in coastal regions of India but also noted their limitations and shortcomings. The workshop focused on strengthening credit delivery mechanisms by following an integrated or “credit plus” approach, which was thought more responsive to the needs of women than just making credit available. This approach should include innovative

financial instruments such as specialized mixed loan products with insurance and risk management instruments.

Financial intermediaries such as NGOs and federations should establish their own risk funds with matching grant contributions from government or MFIs (FAO, 2003c, p. 23). The approach also included capacity building for those involved in microfinance operations and their clients, including leadership development, financial and business management skills, entrepreneurship and vocational training, marketing support and other aspects. Comparative studies of different group lending models were suggested in the context of empowerment of women, as well as the collection and maintenance of gender-based data and statistics related to lending operations as well as other financial statistics.

Small- and medium-scale fishery and aquaculture enterprises

A recent study (Kleih *et al.*, 2013) on financial services for small and medium-scale enterprises (SMEs) in aquaculture and fisheries in six developing countries in Africa and Asia, i.e. Egypt, Ghana, Maldives, South Africa, the United Republic of Tanzania, and Viet Nam, analysed the economics of such SMEs, in particular their capital investment and operating costs, and examined the demand and supply of financial services.

Given the limitation of fishery resources available to capture fisheries, the study notes that in future, aquaculture, including mariculture, will have to play an increasing role in fish supply. In order to achieve sustainable growth in aquaculture businesses in sub-Saharan Africa, various technical and financial constraints need to be overcome. The study observes that traditional financial instruments seem to be unable to meet the financial needs of SMEs in the aquaculture and fisheries sector and recommends developing innovative financial models for SMEs to fill the gap between traditional banking and grant-based donor finance. The study suggests that a key characteristic of such innovative models should be a combination of investment funds with business development funds in order to ensure the economic growth of SMEs as well as the likelihood of prompt loan repayment.

While this idea might be appropriate for medium-scale businesses, it might not be appropriate for SSF enterprises operated by members of artisanal fishing communities because of the limited scale of operation, volume of financial requirements and often remote location, all of which might not be attractive for business development and investment funds. Moreover, developing micro or small-scale enterprises in fishing communities is a complex process that requires, among other things, capacity development of fisherfolk associations and cooperatives, preparation of feasibility studies and business plans, technical skill development, sound financial management practices, development of innovative and high-quality products and access to new markets including regional markets, as concluded by FAO-supported microenterprise development projects on Panay Island in the Philippines (FAO, 2007a).

Fish marketing

A study carried out by FAO (2004) on fish marketing and credit in Viet Nam found that credit is widely used for financing marine capture fisheries, particularly offshore fishing and export-oriented fish culture, processing and marketing. State-owned financial institutions play a major role in financing capital expenditure while working capital requirements are mainly met by informal sources of credit. The study also found that future investment needs are greater than current financing availability. The study recommended that future credit should focus on marketing and making the fleet more efficient rather than on expanding fishing effort.

Other projects and studies in Viet Nam found that institutional credit for small-scale fisheries and aquaculture is very limited. Projects implemented in cooperation with Viet Nam women's unions demonstrated how microfinance in support of small-scale fish farming can be effectively delivered (FAO, 2003b, pp. 77–103). As far as the domestic fish marketing sector is concerned, however, wholesalers and retailers have only limited access to institutional credit. This is perceived as an impediment to the future growth and improvement of the sector.

Credit and microfinance for inland capture fisheries

Experiences with microfinance and credit programmes in inland capture fisheries in Cambodia, China, India, Malaysia and Myanmar are described in FAO (2007c) together with the proceedings of two regional workshops organized in 2004 and 2006 in Kuala Lumpur and Beijing, respectively, to identify credit and microfinance needs for the sustainable use of inland fishery resources and poverty alleviation.

The Kuala Lumpur workshop identified the main threats to sustainable inland capture fisheries as: reduction and pollution of waterbodies and modification of fish and aquatic organism habitat; deforestation; overfishing and destructive fishing practices; local conflict in management and waterbodies; and utilization of migratory fish stocks. Other important threats identified by the workshop included the lack of capital needed for developing and rehabilitating inland fisheries, and related to this, the lack of awareness of financial institutions about the investment and credit needs of inland fisheries.

Other constraints to a proper and sustainable utilization of inland waters include: short-term leasing policies of open waterbodies; inadequate conservation measures; inadequate and/or malfunctioning infrastructure for fish hatching and nursing; inadequate infrastructure for post-harvest handling and marketing; inadequate data on current and potential levels of fishing of waterbodies; inadequate financial assistance, investment support and credit supply to inland fisheries; and exploitation of fishers and primary producers by traders.

This workshop also identified measures that could be taken to overcome the constraints and move towards a sustainable use and rehabilitation of inland fishery resources. These include, among others: improving habitats in rivers, floodplains and other inland waters; facilitating fish migration through retrofitting dams with fish passes and by constructing appropriate fish passage facilities when new dams are built; conserving wetlands; training and socially mobilizing fishers and their associations; upgrading skills of extension workers; improving infrastructure for hatchery and nursery units, landing centres, transportation, marketing, cold storages and ice plants; and setting up effective microfinance programmes.

Further measures include: creating civil society organizations such as SHGs and their federations to reduce the negative influence of traders and intermediaries and to increase active participation of inland fishers in the use and management of inland fishery resources; introducing insurance facilities for fisheries assets and life insurance facilities for fishers; improving access to investment credit and working capital credit facilities; and introducing long-term leasing policies for publicly owned open waterbodies to encourage investment and sustainable development inputs and efforts.

Considering the wide variety of financing needs identified by the Kuala Lumpur workshop, the Beijing workshop highlighted that microfinance alone would not solve the problem of poverty in fishing communities. Microfinance benefits the poor by increasing income-earning opportunities, securing livelihoods, decreasing vulnerability, and empowering beneficiaries, especially women. The workshop observed that, to date, microfinance for inland fisheries has been primarily directed towards aquaculture activities. Inland capture fisheries as well as processing and marketing of inland fisheries products have received little attention from microfinance schemes in the Asia-Pacific region.

Financial institutions were recommended to: establish a monitoring system for microfinance and credit disbursements that distinguishes between inland capture and aquaculture or other subsectors, in order to reach out to inland fishing communities and facilitate poor fishers' access to microfinance and insurance services; implement the FAO guidelines for meeting credit and microfinance needs in inland capture fisheries development and conservation in Asia adopted by the workshop; and provide services that are tailored to the needs of poor inland fishers.

The Beijing workshop further recommended that international/regional organizations, donor agencies and NGOs, among other things, should: encourage financial institutions to make available loans to fishing communities and their associations for rehabilitation of fish habitats and fish stock

enhancement; encourage and assist national governments to establish river basin commissions to ensure that institutional arrangements in all areas of the river under different administrative jurisdictions are consistent and non-conflicting; and provide guarantee funds in support of the implementation of inland fisheries management measures.

6.2 Insurance and welfare

FAO conducted a global review of the current state of world capture fisheries insurance, which also covered social protection schemes in some developing countries (Van Anrooy *et al.*, 2009). The review includes specific reviews of capture fisheries insurance in China, Japan, India, Europe, Africa, Oceania, the United States of America, and the Russian Federation.

With regard to SSFs in developing countries, the review notes that large composite international insurers' interest in small-scale producers is generally low because of:

- the high costs involved in serving often remote fishing villages;
- the difficulty of dealing with a fishing population, which frequently also has no access to other financial services (e.g. bank accounts, credit, or microfinance);
- the small premium fees that would be collected from individual fisherfolk;
- the related high administration and monitoring costs;
- the generally low level of education and widespread illiteracy.

The review notes that, altogether, these characteristics of the SSFs sector do not make it an attractive subsector to international or national insurers. Moreover, the demand expressed by the individual small-scale operators for insurance services is often limited. Also, small-scale operators are either not aware of the existence of insurance services, do not see the need for insurance (or only for life and health insurance), or have such low incomes that purchasing insurance is not a priority for them.

However, in countries where small-scale fisherfolk have a high level of organization (e.g. in associations, cooperatives or self-help groups), the demand for fishing-related insurance services is generally higher. In India and China, as well as in Chile, there is evidence of considerable demand for insurance among the organized small-scale producers and there are a number of insurance services that are being provided.

China

The country report on China notes that, having learned from the experiences of the Republic of Korea and Japan, the Ministry of Agriculture of China expedited the establishment of the China Fishery Shipowners Mutual Insurance Association (CFSMIA), a cooperative society, on 6 July 1994 to branch out into non-profit mutual insurance activities (Van Anrooy *et al.*, 2009, p. 32). After a decade of development, the CFSMIA can be considered the main supplier for the capture fisheries insurance market in China, especially for SSFs. It has about 50 000 members. The insurance covers loss and damage of fishing vessels and gear. Other insurance companies in China also insure fisherfolk against injuries and death.

The headquarters of the CFSMIA is located in Beijing with auxiliary branches in provincial capitals and sales offices in other large cities and towns. The administration of fishery and fishing harbour supervision and the registration of fishing vessels in all provinces and regions of China are activities carried out by the agents of the CFSMIA. Fishers can be members of the association provided they submit: a certificate of fishing vessel inspection; a certificate of fishing vessel seaworthiness; a certificate of professional training; and a copy of their identity card. This regulation includes ship owners, operators and crewmembers, as well as personnel on chartered vessels.

At the outset, the CFSMIA, because of the lack of guarantee funds, could insure ship owners only against the loss of life of crewmembers and the total loss of their fishing vessels. However, with the expansion of business and the increase in reserves, the insurance capacity has become stronger, the

premium rate has been reduced, the minimum required horsepower limit is lower than before, and the maximum compensation limit has increased.

The case study on China concludes that, although fisheries insurance in its current form has only been available since the 1980s, it is playing a positive role in the sustainable development of the capture fisheries sector, has strengthened fishers' security and has contributed to improving working conditions and safety on board vessels. The review of China also admits that fisheries insurance in China is still in its infancy and there are issues that deserve more attention. Moreover, the CFSMIA and other fisheries insurers in China are not sure which development pattern should be followed, i.e. Japan, the Republic of Korea or northern Europe.

Another question raised by the review is whether or not to provide government assistance to the fisheries sector in China after natural disasters. Insurers argue that the lack of such assistance is constraining the development of the insurance business. Another constraint found by the review was that insurance companies and the CFSMIA are in urgent need of reinsurance services. However, commercial reinsurers and other direct insurance companies are reluctant to share and reinsure their risks.

The recommendations of the case study on China might also be relevant to other developing countries. These include the following:

- The insurance sector should adjust its services to the local needs of the fishers rather than operate in a uniform pattern.
- While currently it is not mandatory for fishers to be insured, consideration should be given to making it mandatory that vessels and fishers be covered by some kind of insurance because this would provide security to fisherfolk. It would also lead to a substantial increase in fishery insurance policies, which in turn would lead to economies of scale for insurers, lower costs of administration and management per policy, and increased economic feasibility of insurance schemes.
- Premium subsidies currently provided by government should be replaced by preferential tax regimes and credit guarantees.
- National or regional reinsurance companies should be established, or reinsurers from abroad should be allowed to serve agricultural and fisheries insurance markets.
- Insurance companies should institutionalize development and management policies for the fisheries sector as well, in order to utilize the insurance mechanisms and programmes to increase sustainability and contribute to the implementation of better practices.
- Capacity building within insurance companies and the CFSMIA on fisheries issues is important, as these institutions would be more capable of serving the sectors' needs.
- Because it is difficult to find insurers willing to insure individual fishers against health and life risks, the review recommends that the government either subsidize the provision of insurance to small-scale or poor fisherfolk, who are in high need of life and health insurance, or oblige insurance companies to allow fishers to access their schemes at reasonable premium rates.

India

The country review of India states that a number of subsidized welfare and insurance programmes are being implemented in the country (Van Anrooy *et al.*, 2009). These include: development of model fisherfolk villages; a group accident insurance scheme for active fishers; and a savings-cum-relief scheme for fishers. The report also notes that the Central Government of India is attempting to deliver multiple-risk hedging services to the fisherfolk through its public sector undertakings in the insurance sector, i.e. the General Insurance Corporation (GIC) of India and its four subsidiaries, along with the private sector and a few other institutions. Innovations in developing risk-hedging services have generally been spearheaded by community institutions and NGOs.

Public-sector insurers such as the GIC provide hull and equipment insurance for fishing vessels, while group accident insurance and life insurance products are generally the domain of fisherfolk cooperatives. These have favourable agreements with the public insurers and provide the service to their members as intermediates. Moreover, the Central Government Insurance Scheme for Active Fisherfolk includes various welfare programmes for fisherfolk that have some insurance components incorporated.

At the state level, some have their own fisherfolk welfare schemes and programmes. The review highlights the State of Kerala, which has the second-highest population of active fisherfolk in India (about 602 234 according to the 2005 marine census) and leads the effort in state-level initiatives for fisheries sector development and management. At present, the State of Kerala has two schemes implemented by different agencies. The Kerala Fishermen's Welfare Board operates a life insurance plus personal accident scheme for fisherfolk. The review notes that the entire premium payment for the scheme falls under the responsibility of the state government. Life insurance coverage provides the dependants of a fisher in case of death/missing as a consequence of an accident or disaster the sum of INR100 000.

Kerala State Cooperative Federation for Fisheries Development Limited (Matsyafed) also provides insurance services and other welfare services. Matsyafed is a two-tier cooperative federation with 654 primary fishermen's development welfare cooperative societies. These primary cooperative societies can be subdivided into 340 operating in the marine sector, 183 in the inland sector and 131 women's cooperatives. The review observes that some 300 cooperatives are functioning well. The total membership of Matsyafed is 300 000 fishers and their families.

Various NGOs are also active in the provision of insurance services to fisherfolk in India. Two of these are the South Indian Federation of Fishermen Societies, and the Trivandrum District Fishermen Federation. The former provides life and vessel, equipment, gear insurance services to its members, while the latter provides marine hull insurance, as well as fishing equipment and gear insurance.

Informal mutual support mechanisms in traditional coastal communities

In addition to institutional insurance or formal insurance programmes, there are also informal mutual support mechanisms among people living in rural coastal and other areas, which are activated particularly in times of natural disasters. These are also called mutual insurance rather than support mechanisms by some authors. Takasaki (2011) studied the response of people to natural disasters, in this case cyclones, in Fiji and discovered mutual support mechanisms which he called insurance mechanisms. The author found that poor people rely on other local people in the community for community self-insurance and for informal mutual insurance. The author's assessment is based on his observation that after a cyclone and the damage it caused, households increased coastal fishing and handicraft selling to make up for crop losses ("self-insurance"). Households with undamaged housing intensified fishing to help other kin-group members with damaged housing ("informal mutual insurance").

The author suggests that his findings justify integrating community-based resource management and broad safety-net policies. However, the author admits that different management groups may correspond to different natural resources (e.g. forest vs sea), and that management groups may not match risk-sharing groups. The study concludes that more research on the link of local resource use and management with informal risk sharing is needed.

6.3 Access to technology and infrastructure

In the past, there was a lack of fishing equipment such as engines, spare parts, netting materials, fuel, communication and navigational equipment in some countries, largely because of import restrictions and lack of foreign exchange. In the course of liberalization of trade and financial markets and globalization, these obstacles have largely disappeared, equipment has become freely available, and access to technologies and innovative technologies has improved.

This was observed by participants at a regional workshop on the effects of globalization and deregulation on marine capture fisheries held in October 1999 in Pusan, the Republic of Korea, jointly organized by the Korea Maritime Institute, APRACA and FAO (FAO, 2000a). The same observation was made by participants at a regional workshop on the effects of globalization and deregulation on fisheries in the Caribbean, held in Saint Lucia in December 2000, organized by the Government of Saint Lucia and FAO (FAO, 2001a). Moreover, prices of fish and depth-finding and navigation and GPS equipment, VHF radios, safety and other equipment, suitable for use on small-scale fishing vessels, including handheld equipment, have dropped considerably in recent years, making such equipment more affordable.

Access to fishing technology in the form of fishing craft, gear and accessories no longer seems a problem in most countries, except for cases of natural or human-induced catastrophes and calamities, such as during and after tropical storms, flooding and armed conflicts. However, the lack of adequate post-harvest transport and infrastructure seems to prevail and prevent SSFs in many countries from reaching their full potential as far as their contribution to poverty alleviation and food security is concerned.

As mentioned in Section 5.1, substantial post-harvest losses occur in SSFs due to poor infrastructure and lack of storage and transportation facilities. A study carried out by INFOFISH, INFOPECHE, INFOSA and INFOPESCA revealed that major constraints to SSFs in India and Malaysia, Ghana, Mozambique, Senegal, the United Republic of Tanzania, Brazil, Mexico and Peru are: inadequate facilities for preservation of fish, unhygienic conditions at landing centres, lack of supply of good-quality ice, inadequate transport facilities, lack of cold chains and a lack of modern fish markets (INFOFISH *et al.*, 2008, pp. 23, 34, 69, 84).

A global study on beach seine fisheries carried out by FAO in cooperation with the Sustainable Fisheries Livelihoods Programme (SFLP) in Benin, Ghana, Togo, The Gambia, India, Kenya, Mozambique and Peru also found lack of access of SSFs to adequate and hygienic landing sites, fish handling, storage, processing and transporting facilities and equipment.

In addition to a lack of fisheries infrastructure, there is a widespread lack of community infrastructure in many fishing villages in developing countries, such as safe drinking-water facilities, sewage and waste disposal facilities, educational and health services, transport, communication and other basic facilities.

6.4 Summary

Table 3 summarizes the major findings on the access of fishing communities to credit, microfinance, insurance, welfare, technology and infrastructure.

Table 3

Access of fishing communities to credit, microfinance, insurance, welfare, technology and infrastructure

Subsector / study area	Findings
<i>Credit and microfinance</i>	
<ul style="list-style-type: none"> • Credit needs and services • Access to credit • Informal credit • Microfinance 	<ul style="list-style-type: none"> • Small-scale fisheries have a need for credit, microfinance, savings and money transfer facilities services to meet their production, post-harvest and domestic household needs. • Credit services are needed for acquisition, repair and operation of fishing vessels and fishing gear; fish handling, processing and marketing facilities, for the protection and restoration of marine and inland aquatic habitats and ecosystems; for food

Subsector / study area	Findings
	<p>security, educational, housing and medical needs and for a variety of other purposes.</p> <ul style="list-style-type: none"> • In the past, the access of small-scale fishers in most countries to banks and other formal financial intermediaries has been very limited. The situation has not changed very much with the notable exception of microfinance services and the involvement of NGOs despite ongoing financial and rural financial sector reforms in many developing countries. • Most fisherfolk depend on informal sources of credit such as fish merchants, boat owners, professional money lenders, intermediaries, relatives and friends, whose ability to provide medium- and long-term credit for capital investments is rather limited. • Other disadvantages of some of these informal intermediaries such as intermediaries and moneylenders are the high costs and unfavourable terms attached to credit, which in many cases result in long-term indebtedness of borrowers. • Microfinance programmes became accessible to some extent for small-scale fishing communities, both implemented through NGO, financial institutions and in cooperation of both. Microfinance can involve group formation and the adoption of group lending procedures. Capacity development, training and networking play an important role. • Microfinance is generally defined as provision of a range of financial services such as deposits, loans, payment services, money transfers and insurance. Loan amounts are usually small and lending periods are short term.
<i>Insurance and welfare</i>	
<ul style="list-style-type: none"> • Supply and demand • Level of organization of fishers 	<ul style="list-style-type: none"> • The characteristics of the SSF sector do not make it an attractive subsector to insurers. Moreover, the demand expressed by the individual small-scale operators for insurance services is often limited. • Small-scale operators are either not aware of the existence of insurance services, do not see the need for insurance (or only for life and health insurance) or have such low incomes that purchasing insurance is not a priority. • In countries where small-scale fisherfolk have a high level of organization (e.g. in associations, cooperatives or self-help groups), the demand for fishing-related insurance services is generally higher. • In India and China, as well as in Chile, there is evidence of considerable demand for insurance among the organized small-scale producers and

Subsector / study area	Findings
	there are a number of insurance services that are being provided.
<i>Technology and infrastructure</i>	
<ul style="list-style-type: none"> • Impact of liberalization and globalization • Post-harvest infrastructure • Community infrastructure 	<ul style="list-style-type: none"> • In the past, there was a lack of fishing equipment such as engines, spare parts, netting materials, fuel, communication and navigational equipment in some countries, largely because of import restrictions and lack of foreign exchange. • In the course of trade liberalization, liberalization of financial markets and globalization, these obstacles largely disappeared and equipment has become freely available and access to technologies and innovative technologies has improved. • The lack of adequate postharvest infrastructure prevails and prevents SSFs in many countries from reaching their full potential as far as their contribution to poverty alleviation and food security is concerned. • There is also a widespread lack of community infrastructure in many fishing villages in developing countries such as safe drinking-water facilities, sewage and waste disposal facilities, educational and health services and facilities, transport, communication and other basic facilities.

7. POVERTY, VULNERABILITY AND ADAPTATIONS OF LIVELIHOODS TO A CHANGING ENVIRONMENT

In addition and complementary to the aspects covered in the previous chapters, this chapter elaborates on the sustainable livelihoods approach (SLA) as an integral part of an ecosystem approach to fisheries management and development. The chapter focuses on small-scale fishing communities and their food security, vulnerabilities and resilience. It further explores how fishing communities interact with and try to adapt themselves to the challenges posed by a changing environment caused by demographic changes such as population growth, industrial development, shipping, oil and natural gas exploration, tourism, housing and urban development in coastal and riparian areas and other challenges. The impact of climate change and ocean acidification on the livelihoods of fishing communities and how these communities perceive the changes and try to prepare and adapt themselves to the changes will further be explored.

The chapter identifies priorities and opportunities for reducing food insecurity and vulnerabilities of fishing communities and strengthening their resilience for dealing with changes that threaten and challenge their livelihoods. Among other things, this includes the diversification of livelihoods and the identification of avenues to adapt to climate change.

7.1 Sustainable livelihoods and ecosystem approaches to fisheries management

Sustainable livelihoods approaches (FAO, 2013b) are based on experiences and outcomes of three decades of attempts to alleviate poverty, including the work undertaken by FAO since the 1984 FAO World Conference on Fisheries Management and Development in the field of the integrated development and management of SSFs highlighted in Chapter 1. Sustainable livelihoods approaches recognize that poverty has multidimensional characteristics and causes and is not limited to a certain level of income. They also acknowledge the diversity of people's aspirations and livelihoods strategies they adopt to achieve them, and welcome and invite people's participation in the definition of goals and strategies. Originating from poverty analysis, SLAs further recognize the importance of assets, including social capital, in determining well-being.

Unlike development approaches, which focused mainly on the delivery of goods and services, SLAs place people firmly at the centre of the development activity and define as benchmarks for success whether sustainable improvements in people's livelihoods have taken place rather than whether a certain infrastructure has been built or goods have been delivered. The involvement of community-level institutions and processes is a prominent feature of approaches to natural resource management, as also is linking these processes to macrolevel processes and national- and regional-level institutions.

Sustainable livelihoods principles hold that poverty-focused development activities should be people-centred, responsive and participatory. They should be: multilevel, conducted in partnership with both the public and the private sectors (including civil society / NGOs), and they should be economically, institutionally, socially and environmentally sustainable. These principles are indeed similar to those used by integrated fisheries development and management programmes implemented in the 1980s.

While SLAs focus on people and poverty alleviation, whether fisheries is part of their livelihoods or not, the EAF also includes people.⁹ It takes a wider and more comprehensive view as it recognizes the need for fisheries management to consider the impact of the ecosystem and other users of the ecosystem on fisheries as well as the broader impact of fisheries on the ecosystem as a whole (FAO, 2003a).

⁹ Information on the livelihoods of fishers involved in beach seining in Benin, the Gambia, Ghana, India, Kenya, Mozambique, Peru and Togo, including poverty and vulnerability, was collected by a study carried out by FAO in the 1990s (FAO, 2011). The study shows that beach seine fisheries function as a social safety net for vulnerable groups in small-scale fishing communities, such as physically and mentally handicapped, older people, the sick and poor members of the community, by giving them an opportunity to be present at the time of hauling in the net and providing them with fish to keep for their own consumption.

The EAF strives to balance various societal objectives by taking into account both existing knowledge as well as uncertainties about biotic, abiotic and human components of ecosystems. The EAF also strives to take into consideration the interactions between these components by applying an integrated approach to fisheries within a meaningful ecological context. Thus, attention is paid to the impact of population growth, industrial development, shipping, oil and natural gas exploration, tourism, housing and urban development in coastal and riparian areas and other challenges and to the impact of climate change and ocean acidification on the livelihoods of fishing communities.

7.2 Global

Relationships between ecological, economic and social objectives

As implied within the context of an EAF, understanding the relationships between ecological, economic and social objectives is important in designing policies to manage or restore ecosystems and to protect livelihoods within these ecosystems. Using the Northern South China Sea (NSCS) as a case study, Cheung and Sumaila (2008) examine trade-offs between conservation and socio-economic objectives in managing fisheries in tropical marine ecosystems.

The authors used numerical optimization routines and ecosystem modelling (Ecopath with Ecosim) and found that current management of the NSCS is suboptimal in terms of both conservation and economic objectives. They conclude that improvement in both conservation status and economic benefits can be achieved by reducing fishing capacity. The authors also point to an important obstacle to such a strategy, i.e. the reduced number of fisheries-related jobs and the lack of alternative livelihoods. The authors observe that similar trade-offs are apparent in many tropical marine ecosystems, as shown by previous studies on the trade-offs between ecological, economic and social objectives. In line with the conclusions of these studies, the authors conclude that solving the alternative livelihood problems appears to be a priority for improving management and conservation in these ecosystems.

Impacts of climate variability and change on fishery-based livelihoods

Manifestations of climate variability and change, pathways of impacts and adaptive strategies

An issue that affects small-scale fisherfolk livelihoods at the global level is climate variability and change. Studies have attempted to identify the pathways through which livelihoods are affected by climate variability and change, and have explored current and potential adaptation strategies as well as the wider implications for local livelihoods, fisheries management and climate policies.

Badjeck *et al.* (2010) highlight an increasing concern over the consequences of global warming for the food security and livelihoods of the world's 36 million fishers and the nearly 1.5 billion consumers, who rely on fish for more than 20 percent of their dietary animal protein intake. The authors note mounting evidence of the impacts of climate variability and change on aquatic ecosystems and expect that the resulting impacts on fisheries livelihoods are likely to be significant.

Evidence of the impact of recent global climatic changes on fishery resources identified by the authors includes reduced productivity in African lakes (attributed to elevated late twentieth century atmospheric temperatures), and increases in the frequency and severity of coral bleaching with rising sea surface temperatures in tropical and subtropical coastal zones. The impacts of coral bleaching on fish communities include changes in their diversity, size and composition. The authors also observe that fish species distribution has been altered in the North Sea due to recent increases in sea surface temperatures, and that model projections show that climate change may lead to numerous local extinctions in the subpolar regions, the tropics and semi-enclosed seas.

The authors observe that while anthropogenic climate change is already affecting aquatic ecosystems and the human societies that depend on them, most research on climate variability, change and fisheries has so far focused on documenting trends and fluctuations in fish abundance and distribution, particularly in relation to oceanic regime changes and the major pelagic fish stocks of upwelling zones that are the target of large-scale industrial fisheries.

The authors observe further that there are a number of studies that investigate the vulnerability and adaptive capacity of the fisheries sector and dependent communities to climate change. However, they point out that there has been little directed analysis at the local scale of how climate variability and change is affecting the lives and livelihoods of the “tropical majority” of small-scale fisherfolk.

According to the authors, major manifestations of climate variability and change are changes in ocean currents, El Niño / Southern Oscillation (ENSO), rainfall, evaporation, river flows, lake levels, thermal structure, storm severity and frequency, acidification, salinity, temperature and ice cover. Drawing on their research and the available literature and using a livelihoods framework, the authors identify four different pathways, through which the manifestations of climate variability and change impact fisherfolk livelihoods at the household and community level, i.e. production ecology, fishing operations, community livelihoods and wider society and economy.

Effects on production ecology consist of impacts on species composition (production and yield, species distribution) and diseases (coral bleaching, calcification). Effects on fishing operations consist of impacts on safety and efficiency and protective infrastructure needs. Effects on community livelihoods consist of loss or damage of livelihood assets and strategies, impacts on lives, health risk on human and animal life, displacement of populations and conflict over land, water and natural resources. Effects on wider society and economy are identified as adaptation and mitigation costs, impacts on market chains, water allocation, floodplain biodiversity and usage and coastal defences.

The authors further identified current and potential adaptation strategies and explored the wider implications for local livelihoods, fisheries management and climate policies. They suggest that responses to climate change, either anticipatory or reactive, should include: (i) implement management approaches and policies that build the livelihood asset base of fisherfolk households, reducing vulnerability to multiple stressors, including climate change; (ii) gain understanding of current response mechanisms to climate variability and other shocks in order to inform planned adaptation; (iii) identify and recognize the opportunities that climate change could bring to the sector; (iv) formulate and implement adaptive strategies designed with a multisector perspective; and (v) identify and implement mitigation policies and efforts to reduce greenhouse gas emissions.

Adaptive capacity of already stressed ecosystems

Other studies focused on the aspect of climate variability as an additional stress for an already stressed social-ecological system and on strengthening the adaptive capacity of the system. Following both an SLA and an ecosystem approach to fisheries and natural resources management goal, Perry *et al.* (2010) state that a broad marine policy goal should be the maintenance of healthy marine social-ecological systems that are capable of sustaining desirable ecosystem services and support human livelihoods. The authors observe that marine social-ecological systems are already stressed by a number of environmental factors and by the impacts of globalization. Climate change is seen as an additional stress that may push marine social-ecological systems beyond the ranges of past variability for which they had previously become adapted.

The authors further observed that human social systems have well-developed strategies for dealing with variability within their normal ranges of experience, although they observe that these capacities are not distributed homogeneously around the globe. As far as fishing is concerned, the authors suggested that fisheries, referred to as human social fishing systems, dealing with high-variability upwelling systems with rapidly reproducing fish species may have greater capacities to adjust to the additional stress of climate change than fisheries focused on longer-lived and generally less variable species. While it is admitted that the details of local impacts of climate change and its interactions with existing stresses on marine social-ecological systems are difficult to predict, the authors presume that climate variability will lead to more extreme events and increased uncertainty. They suggest that management must strive to enhance the adaptive capacities of these systems to uncertainty and to change.

However, the resulting suggestions of practical management measures, such as to address the problem of overfishing, are not directly related to climate change, even though it is generally understood that the capacity of any system, not only “marine social–ecological systems”, to deal with new challenges can only be strengthened if already existing challenges are reduced. As far as identification and resolution of impacts of climate change are concerned, the authors admit that multiple interacting time, space and organizational scales might make these tasks difficult to accomplish. The authors propose to develop integrated observing and modelling systems for the full social–ecological system, which can quickly recognize changes, to enhance communications with stakeholders, and to develop or build in flexibility in new and or existing institutions that can and will adjust rapidly to new circumstances.

The role of social capital in the adaptation to climate variability and change

Other studies focused on the role social capital can play in the adaptation to climate change. Jones and Clark (2013) stress that in the context of coastal zone management, the development of public policies that respond to climate change demands an examination of multiple physical and social variables, which range from addressing prevailing environmental conditions to accommodating the socio-economic needs of local communities and acknowledging the attitudes, norms and environmental behaviour of individuals.

Their paper focuses on these social aspects and develops an explanatory framework to model the effectiveness of coastal management policies based on the role of social capital. It analyses the influence of three social capital elements, i.e. social trust, institutional trust and social networks, on public responsiveness. The authors postulate that higher levels of social and institutional trust will result in more positive community perceptions of proposed policies for coastal management. Similar reactions are expected in communities where dense social networks lead to higher levels of environmental awareness.

The paper then identifies potential new areas of research that might address the current lack of consideration of non-economic social costs and benefits on public acceptability of coastal management policies. A principal claim made here is that higher levels of policy acceptability are generally evident in coastal communities with strong social capital, as such communities tend to perceive low social costs and high benefits arising from policy intervention. In addition to these global studies, assessments of the impacts of climate change on livelihoods have also been conducted at the national level and are described in the following sections.

7.3 Asia

Indonesia

Poverty and dependence on fisheries

Poverty and vulnerability are still widespread and even increasing in small-scale fishing communities in Indonesia and other countries in Asia. Studies carried out in Indonesia explored the relationship of poverty to the dependence on fisheries as occupation in West Sumatra, and the relationship between aquatic and land resource use and livelihoods strategies in coastal communities in the Central Moluccas. They also highlighted the need to include the collection of information on poverty in fishing communities in ongoing marine spatial planning processes.

Stanford *et al.* (2013) examine the relationship of poverty to the dependence on fisheries as an occupation in West Sumatra. The authors observe that, as many other nations, Indonesia is conducting expensive marine spatial planning processes with the objective to achieve more coherent marine management. However, this process has only a very limited social and economic component. The authors point out that social and economic data, including data on poverty, are routinely collected on fishing and other rural communities and that it is possible to integrate these data in the planning process. The study outlines a simple methodology using social and economic statistics routinely collected by government agencies, and applies it to the coastal province of West Sumatra.

Two indices are developed to map fisheries dependence and incidences of poverty among fishers at three spatial scales. Using census data on employment and poverty across all economic sectors, incidences of poverty among fishers are placed in the wider poverty context. The study found that the number of fishers in a state of poverty is increasing, that fishing together with crop farming are the two sectors in which incidences of poverty are greatest. The study also found that there is no significant correlation between high fishing dependence and high proportions of poverty among fishers.

Van Oostenbrugge, Van Densen and Machiels (2004) studied the relationship between aquatic and land resource use and livelihoods strategies in coastal communities in the Central Moluccas. The authors studied four types of enterprises exploiting natural resources, i.e. the purse-seine fishery, sago extraction, nutmeg cultivation and clove cultivation in terms of size, patterns and uncertainty in production and income in the coastal community in Ambon and the Lease Islands in the Moluccas. They found that only owners of purse-seine vessels have sufficient incomes to maintain their families although the basic uncertainty in their daily income was found to be extremely high. The low income and high uncertainty of incomes earned by crew members of purse seiners was not found sufficient to sustain a household, which meant that other sources of income were needed.

The Philippines

Livelihoods diversification and microenterprise development

The University of the Philippines in the Visayas in cooperation with partners and with support from FAO implemented a pilot project in Banate Bay, Iloilo, in support of the development of microenterprises. The objective was to promote and support the diversification of livelihoods in small-scale fishing communities (FAO, 2007a). A number of microenterprises were introduced and supported in the municipalities including fish ball production, shrimp paste production, oyster and mussel culture, salt production and iodization, fish marketing and fish sauce production. Training programmes were conducted for fisherfolk on product development and marketing of their products.

The experiences of the project suggest that good coordination with local government units, active participation of all stakeholders and conduct of appropriate training programmes are essential for the sustainability of the microenterprises. The project also found that the involvement of fisherfolk in livelihoods activities and microenterprises is strengthening their participation in the fisheries and aquatic resources management councils of Banate Bay and Southern Iloilo. The experiences of the pilot project suggest that in order to make various income-generating livelihoods initiatives sustainable and stand on their own feet, many of these need to develop further into fully fledged microenterprises.

As far as future opportunities for livelihoods diversification and microenterprise development are concerned, the project found that considerable scope lies in the farming of aquatic organisms such as seaweed, shellfish and various fish species as well as in fisheries-related value-adding activities such as fish processing and marketing. As regards the relationship between the conservation of aquatic resources and the generation of income, the quality of the aquatic environment and the economic success of mariculture microenterprises and activities are directly related. This should create a strong motivation for fisherfolk entrepreneurs involved in such type of enterprises to be strong advocates and stewards of a healthy coastal ecology.

The National Workshop on Micro-enterprise Development in Coastal Communities in the Philippines, organized with support from FAO (FAO, 2007a), facilitated the exchange of experiences and good practices, and identified financial and institutional support services and facilities to sustain livelihoods and microenterprise development in coastal areas. The workshop was attended by 45 participants from people's organizations, fisherfolk cooperatives, NGOs, national government agencies and financing institutions. The discussions at the workshop showed that livelihoods diversification and the improvement of income and employment opportunities in coastal fishing communities are crucial for their participation in the conservation and management of aquatic resources.

Key elements of sustainable microenterprise development as identified by the workshop include capability development of fisherfolk organizations such as cooperatives and associations to implement livelihoods projects, the preparation of feasibility studies and business plans, technical skills development, sound financial management practices, development of innovative and high-quality products, access to new markets including urban and regional markets, and the full participation of fisherfolk in the identification of livelihoods activities and microenterprises.

Small-scale fisheries and tourism

Muallil *et al.* (2013) studied socio-economic factors associated with fishing pressure in SSFs along the South China Sea biogeographic region. The authors found that types of alternative livelihoods and fishers' age were the most important factors influencing fishing effort. Fishers who also worked as drivers, boat operators, construction workers, carpenters and in other occupations in addition to going fishing had a lower fishing effort than fishers without alternative livelihoods, who exclusively depended on fishing. Younger full-time fishers fished more frequently than older ones.

Fabinyi (2010) studied the intensification of fishing and the rise of tourism as competing livelihoods. The author notes that, in the context of declining profitability in the fishing industry due to environmental degradation and overfishing, local and central government agencies are heavily promoting tourism in the Philippines. The study examines how coastal residents in the Calamian Islands, Palawan Province, negotiate these changes in the fishing and tourism industries.

The study finds that, despite a push for tourism as a more sustainable alternative to fishing, the relative costs and benefits of fishing and tourism as experienced by local fishers suggest that the transition from fishing to an economy based more on tourism is neither simple nor necessarily more beneficial for fishers. Because of the high prices for live grouper and strong demand from Asian markets, fishing continues to provide significant economic incentives. The author observed that fishers are extending the length and duration of their fishing trips, using new technologies such as fish finders and cages, as well as migrating to other areas to gain access to better markets and fishing grounds.

By contrast, the author also observed that the promises of tourism have so far had mixed outcomes for fishers. While some fishers have gained through alternative income opportunities, some seasonally and others permanently, for others living in more remote areas tourism is yet to become an everyday reality. Apart from geographical aspects, many fishers see the development of tourism as something that will eventually threaten their livelihoods. The author found that many fishers believe that the benefits of tourism will be siphoned off by local elites and by foreign investors. As a consequence, fishers express concern about the implications of coastal tourism for the security of both their land tenure and their rights to fish in nearby waters.

India

Climate change and livelihoods

Salagrama (2012) studied the impact of climate change on livelihoods of small-scale fishers in the context of already ongoing changes in the livelihoods of fishers and fishing communities in India. The study was carried out on behalf of the International Collective in Support of Fishworkers (ICSF) and had the following objectives:

- assess perceptions of fishing communities of the impact of climate variability/change on their lives and livelihoods;
- assess knowledge, institutions and practices of fishing communities of relevance to climate change preparedness;
- identify adaptation and mitigation measures that may need to be adopted by fishing communities and government in relation to climate change;
- propose measures to protect the lives and livelihoods of small-scale fishing communities in the context of climate-change policies and programmes at different levels.

The study finds growing evidence that, in the perception of fishing communities, climate change has been influencing the viability of fishing operations, requiring fishers to take a wide range of adaptive and mitigation measures. However, climate change needs to be understood as adding a new dimension to the crisis already facing the fisheries sector. The author observes that although the direct contribution of the fisheries sector to aggravating climate-change processes is considered low, there is evidence that some practices and processes within the sector could be exacerbating the impacts of climate change on the lives and livelihoods of fishers, such as: growing fishing fleet size, engine power and capacity; destructive and ecologically unsound fishing practices; and poor engine and fuel efficiencies.

However, external factors are seen as more significant than fisheries in terms of aggravating climate-change-related processes. They include a range of processes relating to, among others, industries, nuclear/thermal power plants, tourism, defence establishments, ports and shipping, agriculture and irrigation, mining, and urban development. Their impacts include: pollution; competition for coastal space and resources; shoreline changes; and destruction of fish habitats and sensitive ecosystems.

In addition, increasing population, both within and outside fishing communities, is seen as putting extra pressure on the resources and further aggravating the climate-change processes and their impacts. Impacts of the climate-change processes, which are frequently mixed up with those of a number of other factors in the fisheries sector, are felt by different fisheries stakeholders in a number of areas and include:

- access to, and availability of, fish and other coastal resources such as mangroves;
- fishing systems and working conditions;¹⁰
- terms of access to fishing grounds;
- fishing investments and returns;
- fish traders' and women's access to markets and terms of fish trade;
- quality of life;
- sea-safety concerns;
- traditional knowledge, practices and governance systems;
- domestic economies.

The study concludes that efforts to address climate change must encompass a wider range of activities, extending beyond those directly focusing on climate change alone, and concentrate on enhancing the overall resilience and adaptive capacities of fishing communities. Similarly, adaptation and mitigation measures that may need to be adopted by fishing communities in response to climate change will be similar to those already in place for dealing with ongoing crises of overfishing and fishing fleet overcapacity. Regarding measures to protect the lives and livelihoods of small-scale fishing communities in the context of climate-change adaptation and mitigation policies and programmes at different levels, the author observes that, currently, the level of institutional response to climate-change impacts on fisheries is still in the early stages. It is largely focused on technical aspects such as pursuing solar energy, conserving water, creating a "green" India and creating sustainable agriculture. The coastal ecosystem is not specifically addressed as part of national and regional plans. Human and socio-economic implications of the various changes are yet to be fully understood.

The author also observes that, although coastal communities are widely regarded as among those most severely impacted by climate change, there is no specific focus in the National Action Plan on Climate Change on the coastal ecosystem or on coastal communities. In the absence of the fishers' representation in the decision-making processes, the author further observes that the various conservation measures being undertaken to protect sensitive species or ecosystems, seen as

¹⁰ According to the author, harder working conditions and additional pressure on the physical and emotional well-being of the crew are due to siltation in the creeks and river mouths and beach erosion, which makes it more difficult to launch boats.

contributing to climate-change adaptation, and the way they are implemented have been having an adverse impact on the fishing communities, further exacerbating their conditions.

The author reports that coastal protection and conservation programmes such as coastal and marine national parks and sanctuaries have become a major constraint for the fishers. In most cases, fishers have been excluded from decision-making, and the impacts have been uniformly negative, leading to increased vulnerability and decreased livelihood security by alienating coastal dwellers from their traditional habitats and livelihoods.

The study suggests measures to help fishers cope better with climate change and its impacts. These include:

- enhance focus on coastal issues and representation of fishing communities in policy-making and participatory research processes;
- increase awareness about climate variability and change among fishing communities and other stakeholders;
- improve fisheries management through bottom-up adaptive processes and their relation to climate change;
- improve more efficient engine types and efficiencies for better economic and reduced emissions;
- address issues of sea safety to make vessels more adapted to the changing operations needed to fish stocks that have modified their reproductive and migratory behaviour due to climate change;
- address issues of migrants coming from drought or flood prone inland area towards coastal areas and become fishers, thereby increasing fishing effort and giving rise to conflicts with traditional fishers;
- address non-fisheries issues that affect fishery resources and the quality of life of fishing communities, including access to basic services and decent and safe housing and livelihoods diversification through consultative processes;
- strengthen planning and measures for disaster and disaster preparedness.

Bangladesh

Limits to climate change adaptation

Islam *et al.* (2014) examine limits and barriers to adaptation to climate variability and change in coastal fishing communities in Bangladesh. The study identifies limits and barriers to adaptation of fishing activities to cyclones and examines interactions between them in two fishing communities in Bangladesh. The limits to adaptation to climate variability identified by the study include the physical characteristics of climate and sea conditions, such as higher frequency and duration of cyclones as well as hidden sandbars. The barriers identified by the study include: boats that are poorly constructed and not fully seaworthy; underestimation of cyclone occurrence; inaccurate or lack of weather forecasts and cyclone warnings as well as poor radio signals; lack of access to (or unfavourable) credit schemes that hamper occupational mobility and diversity; low incomes; coercion of fishers by boat owners and captains to go fishing despite storm warnings; lack of education, skills and livelihoods alternatives; lack of enforcement of fishing regulations and maritime laws; and lack of access to fish markets.

The study highlights that these local and wider-scale factors interact in complex ways and constrain completion of fishing trips, coping with cyclones at sea, safe return of boats from sea, and timely responses to cyclones and livelihoods diversification. The findings indicate a need for further detailed research into the determinants and implications of such limits and barriers, in order to move towards an improved characterization of adaptation and to identify most suitable means to overcome the limits and barriers.

In addition, Ahmed, Occhipinti-Ambrogi and Muir (2013) examine the impact of climate change on prawn post-larvae fishing in coastal Bangladesh. The study found that in Bangladesh, prawn (*Macrobrachium rosenbergii*) farming remains dependent on the capture of wild post-larvae as hatchery production is still inadequate. However, prawn post-larvae fishing has been accompanied by concerns over recent climate change.

The authors observe that different climatic variables including cyclones, salinity, sea level rise, water temperature, flood, rainfall and drought have all had adverse effects on coastal ecosystems, thus determining a decline in the availability of prawn post-larvae and production levels. As a consequence, the households of post-larvae fishers face a variety of socio-economic constraints, which the authors attribute to climate change. The authors conclude that considering the extreme vulnerability to the effects of climate change, an integrated approach needs to be introduced to cope with the challenges.

Viet Nam

Future of small-scale fishery livelihoods

Armitage and Marschke (2013) examine the future for small-scale fishers and fish producers in the rapidly changing Tam Giang Lagoon in central Viet Nam. Their analysis shows the multidimensional and linked social, ecological and economic challenges confronting lagoon resource users and government officials, including the possibility that important features of the ecological system have been significantly altered.

Results of the research suggest that the future for small-scale fish producers in the Tam Giang lagoon is relatively bleak. Two decades of economic growth, rapid aquaculture expansion and the intensification of resource exploitation¹¹ have altered the Tam Giang lagoon system and negatively impacted the ecosystem even though the extent to which this has happened is not fully known. The study also found that relatively weak institutions and increasing competition for aquatic resources from aquaculture and capture fishing have increased fishing and provided short-term incentives to use destructive fishing gear. The authors warn that projected impacts from market pressures and a possible trend toward consolidation in small-producer fish farming and climate change in the form of sea-level rise, as seen in some areas of southern Viet Nam, may well accelerate negative impacts on the ecosystem.

The authors conclude that policy and management interventions need to better reflect social and ecological variability, incorporate local perspectives about the future of small-scale fishing and small producer aquaculture, and acknowledge how individuals simultaneously produce, resist and/or adapt to change. The authors conclude further that key policy responses should include the adoption of an integrated fishery (fishing and aquaculture) and coastal systems perspective, clarifying security of access rights to aquatic resources, and building institutional conditions for greater collaboration and learning among resource users and decision makers.

The authors suggest that one of the ways forward would be to continue with and improve co-management arrangements and the network of fishing associations that have emerged in the lagoon to better address conflict and foster cooperation between users. They note that more collaborative governance and greater cooperation, both vertical and horizontal, might have the potential to mitigate the impacts of ecological change by helping improve stocking density and banning destructive fishing gear.

¹¹ Phung and Van Dijk (2013) discuss the reasons for compliance and non-compliance of small-scale fishers in Ca Mau province in the Mekong Delta with fisheries regulations and impacts on their livelihoods (Phung and Van Dijk, 2013).

China

Livelihoods and land-use changes

The study by Huang *et al.* (2012) focuses on the vulnerability of coastal communities and land-use change in China. The authors observe that coastal regions in China are undergoing rapid land-use change but that little attention is paid to the implications of this change for the local community. Their study presents an analytical framework and an associated indicator system to assess and compare the vulnerability of communities to land-use change in coastal areas. The indicator system is applied to a case study in Maluan Bay, Xiamen, China.

The indicators are combined for three indices i.e. the Exposure Index (EI), the Sensitivity Index (SI) and the Adaptive Capacity Index (AI). While EI measures intensity of land use, SI and AI are based on socio-economic characteristics of native residents as well as on their views on environmental change and management. Based on the quantification of SI and AI, the Vulnerability Index (VI) is compared among different communities.

Maluan Bay, Xiamen, China, consists of four rural administrative units, with different policies and development modes. These administrative units were formed in the 1980s to promote urbanization, industrialization and development, incorporating the rural communities that previously resided in the area. A comparison of EI and VI reveals large disparities among communities and that vulnerability is not evenly distributed across communities.

The authors assume that these differences might be linked to the different stages of transformation the community was in prior to the administrative changes. The study finds that vulnerability tends to increase with the increase of exposure to land-use change, but can peak off once the community starts to benefit socio-economically from development. The most vulnerable community was found to be the one where native residents lost their livelihoods but benefited only little from economic development. The authors conclude that there is a need for tailor-made policy responses to help rural communities benefit from development and aid their smooth integration into an urbanized environment as a way to enhance adaptive capacity of coastal communities to land-use change.

7.4 Pacific Islands

Food security, poverty alleviation and resource conservation

Striking a balance between food security, poverty alleviation and resource conservation is a challenging problem facing many developing countries. In the case of SIDS such as the Pacific islands, where natural resources are limited and the dependence of the population on these resources is high, the problem becomes even more acute. Hardy *et al.* (2013) note that, in Solomon Islands and other Pacific islands, reef fish and other fisheries are exposed to increasing fishing pressure because of rapid population growth and poverty. This has severe implications for food security as fish represents the major protein source for local populations.¹²

The authors propose a bioeconomic model based on the local fishery that accounts for multispecies and multifleet dynamics and integrates trophic dynamics. Several contrasting fishing scenarios are tested and their results compared using two biological indicators (Simpson index and species richness) and two socio-economic indicators (fish consumption and cash income). Simulations identify the conditions under which fishing outputs including subsistence and profitability of fishing can be sustained for the next 40 years.

The results of their analysis confirm that under the current situation, the two main fisheries on Solomon Islands, i.e. the reef fish fishery and the sea-cucumber fishery, will be unable to maintain the country's population above the local poverty line, and the biodiversity of the reef will be progressively eroded. The analysis shows further that it is possible to find a combination of viable fishing strategies

¹² See also Bell *et al.* (2009), who elaborate on a plan to use fish for food security in the Pacific.

that would allow the preservation of the biological diversity of the reefs and at the same time enable the local fisheries to deliver their main social and economic functions. This would require limiting fisheries within the reefs and the development of an inshore tuna fishery as well as cultural and behavioural changes among the fishers' communities and political will and planning from the national-level policy-makers.

Vulnerability, resilience and adaptation to global changes

Other studies carried out in the Pacific islands focus on vulnerability, resilience and adaptation of remote rural communities to shocks, institutional and global changes including climate change. Schwarz *et al.* (2011) studied vulnerability and resilience of remote rural communities to shocks and global changes in Solomon Islands. The authors used an integrated assessment map to examine communities' multiple dimensions of vulnerability and to identify factors affecting households' perception about their resilience to cope with shocks. They found that social processes such as community cohesion, good leadership, and individual support to collective action were critical factors influencing the perception that people had about their community's ability to build resilience and cope with change. The analysis also suggests a growing concern for a combination of internal, local and more external, global contingencies and shocks, such as the erosion of social values and fear of climate change.

Guillotreau, Campling and Robinson (2012) examine the vulnerability of small island fishery economies to climate and institutional changes. The authors conclude that fisheries-dependent small island economies are particularly exposed and sensitive to climate change and oscillations. They note that catchability and fish habitat of pelagic fish are generally strongly affected by deeper thermocline and warmer sea surface temperatures during extreme climate events, resulting in temporary or persistent latitudinal and longitudinal shifts in stock distribution that have major consequences for fish-dependent local economies.

The authors argue that both empirical and theoretical research is required to better understand the effects of climate on both offshore and SSFs and the role of these fisheries for employment, trade and food security in small islands. To enhance the adaptive capacity of SIDS, they further argue for a more systematic understanding of the causality link between environmental indicators such as temperature, sea-level pressure, dissolved oxygen and water acidity on the one hand and socio-economic indicators such as vessel expenditure, zonal access fees and trade on the other hand.

The authors view dynamics in fish trade as a critical element of adaptive capacity and exposure/sensitivity and note that SIDS are vulnerable to environmental and macroinstitutional changes such as trade and conservation policies. The authors conclude that there is a need for further research on the consequences of major shifts in the spatial distribution of tuna and other major species for future trade dynamics and fisheries-dependent economies. Future research should also aim to identify thresholds that may facilitate real-time adaptive management responses to the influence of climate oscillations and other factors affecting fish landings and trade.

Adaptation of fisheries and aquaculture to climate change at the regional level

A regional workshop on priority actions for adaptation to climate change for Pacific fisheries and aquaculture was co-hosted by FAO and the Secretariat of the Pacific Community (SPC) as the culmination of more than three years of work to assess the vulnerability of Pacific fisheries and aquaculture to climate change (FAO, 2013a). Discussions focused on priority adaptation actions for economic development and government revenue, food security and sustainable livelihoods for Melanesian, Micronesian and Polynesian nations.

The workshop identified priority actions to be taken at the regional and national level for a successful adaptation of the fisheries and aquaculture sectors of the region to climate change. These actions and recommendations include:

- governments need to work together to manage shared oceanic fishery resources jointly and adaptively as stocks are redistributed by climate change;
- some Pacific Island Countries and Territories (PICTs) stand to benefit from the projected eastward movement of tuna, and short-term actions can establish the structures to capitalize on these opportunities in the future;
- adaptations for food security will require the cooperation of governments and industrial fleets to ensure greater access to tuna for rapidly growing urban populations;
- sectors will need to work together to address the multiple pressures on freshwater and coastal habitats that undermine the resilience of these habitats and, ultimately, fisheries;
- Melanesian nations need to capitalize on the expected improved conditions for freshwater fisheries and inland aquaculture to contribute to food security.

7.5 Africa

West and Central Africa

Migration, resource management and global change in fishing communities in West and Central Africa

Migration constitutes one of the strategies that fishing communities often use in order to secure their livelihoods. Njock and Westlund (2010) analyse the patterns of migration in West and Central Africa based on case studies. The authors attempt to shed light on migration flows and to explain the reasons for migration. They also try to identify the main challenges with regard to integration of migrants into local communities and how the interests of residents and migrants can best be accommodated for mutual benefit in the context of resource management and poverty reduction. The article is based on the work of the SFLP.

The authors admit that there are only limited statistics on the migration of fishing communities in West and Central Africa. However, evidence collected by the SFLP migration study suggests that migration is important, both with regard to its magnitude and as part of local livelihoods strategies. The authors suggest that economic globalization and climate change will affect the livelihoods of fishing communities in West and Central Africa as well as migration, although little is known of the characteristics and magnitude of these consequences.

The authors observe that many fishing communities are already poor and exposed to a variety of hazards, and the migrants among them often belong to the most vulnerable population groups. They suggest that their resilience and capacity to adapt need to be strengthened before the effects of climate change start to be felt more seriously. The sustainable use of fishery resources needs to be at the core of such measures but poverty in a broader sense must also be addressed through co-management in combination with pro-poor policies and activities focusing on the empowerment of marginalized groups and outcomes that are for their benefit. They conclude that mechanisms need to be found for the involvement of migrant fishers in the formulation and implementation of fisheries management policies and in local development and poverty reduction strategies.

East Africa

Sustainability and benefits of Nile perch fisheries on Lake Victoria

Bergman and Vieweg (2012) examine the claim that the increased export revenues from the Nile perch fishery have failed to benefit local populations. They investigate the evolution of welfare and income inequality alongside the expansion of Nile perch exports in the regions of Mwanza and Mara in the United Republic of Tanzania in the past 20 years.

First, the authors find evidence of an overall increase in welfare indicated by a significant reduction of the share of the population living below basic needs, a significant decrease of the share of household expenditure devoted to the purchase of food, and a significant increase in overall consumption. Second, the authors find signs of a convergence of living standards between rural and urban areas in

the two regions. However, the authors also find evidence of increased income inequality. Fishing villages seem significantly poorer than other villages.

The authors explain that while it seems that Nile perch exports have benefited the regions as a whole but not the fishing communities, this might not be the full picture. The authors also found that fishers who are involved in the Nile perch fishery are better off than fishers who are involved in other fisheries such as the dagaa (a small freshwater sardine) fishery, which is oriented towards the domestic market. The authors conclude that the prevailing poverty in fishing communities is not so much caused by Nile perch exports but by the organization of the fishery industry itself and the fact that remuneration of crew members is extremely low compared with the remuneration of boat owners, traders and processors located higher up the value chain.

Van der Knaap and Ligtoet (2010) examine the sustainability and benefits of western consumption of Nile perch from Lake Victoria and come to similar conclusions, even expanding the explanation for lack of benefits from Nile perch exports from the characteristics of the fishery industry to more general social characteristics of the region. The authors observe that the fishing of Nile perch resources of Lake Victoria has increased considerably in recent years. While catch rates have been decreasing and numbers of fishers, fishing craft and gear have been increasing, the authors find that it remains economically attractive enough to continue the fishing and exportation of Nile perch. Exports to the European Union (Member Organization), however, seemed to have peaked in 2003, which could have been due to competition from cheaper fish products from some Asian countries as well as to market diversification by the East African exporting firms.

The authors further observe that fish prices paid to fishers increased over time as a result of the success of the Nile perch fishery. However, the increased influx of money into the fishing communities did not necessarily lead to a reduction in poverty. The authors suggest that this could be due to the lack of saving and investment possibilities. The authors also observe that in the absence of sufficient schools, youths automatically enter the fishery sector. They expect that as a result of relatively low investment costs and relatively high earnings, fishing effort will continue to increase until the open-access-based management regime is replaced by a licensing system. The authors suggest that the role BMUs can play in managing the human and fishery resources will have to be strengthened.

The study concludes that the economic gains based on the new fishery in itself have proved to be insufficient to provide a structural sustainable development¹³ due to the restricted social and institutional capacity, which hampers the riparian population's ability to adapt to the new social and fishery challenges.

Income diversification and livelihoods

Suggestions as to how social and institutional capacity could be developed and fishers could improve their standard of living and welfare are provided by Olale and Henson (2013). The authors studied the impact of income diversification among fishing communities in the west of Kenya and found that income diversification increases the incomes of fishworkers. The study also found that education, membership in an association and access to credit are key factors that are related to income diversification decisions among fishworkers.

Based on their findings, the authors suggest that income diversification should be considered as a possible strategy for reversing the poverty status among fishing communities. Income diversification may also relieve the pressure exerted on fish resources, which may benefit the fishing communities in the long term.

¹³ A complex framework for understanding future ecosystem changes in Lake Victoria basin using participatory local scenarios is provided by Odada, Ochola and Olago (2009).

However, despite these benefits, this study found that currently only one-fourth of fishworkers in the west of Kenya had diversified incomes. The authors conclude that there is a need to encourage income diversification by providing better access to credit and promoting membership in associations. Associations could provide credit through microfinance programmes to members. In addition, associations could improve the bargaining power of fishworkers for acquisition of production inputs and marketing of their products.

The authors suggest further that efforts should be put in place to instil business management skills among fishworkers. This can be done by offering basic literacy classes and teaching fishers how to start and manage non-fishery enterprises. The authors hope that business management skills coupled with information on business opportunities will nurture an entrepreneurial spirit among fish workers.

Food security in remote rural areas

Béné *et al.* (2009) studied livelihoods of riverine fishers in a remote region of the Democratic Republic of the Congo and investigated the dual role of fish as a food and cash crop. They found that both men and women were involved in fishing as part of a household multiple activity livelihoods strategy. The study showed that poor households rely heavily on fishing for their supply of animal protein, in particular through women's subsistence catches. Fishing also appeared to be the main source of cash income for most households, including local farmers. The authors conclude that SSFs can play a fundamental role in local economies, especially in remote rural areas, where they strengthen significantly the livelihoods of people through their role in both food security and cash-income generation.

Southern Africa

Food security strategies

Sowman and Cardoso (2010) provide an overview of the SSF sector in countries within the Benguela Current Large Marine Ecosystem. The study reveals that Angola, Namibia and South Africa have very different legal and policy frameworks, show different levels of compliance with international and regional agreements to protect the livelihoods and food security of small-scale fishers, as well as of integration of fisheries into food security strategies.

The authors observe that Angolan law recognizes and protects small-scale fishers through legal and institutional mechanisms. In Namibia, this sector of fishers is not legally recognized, while in South Africa traditional fishers have been largely excluded from the new fisheries management framework. Trends in national and regional fish consumption and in the extent of export orientation in fisheries are explored as well as the potential threats to small-scale producers and food security in the region posed by ongoing drives to incorporate fisheries in the World Trade Organization agreements.

7.6 Latin America and the Caribbean

Poverty and vulnerability among fishing communities in the Caribbean

Within the Caribbean region, fishers and their communities are often characterized by: substandard living conditions; poor housing; low levels of formal education; inadequate access to basic services such as water, schools and health care; low savings and inadequate access to credit; poor infrastructure such as roads or markets; and limited alternative employment opportunities (CRFM, 2012a, 2012b). The Caribbean Regional Fisheries Mechanism (CRFM) recognizes that poverty is a very complex, multifaceted issue that varies considerably from country to country and from community to community.

The CRFM carried out a diagnostic study to determine poverty levels in fishing communities of the Caribbean Community (CARICOM) to better understand and define the nature, extent and underlying causes of poverty. The study was conducted in ten selected CARICOM countries territories – the Bahamas, Barbados, Belize, Grenada, Guyana, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Vincent and the Grenadines, and Trinidad and Tobago. The study also aimed to assist national and

local governments and interested organizations in developing and implementing more focused interventions to improve the quality of life of fishing communities by dealing with poverty and the underlying factors that give rise to it in an informed manner.

This study examined poverty in CARICOM fishing communities from a quantitative and a qualitative point of view. The quantitative analysis, by means of an unsatisfied basic needs index and fishing activity and poverty indicators, quantified the importance of poverty in fishing communities' households. The qualitative analysis identified the countries with the highest percentage of poor households, the importance of poor and vulnerable homes within each fishery subsector (capture fisheries, fish processing and aquaculture) and the most sensitive communities of each country and its main constraint.

Some major findings are:

- No fisherfolk household from Bahamas, Barbados, Montserrat and Saint Kitts and Nevis was considered to be poor.
- Belize and Guyana, followed by Grenada and Jamaica, were found to be the countries with the highest percentage of poor and vulnerable households. They were also found to be the countries in which households have more trouble in meeting their basic needs.
- In general terms, in the three types of fisheries subsectors studied, the percentage of non-poor households is above the 75 percent mark with the exception of Belize, Guyana, Jamaica and Grenada.
- Capture fisheries is the sector, of the three subsectors studied, most affected by the presence of vulnerable and poor households.
- According to the results of the study, there are no poor households in the fish processing sector.

The study noted that poor people tend to be the most dependent upon the environment and the direct and indirect use of natural resources, such as the coast, and therefore are the most severely affected when the environment is degraded or their access to natural resources is limited or denied. Not only are their economic activities linked to these access issues, but their ability to engage in economic activities can be affected by poor environmental quality and the resulting impact on their health.

The study made a number of recommendations towards poverty reduction in fishing communities. They are related to the following areas:

- improvement of policy processes such as participation of SSF organizations, regular reviews and analysis of policies and assessment of their impacts on SSFs, consideration of how fisheries policy development can be linked to national poverty reduction strategies;¹⁴
- social issues such participation of small-scale fishers in social security systems, microfinance and rural credit schemes in collaboration with related financial agencies and governments to provide fisherfolk and fishers organizations with access to credit for investment in responsible fishing gear and technologies, safety gear and safer practices;
- education and skills including academic fields and training for members of fishers associations in vocational, management and business skills;
- impact on the economy such as improvement of fisheries infrastructure, post-harvest and marketing;
- improvement of fisheries management and co-management;
- empowerment of women in fisheries;
- vulnerability to natural hazards;
- protection of the environment;

¹⁴ The CRFM provides a detailed description and analysis of stakeholders in the eastern Caribbean flyingfish fisheries (CRFM, 2012c) and the Caribbean large pelagic fisheries (CRFM, 2012d).

- conduct a study to determine the aquaculture potential of the different States that would provide conclusions that will support decisions on how to develop the sector, both inland and on the coast.

Fishers' well-being aspirations and implications for governance

Trimble and Johnson (2013) studied the well-being aspirations of fishers in coastal Uruguay and southeast Brazil and discussed their implications for governance. The authors observe that in the regions of Piriapolis, Uruguay, and Paraty, Brazil, artisanal fishers view fishing as a way of life rather than just an occupation. The freedom of fishing and an inherent satisfaction in the occupation are important factors in fishers' attachment to it. However, the authors observe strong indications that the relationship of fishers to fishing is changing.

First, while fishers from both regions wish to keep fishing in the future, they are moving into different occupations or supplementing their work in fishing with other employment. Second, artisanal fishers from Piriapolis and Paraty identified fishing as an undesirable occupation for their children, because they believe that in the future fishing will no longer be a viable occupation. Nonetheless, young men and women in Piriapolis and to a lesser degree in Paraty continue to become involved in fishing and fishing-related activities.

The authors also observe that, while artisanal fishers feel under pressure as ecological conditions worsen, they also feel neglected by state fisheries management agencies. The authors conclude that there is much that state agencies could do to reverse that sense of neglect and thereby to ameliorate conditions for the success of artisanal fisheries. It is suggested that artisanal fishers need to be made to feel that they are valued partners in the governance of fisheries and in coastal development and management. This would be facilitated if state fisheries agencies understood and appreciated fishers' well-being aspirations and took them into account in the communication and public relation strategies and activities.

7.7 Summary

Table 4 summarizes the major findings on poverty, vulnerability and adaptations to livelihoods to a changing environment.

Table 4

Major findings on poverty, vulnerability and adaptations to livelihoods to a changing environment

Subsector / study area	Findings
• <i>Relationships between ecological, economic and social objectives in the Northern South China Sea (NSCS)</i>	
	<ul style="list-style-type: none"> • improvements in conservation status and economic benefits can be achieved by reducing fishing capacity; • solving the alternative livelihood problems appears to be a priority for improving management and conservation in these ecosystems and securing a transition to sustainable livelihoods.
• <i>Impacts of climate variability and change on fishery-based livelihoods</i>	
	<ul style="list-style-type: none"> • impact of climatic changes on fishery resources includes reduced productivity in African lakes attributed to elevated late twentieth century atmospheric temperatures, and increases in the frequency and severity of coral bleaching with

Subsector / study area	Findings
	<p>rising sea surface temperatures in tropical and subtropical coastal zones;</p> <ul style="list-style-type: none"> • impacts of coral bleaching on fish communities include changes in their diversity, size and composition; • fish species distribution has been altered in the North Sea due to recent increases in sea surface temperatures and climate change may lead to numerous local extinctions in the subpolar regions, the tropics and semi-enclosed seas; • manifestations of climate variability and change are changes in ocean currents, ENSO, rainfall, evaporation, river flows, lake levels, thermal structure, storm severity and frequency, acidification, salinity, temperature and ice cover; • manifestations of climate variability and change impact fisherfolk livelihoods at the household and community level in four different areas i.e. (i) production ecology, (ii) fishing operations, (iii) community livelihoods, and (iv) wider society and economy; • effects on production ecology consist of impacts on species composition and diseases; effects on fishing operations consist of impacts on safety and efficiency and infrastructure; effects on community livelihoods consist of loss or damage of livelihoods assets and strategies, impacts on life, risk to health and life, displacement and conflict; effects on wider society and economy are identified as adaptation and mitigation costs, market impacts, water allocation, floodplain and coastal defence; • human social fishing systems, dealing with high variability upwelling systems with rapidly reproducing fish species may have greater capacities to adjust to the additional stress of climate change than fisheries focused on longer-lived and generally less variable species; • fisheries management must strive to enhance the adaptive capacities of these systems to uncertainty and change; • social capital such as high levels of social and institutional trust and dense social networks might result in more positive community perceptions of proposed policies for coastal management regarding adaptations of livelihoods to climate change; • climate change in Bangladesh has an impact on prawn post-larvae fishing; different climatic variables including cyclones, salinity, sea level rise, water temperature, flood, rainfall and drought have adverse effects on coastal ecosystems and cause a decline in the availability of prawn post-larvae and thereby catch; as a consequence, the households of

Subsector / study area	Findings
	post-larvae fishers face a variety of socio-economic constraints.
• <i>Livelihoods diversification</i>	
	<ul style="list-style-type: none"> • the promotion of microenterprises can facilitate livelihoods diversification in fishing communities in the Philippines; a good coordination with local government units, active participation of all stakeholders and conduct of appropriate training programmes is essential for the sustainability of the microenterprises; • involvement of fisherfolk in livelihoods activities and microenterprises is strengthening their participation in the fisheries and aquatic resources management councils; • the push for tourism as a more sustainable alternative to fishing and the relative costs and benefits of fishing and tourism as experienced by local fishers, suggest that the transition from fishing to an economy based to a greater extent on tourism is neither simple, nor necessarily more beneficial for fishers; • a study on income diversification among fishing communities in western Kenya found that income diversification increases the incomes of fish workers; education, membership of an association and access to credit are key factors that are related to income diversification decisions among fishworkers.
• <i>Vulnerability, resilience and adaptations to global changes</i>	
	<ul style="list-style-type: none"> • studies carried out in the Pacific islands on vulnerability, resilience and adaptations of remote rural communities to shocks, institutional and global changes found that social processes such as community cohesion, good leadership, and individual support to collective action were critical factors influencing the perception that people had about their community's ability to build resilience and cope with change; • fisheries-dependent small island economies are particularly exposed and sensitive to climate change and oscillations. The catchability and habitat of pelagic fish are generally strongly affected by deeper thermocline and warmer sea surface temperatures during extreme climate events, resulting in temporary or persistent latitudinal and longitudinal shifts in stock distribution that have major consequences for fish-dependent local economies.
• <i>Livelihoods and globalization</i>	
	<ul style="list-style-type: none"> • there is evidence of an overall increase of welfare

Subsector / study area	Findings
	<p>and signs of a convergence of living standards between rural and urban areas in the regions from where Nile perch is exported in the United Republic of Tanzania; however, fishing villages seem significantly poorer than other villages;</p> <ul style="list-style-type: none"> the prevailing poverty in fishing communities might not be caused so much by Nile perch exports but by the organization of the fishery industry itself and the fact that remuneration of crew members is extremely low compared to the remuneration of boat owners, traders and processors located higher up the value chain;
<ul style="list-style-type: none"> <i>Food security in remote rural areas</i> 	
	<ul style="list-style-type: none"> a study of livelihoods of riverine fishers in a remote region of the Democratic Region of the Congo highlights the dual role of fish as a food and cash crop; poor households rely heavily on fishing for their supply of animal protein, in particular through women's subsistence catches; fishing also is the main source of cash income for the majority of households, including local farmers; SSFs can play a fundamental role in local economies, especially in remote rural areas, where they strengthen significantly the livelihoods of people through their role in both food security and cash-income generation.
<ul style="list-style-type: none"> <i>Poverty, vulnerability and fishers' well-being aspirations</i> 	
	<ul style="list-style-type: none"> a study on poverty in fishing communities of the Caribbean Community found that Belize and Guyana, followed by Grenada and Jamaica, were found to be the countries with the highest percentage of poor and vulnerable households; capture fisheries is the sector, of the three sectors studied, i.e. capture fisheries, fish processing and aquaculture, with the largest proportion of vulnerable and poor households; poor people tend to be the most dependent upon the environment and are the most severely affected when the environment is degraded or their access to natural resources is limited or denied; a study of the well-being aspirations of fishers in coastal Uruguay and southeast Brazil found that artisanal fishers view fishing as a way of life rather than just an occupation; however, fishers are gradually moving into different occupations or supplementing their work in fishing with other employment, because they believe that in the future, fishing will no longer be a viable occupation.

8. PARTICIPATION IN GOVERNANCE AND NATURAL RESOURCE MANAGEMENT AND CONSERVATION

The chapter provides an overview of the participation of fishing communities in local, national and regional governance and in natural and fishery resources management and conservation. Article 7.2 of the Code states that management measures should provide that the interests of fishers including those engaged in subsistence, small-scale and artisanal fisheries are taken into account. Article 5.2 postulates further that States should work for the adoption of measures to address the needs of developing countries, especially in the area of financial and technical assistance, technology transfer, training and scientific cooperation and in enhancing their ability to develop their own fisheries as well as to participate in high seas fisheries, including access to such fisheries (FAO, 2003a).

Participation of fishing communities in governance and resources management arrangements and mechanisms needs to be seen in the framework of an ecosystem approach to fisheries management, which is an integral part of the Code, and of a precautionary approach to fisheries management. The ecosystem approach to fisheries management (EAF) recognizes the need for fisheries management to consider the impact of the ecosystem and other users of the ecosystem on fisheries as well as the broader impact of fisheries on the ecosystem as a whole (FAO, 2003a).

The EAF also strives to balance various societal objectives by taking into account both existing knowledge as well as uncertainties about biotic, abiotic and human components of ecosystems. The EAF further strives to take into consideration the interactions between these components by applying an integrated approach to fisheries management and development within a meaningful ecological context.

In the context of an ecosystem approach to fisheries management and development, this chapter shows why sustainable livelihoods and fisheries and sustainable fisheries management and conservation cannot be achieved without the active participation of fishing communities in local, national and regional governance and resource management and conservation mechanisms and processes. Experiences from different parts of the world with co-management and community-based fisheries and coastal resource management arrangements are described below. The chapter identifies the constraints to an effective participation of fishing communities in governance and resource management and conservation, and documents ongoing efforts to overcome such constraints.

8.1 Asia

The Philippines

Performance of community-based coastal resource management (CBCRM) programmes

The passage of the Local Government Code of 1991 (Republic Act 7160) decentralized government functions to local government units (LGUs) and served as the impetus for the emergence of different co-management arrangements in the Philippines. In the case of coastal fisheries and aquatic resources management, the need to expand the management process beyond the scope of single LGUs, i.e. municipalities, has been recognized. Inter-LGU governance alliances have been created beyond the municipal water boundaries at the ecosystem scale, acknowledging the fact that what one municipality does will eventually affect the adjoining municipality sharing with the same resource.

Maliao, Pomeroy and Turingan (2009) examined the performance of 16 CBCRM programmes in the Philippines using indicators that represented the perceptions of local resource users. The performance indicators were: participation in CBCRM, influence over CBCRM, control over coastal resources, fair allocation of access rights to coastal resources, household income, conflict management, fish abundance and community compliance with fisheries rules.

The authors find that, overall, the CBCRM programmes were perceived to have a significant positive impact. However, the performance of each of the indicators was found to be mixed. Although the CBCRM programmes were perceived to be effective in empowering the local fishing communities,

their perceived impact on improving the state of the local fishery resources remained limited. Moreover, the authors found that the resource users remained sceptical about the programmes' impact on uplifting their livelihoods. The authors conclude that, for CBCRM programmes to be successful, it is important to incorporate ecological and socio-economic considerations in setting up fisheries management regimes.

Espectato *et al.* (2012) reviewed and analysed the experience of such an inter-LGU alliance, i.e. the Southern Iloilo Coastal Management Council (SICRMC), which is the emerging fisheries co-management arrangement in Southern Iloilo, the Philippines. The SICRMC is an inter-LGU alliance of five coastal municipalities to address their common concerns associated with the management of the Panay Gulf including illegal fishing activities and habitat degradation.

The authors evaluate the SICRMC based on eight key indicators for successful fisheries co-management:

- Enabling policies and legislation. This includes the establishment of supportive legislation and authority structures to provide legitimacy to the arrangement.
- Clearly defined boundaries so that the physical boundaries of the area to be managed are defined to avoid possible conflicts related to resource utilization and LGUs' jurisdictional boundaries.
- Participation of resource users affected by the management arrangement.
- Leadership¹⁵ in the council to provide direction and initiative.
- Support from the member-LGUs.
- Conflict management mechanisms so that the council can serve as venue for arbitration and resolution of conflicts among its member LGUs, especially those involving resource use and enforcement of management rules.
- Integrated coastal resource management (CRM) planning and existence of a pragmatic CRM plan to manage the coastal resource of Southern Iloilo, integrating the concerns and priorities of its member LGUs.
- External agents. Participation of other sectors/agents is needed to serve as catalysts in the development process or to facilitate the establishment of the co-management arrangement.

As a result of their evaluation, the authors rated the SICRMC high on the enabling policies indicator, medium on defined boundaries, leadership, conflict management and integrated planning indicators, and low on participation, LGU support, and presence of external agents. The authors conclude that the council has great prospects to succeed provided it works on the seven key conditions where it is rated low or medium. The authors also identify the key challenges posed to the council for it to be truly sustainable. These include the encouragement of the participation of other sectors such as people's organizations and NGOs and having the community i.e. fishers, directly participate in the council either through representation in the board of trustees or in the technical working group.

The authors also describe the evolving role of the academe as an external agent in the arena of fisheries co-management in the Philippines. In the case of the SICRMC, the University of the Philippines, Visayas, served as a neutral catalyst in a politically charged environment by unifying opposing municipalities through their common concern, which is CRM.

Wagner (2012) studies coastal resource use, management and MPAs in the Philippines and comes to similar conclusions as the above studies. Her analysis of coastal resource perceptions and behaviours demonstrates that, while there are documented successes throughout the Philippines in community-based integrated coastal management projects, opportunities and challenges remain to fully realize the benefits identified by local communities.

¹⁵ Gutierrez, Hilborn and Defeo (2011) elaborate on the role of leadership in the promotion of sustainable fisheries management.

Using survey data from 40 communities in Bohol, Luzon, Mindoro Occidental, and Mindoro Oriental, the author finds that coastal resource users acknowledge resource problems such as a decline in fish abundance and catches. However resource users think that the management and conservation of fishery resources are primarily the responsibility of the government and not theirs. The author also finds that barangays (villages) with a community-based MPA are more likely to support restrictions on fishing activity, report fishing violations, and be a member of bantay dagat (sea guards) than villages without an MPA.

Overall, resource users perceive MPAs as being beneficial and are willing to protect larger marine areas. However, community participation in MPA activities and management in the study sites, recognized as a critical factor in the success of community-based management, is low. The author concludes that given the high community acceptance and perceived benefits of MPAs, there is an opportunity to implement more effective management measures and involve participatory processes that take into account local needs and expectations, build capacity, and empower community members to manage their resources.

Cambodia

Impediments to community fisheries management

Sok, Yu and Wong (2012) examine the reasons why co-management of inland fisheries by resource users and state agencies in Cambodia remains difficult to realize. Their survey is carried out in fishing communities of Krakor District, located along Tonle Sap. The authors find that although the commune is a local administrative authority in the context of Cambodia's evolving decentralization reform process, decision-making and accountability in natural resource management have yet to be transferred to, or opened to participation from, local and subcommune-level stakeholders and agencies. Moreover, the authors find that institutional links between the commune council and community fisheries organizations are ambiguous. The authors conclude that lack of linkages between central government, state agencies, and community fisheries organizations has left fisherfolk struggling to stand their ground against more powerful competing interests.

8.2 Caribbean and Latin America

Fisheries management and co-management in Mexico

Cinti *et al.* (2010) investigate the local social and fisheries impact of formal fisheries policies in Bahia de Kino, one of the most important fishing villages in terms of extraction of benthic resources in the north of the Gulf of California, Mexico. Their study focuses on cross-scale institutional interactions and analyses how existing formal policies are functioning on the ground, how these policies interact with local arrangements and how this interaction may affect the incentives of different actors towards sustainable fisheries. Besides providing lessons on how the performance of a local fishery could be improved, their study attempts to answer the questions of whether the formal institutional structure of Mexican fishing regulations is effective in promoting responsible behaviour by SSF stakeholders.

The study finds that the design of the most widely used management tool to regulate access to marine resources throughout Mexico, i.e. the permit and licensing system, provides the wrong incentives for sustainable use. The authors observe that existing requirements to access fishing permits create an institutional environment in which people who are not necessarily closely attached to the fishing activity and/or community decide to enter the fishery for business purposes. Often, full-time fishers do not have the means, the capacity and/or the time to fulfil the requirements and successfully navigate through the bureaucracy in order to access a fishing permit.

The authors observe that, as a result, the system tends to promote the disconnection of rights holders from the resource and to intensify rent-seeking interests. While the authors acknowledge that fishers cooperatives can also acquire permits and licences, they observe that cooperatives functioning in the area of their study are often dominated by a few individuals, who are often not members of traditional fishing communities, and that these cooperatives do not truly represent the interests of fishers or promote responsible fishing practices. The authors suggest that the present system of permits and

licences should be replaced by the granting of secure rights of access to resources to those who are already actively involved in a fishery, as a necessary step for promoting sustainable fishing practices.

The findings of another study carried out with ten fishery cooperatives of the Pacific coast of Mexico suggest that, if fishing permits are acquired by well-functioning cooperatives, active fishers can actually be successfully involved in the co-management of fishery resources (McCay *et al.*, 2013). The authors observe that these cooperatives hold exclusive rights to “concession” territories for major fisheries, i.e. territorial use rights, and that they are linked by geographic adjacency and through a federation.

The authors identify the key factors that contribute to the successful co-management arrangement as: smallness of scale; productivity and visibility of the resources and fisheries involved; clarity of social and territorial boundaries; adjacency and linkages among territorial units; and a strong sense of community. The authors also observe that the cooperatives made considerable investments in attaining high levels of knowledge, leadership, transparent and democratic decision-making and enforcement of the rules for the running of the organization.

Governance of large-pelagic and flying fish fisheries in the Caribbean Large Marine Ecosystem

Efforts are ongoing in the Caribbean Large Marine Ecosystem (CLME) to introduce efficient governance arrangements¹⁶ at the regional and national levels, for large pelagic as well as for flyingfish fisheries (Tietze and Singh-Renton, 2012a, 2012b; Berry and Tietze, 2012a, 2012b). In the framework of CARICOM and the CLME project, a strategic action programme (SAP) has been prepared for achieving effective governance and management of flyingfish fisheries and large pelagic fisheries in the Wider Caribbean Region (WCR). A transboundary diagnostic analysis carried out by the CLME project identified three priority transboundary problems that affect the CLME: unsustainable exploitation of fish and other living resources; the degradation and modification of natural habitat; and pollution and contamination.

Case studies carried out by the CRFM strengthened the technical-scientific information and knowledge base, identified gaps and examined options for promoting precautionary and ecosystem approaches to fisheries governance for the Eastern Caribbean flyingfish fishery and for the large pelagic fishery. Stakeholders were involved from the very beginning in the preparation, conduct and review of these studies, both at the national as well as at the regional level.

The overall vision of the SAPs for flyingfish fisheries and for pelagic fisheries in the WCR encompasses healthy marine ecosystems that are adequately valued and protected through robust, integrative and inclusive governance arrangements at the local, national, subregional and regional levels. Such arrangements should effectively enable adaptive management that maximizes, in a sustainable manner, the provision of goods and services in support of enhanced livelihoods and human well-being.

The overarching ecosystem quality objective encompasses healthy ecosystems including the conservation, protection and/or restoration of the fish stocks and biodiversity of the ecosystems. The overarching societal benefit objective encompasses the provision of goods and services by the ecosystems so that it maximizes the systems contributions to societal well-being and development needs in the WCR, including the preservation of aesthetic, traditional, health and scientific values of the ecosystem.

The objectives of the SAP for flying fish fisheries are fully compatible with the management goals, objectives and indicators proposed in the 2012 Update of the Sub-regional Management Plan for Flyingfish Fisheries in the Eastern Caribbean, which is currently being reviewed at the national level by all stakeholders. The SAP identifies broad interventions, strategies, targets, indicators, investments,

¹⁶ FAO, in close cooperation with the CRFM, conducted case studies in selected Caribbean countries and identified socio-economic indicators that can be used in integrated coastal zone and community-based fisheries management (FAO, 2006a).

timeframes, costs and responsibilities that are needed for achieving effective governance and management of flyingfish fisheries in the WCR. Based on the findings of the case studies, these broad interventions are further subdivided into specific interventions and reforms to be implemented for effective governance and management of the flying-fish fisheries and large pelagic fisheries using precautionary and ecosystem-based approaches. For each of the specific interventions, priority, time frames, costs, and the party/stakeholder responsible for implementation are identified.

8.3 Africa

Fisheries restoration and public participation in Lake Victoria and Lake Tanganyika

Van der Knaap (2013) observes that four decades after the initial export of Nile perch from Lake Victoria, Nile perch resources are under pressure. While there is a form of co-management in place, it is not clear who is responsible for resource management. The author notes that fishers claim that governments are responsible, while governments say that the fish export industry is responsible.

In 2003, results of six years of research led the Council of Ministers of the LVFO to endorse the recommendation to enforce fisheries management measures. These management measures included lake-wide technical controls such as minimum gillnet mesh size limits for Nile perch and tilapia, minimum mesh size limits for gillnets targeting dagaa, and minimum sizes for Nile tilapia for capture, processing and trading. The following gear types and methods were prohibited for use on Lake Victoria: trawling, beach seines, monofilament nets, cast nets, driftnets, and the use of chemicals and explosives. Vertical joining of nets was made illegal and gillnets more than 26 meshes deep were prohibited. In addition, other requirements and legislation were introduced requiring fishers to hold a current individual fisher licence and a vessel fishing licence or permit, but these measure have been poorly implemented.

When the measures came into force, they were initially strictly adhered to, but with time, the authorities relaxed them until many management measures were discontinued. The author reported that identical measures were adopted by the Council of the LVFO in 2009, and that this resulted in the professional fish export associations rigidly maintaining one portion of the measures, while claiming that no scientific evidence existed for the other part.

The co-management system making use of BMUs is well developed on Lake Victoria, but has only been partly introduced to the shores of Lake Tanganyika, where no other management structures have existed for many years. On Lake Tanganyika, an industrial fishery was operational in the northern part of the lake from the mid-1970s to the mid-1990s. This fishery gradually moved southwards with time and was eventually outcompeted by the emerging artisanal fishery, whose fishing effort is still increasing. The author concludes that while riparian Governments subscribe to international action plans, messages have yet to be put across to the fishing communities about the restoration of the lakes' ecosystems.

The Lake Tanganyika Authority, with support from the Lake Tanganyika Large Marine Ecosystem Project and various donors, has prepared an ambitious SAP for the biodiversity and sustainable management of natural resources in Lake Tanganyika and its basin (Lake Tanganyika Authority Secretariat, 2012).

8.4 Summary

Table 5 summarizes the major findings on participation in governance and natural resources management and conservation.

Table 5

Summary overview of the major findings on participation in governance and natural resources management and conservation

Subsector / study area	Findings
• <i>Participation in governance and natural resources management and conservation</i>	
	<ul style="list-style-type: none"> • participation of fishing communities in governance and resources management arrangements and mechanisms needs to be seen in the framework of an ecosystem approach to fisheries management, which is an integral part of the Code and of a precautionary approach to fisheries management;
	<ul style="list-style-type: none"> • sustainable livelihoods and fisheries and sustainable fisheries management and conservation cannot be achieved without the active participation of fishing communities in local, national and regional governance and resource management and conservation mechanisms and processes;
• <i>Performance of community-based coastal resource management (CBCRM) programmes in the Philippines</i>	
	<ul style="list-style-type: none"> • although the CBCRM programmes were perceived to be effective in empowering the local fishing communities, their perceived impact on improving the state of the local fishery resources remained limited;
	<ul style="list-style-type: none"> • key indicators for successful fisheries co-management at this level are enabling policies and legislation, clearly defined boundaries, participation of all resource users affected by the management arrangement, appropriate leadership in the council for direction and initiative, full support from the member LGUs, conflict management mechanisms, integrated coastal resource management (CRM) planning and existence of a pragmatic CRM plan to manage the coastal resource and the participation of other sectors/agents to serve as catalysts;
• <i>Impediments to community fisheries management in Cambodia</i>	
	<ul style="list-style-type: none"> • although the commune is a local administrative authority in the context of Cambodia's evolving decentralization reform process, decision-making and accountability in natural resource management have yet to be transferred to, or opened to participation from, local and subcommune level stakeholders and agencies;
• <i>Fisheries management and co-management in Latin America and the Caribbean</i>	
	<ul style="list-style-type: none"> • existing requirements to access fishing permits create an institutional environment in which people who are

Subsector / study area	Findings
	not necessarily closely attached to the fishing activity and/or community decide to enter the fishery for business purposes;
	<ul style="list-style-type: none"> • present system of permits and licences should be replaced by the granting of secure rights of access to resources to those already actively involved in a fishery as a necessary step for promoting sustainable fishing practices;
	<ul style="list-style-type: none"> • if fishing permits are acquired by well-functioning cooperatives, active fishers can actually be successfully involved in the co-management of fishery resources. These cooperatives hold exclusive rights to “concession” territories for major fisheries, i.e. territorial use rights, and that they are linked by geographic adjacency and through a federation;
	<ul style="list-style-type: none"> • in the framework of CARICOM and the Caribbean Large Marine Ecosystem Project (CLME project), strategic action programmes (SAPs) have been prepared for achieving effective governance and management of flying-fish fisheries and large pelagic fisheries in the Wider Caribbean Region (WCR);
<ul style="list-style-type: none"> • <i>Fisheries restoration and public participation in Lake Victoria and Lake Tanganyika</i> 	
	<ul style="list-style-type: none"> • while the co-management system making use of beach management units (BMUs) is well developed on Lake Victoria, it has only been partly introduced to the shores of Lake Tanganyika, where other management structures have existed for many years. Studies conclude that while riparian Governments subscribe to international action plans, messages have yet to be put across to the fishing communities about the restoration of the lakes’ ecosystems;

9. THE ROLE OF WOMEN IN SMALL-SCALE FISHERIES

This chapter provides an overview of the social, economic and occupational role that women play in fishing communities in different parts of the world. The chapter also documents cases where women in fishing communities have been empowered and enhanced their social, economic and political roles in their communities and in the fishery industry. The chapter further identifies constraints to the full social, economic and political participation of women, as well as opportunities for overcoming these constraints.

The 1984 FAO World Conference on Fisheries Management and Development stressed the crucial role women play in fishing communities all over the world. Their role encompasses social and economic responsibilities and duties, both within and outside the family, including marketing, processing and also harvesting and farming of aquatic organisms, among other things. Following the conference, FAO and other organizations placed an emphasis on women as a special target group of integrated SSF development projects. Technical assistance projects promoted and introduced alternative and supplementary income-generating activities for women to strengthen their economic role, and promoted the empowerment of women through training, capacity building and support to

forming groups and associations. FAO also published widely distributed and used guidelines on women in fishing communities as a special target group of fisheries development projects (FAO, 1988).

Technical assistance projects and studies also promoted the access of women to family planning services and their reproductive rights. Studies carried out by FAO with support of the United Nations Population Fund had shown that high fertility rates in fishing communities negatively affected their livelihoods because large families were difficult to feed and sustain, and contributed to the growth of the numbers of small-scale fishers, which put more pressure on already heavily fished inshore fishery resources (FAO, 2000b). Projects in the Philippines tried to improve the status of women in fishing communities by combining economic empowerment through microenterprise development and microfinance with family planning and reproductive health education (FAO, 2003b).

In 1997, the United Nations Economic and Social Council adopted gender mainstreaming as the methodology by which the entire UN system would work towards the advancement of women and gender equality goals (FAO, 2012, p. 107). In 2000, all UN Member States and more than 23 international organizations agreed to the Millennium Development Goals (MDGs), and the issue of promoting gender equality and empowering women (MDG 3) was again highlighted on the international agenda. The objective was one of ensuring that, in whatever sector they may be working, men and women should have equal rights to participate in the development process, and their interests and needs should be protected.

However, despite these efforts and proclamations, the substantial role of women in fisheries is still overlooked in management and policy. This is the finding of a recent review by Harper *et al.* (2013). The authors also note that this fact is gaining recognition, despite the lack of quantitative data describing the scale of participation and contribution. Their review summarizes existing knowledge on women's participation in marine fisheries globally, which is referred to in the subchapters below.

The authors conclude that recognizing and quantifying the role of women in fisheries has profound implications for management, poverty alleviation and development policy. Some specific management and policy recommendations identified by the authors include: better utilization of women's ecological knowledge in fisheries management, particularly in developing policies concerning biodiversity, conservation and climate change; a need to highlight women's indirect inputs to the economy and unpaid work as a way to better understand the overall dynamics of fisheries economies; a collection of gender-specific fisheries participation data; and improved inclusion of women in decision-making processes.

9.1 Asia and the Pacific

Women play an important role in the SSF sector of the Asia and Pacific region. They are involved in all stages of the industry from fish and shellfish farming to harvesting, processing and marketing of fish products. Harper *et al.* (2013) estimate that, in the Pacific region, women account for 56 percent of annual SSF catches, which is equivalent to USD110 million in revenue.

In India, the participation of women in pre- and post-harvest fishery operations is substantial, involving half a million women out of a total workforce of 1.2 million (FAO, 2003c). According to the Central Institute of Fisheries Education (CIFE), women constitute 25 percent in pre-harvest activities, 60 percent in export marketing and 40 percent in internal marketing. Women are also involved in small-scale aquaculture, particularly as caretakers of homestead fish ponds, nurseries, cages and of fish farming in rice fields. According to CIFE, the potential and opportunities can be further enhanced in the field of pond fish culture, raising fry and fingerlings in seasonal ponds, backyard hatchery management, integrated aquaculture, management of fish pens and cages, crab culture, and aquarium fish breeding.

A national workshop on best practices in microfinance programmes for women in coastal fishing communities in India organized by FAO in cooperation with NABARD identified and prepared technical and financial feasibility studies for 18 income-generating activities and microenterprises in

the fields of mariculture, freshwater aquaculture, fish and fishery product processing, services and agriculture that are suitable for women in fishing communities (FAO, 2003c).

These activities and microenterprises can be adopted and implemented with training, organizational and financial/credit support from financial and microfinance institutions, government agencies and NGOs. Many of these activities are appropriate for other countries in the region and others are already carried out by women from small-scale fishing communities in Asia and the Pacific:

- Mariculture: mussel culture, oyster culture, crab fattening.
- Freshwater aquaculture: backyard hatchery for giant freshwater prawns, carp seed nurseries.
- Fish and fishery product processing: smoked fish, hygienically dried and packed fish, battered and breaded fish products for bakeries, caterers and restaurants, fish silage preparation from fish waste, shellcraft production, hygienic preparation of masmin (boiled, salted and smoked tuna).
- Services: fish vending stalls, fish fast-food counters, setting up and maintenance of aquariums, contract cleaning of fish markets, net-making by hand.
- Agriculture: organic farming on leased land.

Women are also actively involved in beach seine fishing operations and in marketing and processing of the catch in India (Tietze *et al.*, 2011), Sri Lanka and other Asian countries. Women also participate in small-scale fishing operations, particularly in Southeast Asian countries such as Cambodia, the Philippines, Thailand and Viet Nam, often as part of crews consisting partly of family members.

Harper *et al.* (2013) highlight the changing role of women in Asian fisheries. They attribute these changes to several factors, including increased aquaculture production, movement of labour between countries, and evolving social status of women. The authors point out that, as the largest aquaculture producing region in the world, Asia has an increasing number of women involved in this sector. In China, which generated 62 percent of the world aquaculture production in 2008, women represent 33 percent of the rural aquaculture labour force. In Indonesia and Viet Nam, women accounted for 42 and 80 percent of the aquaculture labour force, respectively. Women who were traditionally involved in collecting shellfish and other seafood along the shore have moved to neighbouring countries and the Near East to work as domestic helpers or in other jobs.

Examples of two successful projects implemented by FAO show how women and their households and families can be economically strengthened and their livelihoods diversified. In Viet Nam, the project was undertaken in close cooperation with national and local partners in the provinces of Lai Chau, Son La and Hoa Binh (FAO, 2003b, pp. 77–103). In the Philippines, the project was undertaken in the provinces of Capiz and Pangasinan (FAO, 2003b, pp. 67–76). The projects show how women at the same time can be socially and politically empowered through introduction of new income-generating activities, microfinance support, establishment of associations and groups, training and capacity building.

As an evaluation showed, the new livelihoods activities introduced by the projects (small-scale aquaculture in Viet Nam, and a variety of livelihoods activities in the Philippines) are continuing many years after the projects and so are the associations formed during the life span of the projects. The political empowerment of women is shown by the fact that the associations and their members gained political influence and their voices were heard particularly during election times. Some of the members have also been elected to local governments.

9.2 Latin America and the Caribbean

Harper *et al.* (2013) observe that, in Latin America and the Caribbean, women participate directly in fishing-related activities, and indirectly in supporting fisher families and communities. As in other regions, women are more involved in processing, aquaculture and marketing than in capture fisheries. The authors find that women in the region are beginning to organize themselves and find a collective voice in fishworker cooperatives in order to raise their profile within fishing communities and at the

level of government. Through participation in workshops and conferences, women are starting to contribute to discussions on the link between sustainable fisheries and healthy fishing communities.

Women also participate in the management of marine protected areas in Brazil (Di Ciommo and Schiavetti, 2013). The Marine Extractive Reserve Corumbau (MERC), a type of Sustainable Brazilian Conservation Unit, was created for the sustainable use of fishing resources. The authors observe, however, that women's participation in meetings of the MERC is limited and hampered by factors related to gender, unmet expectations and lack of information.

According to the authors, women declared that meetings at MERC have been held within a male space that takes away their spontaneity to express their points of view. Another difficulty pointed out is to find someone to replace them with the children, when their husbands are away from home attending the meetings. Therefore, in general it is hard for husband and wife to participate together in a meeting.

The lack of recognition of women's specific needs leads women not to participate in meetings and decision-making for collective action. The authors found that women have difficulties to access social security and benefits of the "closed season" aid. This was found to be an important factor reported by the women as a frustration with the benefits they expected from MERC. The authors conclude that the dynamics of the meetings and the decision-making process need to address specific women's needs and priorities with gender-sensitive measures.

9.3 Africa

Harper *et al.* (2013) report that, in the Congo, up to 80–90 percent of fish traders are women. In West Africa, women play a key role in the processing and financing of fisheries. The authors observe, however, that women's role in fish processing has changed with the increased demand for fresh fish on the international market. Fish is increasingly sold fresh to retailers supplying European markets, transferred directly to boats destined for Europe or to factories designed with European health specifications in mind. The authors conclude that, while providing economic opportunities to some, this expansion came at the expense of many women involved in the fishery sector.

Market women in West Africa provide credit to fishermen and maintain well-defined client–patron relationships. Although women in West Africa are generally not involved in fish capture, they have a key role in distributing fish, which determines economic returns to the family, and in support activities such as supplying provisions, e.g. ice, bait and salt, and repairing fishing gear. As far as fishing with beach seines is concerned, a study carried out by FAO found that, in Benin, the Gambia, Ghana, Togo and Mozambique, women play an important role in beach seining as well as in the entire fisheries sector (Tietze *et al.*, 2011). They participate in the hauling of beach seines, provide credit and are engaged in the processing, storing and marketing of fish.

Harper *et al.* (2013) further report that in Mozambique women collect shellfish and other organisms from the intertidal zone. In the United Republic of Tanzania, women engage in seaweed farming, octopus trapping and catching small fish in the intertidal zone. However, as octopus has become a valuable commodity on the international market, women are being increasingly displaced by men from this activity. Women play also a role in fish marketing on Lake Victoria. Medard (2012) shows how women's interests are particularly involved in the less lucrative dagaa fishery, and suggests that their involvement as the fishwives of mostly male owners and investors needs attention in management schemes.

Similarly, Lwenya and Yongo (2012) report that fishermen's wives occupy a central place in the fishing sector of Lake Victoria. According to the authors, these women dominate the onshore post-harvest activities while fishing itself is dominated by men. The women compete with other women from their own communities as well as with outsiders. The authors observed that, in recent years, women from outside the local communities have gained more influence, and fishermen's wives have responded by forming social networks with fish suppliers in order to be supplied with enough fish. The women also exert influence as creditors to fishermen to secure fish supplies.

Hauzer, Dearden and Murray (2013) studied fisherwomen of Ngazidja island, the Comoros. The authors observe that women on Ngazidja have fished for generations. However, authorities have recently attempted to ban them from fishing as their fishing practices were considered destructive to near-shore reefs and juvenile fish populations. While the authors admit that the women's fishing methods can be destructive and may have contributed to localized declines in intertidal marine resources and habitats, they also note that fisherwomen provide substantial contributions to household livelihoods and food security through their fishing practices. The authors conclude that banning the women's fishing activities altogether is not an acceptable solution. Instead, authorities should work to empower fisherwomen with the tools necessary to manage their fishery sustainably, which will eventually lead to improved conservation measures.

9.4 Summary

Table 6 summarizes the major findings on the role of women in SSFs.

Table 6

Summary overview of the major findings on the role of women in small-scale fisheries

Subsector / area of study	Findings
• <i>Asia and the Pacific</i>	<ul style="list-style-type: none"> • women play an important role in the SSFs sector of the Asia and Pacific region. They are involved in all stages of the industry from fish and shellfish farming, harvesting to processing and marketing of fish products; • in the Pacific region alone, women account for 56 percent of annual SSF catches, which is equivalent to USD110 million in revenue; • in India, the participation of women in pre- and post-harvest fishery operations is substantial, involving half a million women out of a total workforce of 1.2 million; women constitute 25% of the labour in pre-harvest activities, 60% in export marketing and 40% in internal marketing; • women are also involved in small-scale aquaculture, particularly as caretakers of homestead fish ponds, nurseries, cages and of fish farming in rice fields; • studies observe that the role of women in Asian fisheries is changing. These changes can be attributed to increased aquaculture production, movement of labour between countries and evolving social status of women; • in China, women represent 33% of the rural aquaculture labour force and in Indonesia and Viet Nam, women accounted for 42 and 80% of the aquaculture labour force, respectively; women who were traditionally involved in collecting shellfish and other sea food along the shore have moved to neighbouring countries and the Near East to work as domestic helpers or in other jobs; • projects in the Philippines, Viet Nam and elsewhere have demonstrated how women and their households and families can be economically strengthened and their livelihoods diversified;
• <i>Latin America and the Caribbean</i>	
	<ul style="list-style-type: none"> • in Latin America and the Caribbean, women participate directly in fishing-related activities and indirectly in

Subsector / area of study	Findings
	<ul style="list-style-type: none"> supporting fisher families and communities; as in other regions, women are more involved in processing, aquaculture and marketing than in capture fisheries; women in the region are beginning to organize themselves and find a collective voice in fishworker cooperatives in order to raise their profile within fishing communities and at the level of government;
• <i>Africa</i>	
	<ul style="list-style-type: none"> in West Africa, women play a key role in fish processing and marketing as well as in the financing of fisheries; market women in West Africa provide credit to fishermen and maintain well-defined client–patron relationships; their role in fish processing, however, has changed with the increased demand for fresh fish on the international market; fish are increasingly sold fresh to retailers supplying European markets, transferred directly to boats destined for Europe or to factories designed with European health specifications in mind; women play an important role in beach seining; in East Africa, women also collect shellfish and other organisms from the intertidal zone and engage in seaweed farming, octopus trapping and catching small fish in the intertidal zone; women play also a role in fish marketing on Lake Victoria, particularly in the less lucrative dagaa fishery; fishermen’s wives occupy a central place in the fishing sector of Lake Victoria.

10. GENDER EQUALITY IN FISHING COMMUNITIES

Global reviews and conferences

In 1997, the United Nations Economic and Social Council adopted gender mainstreaming as the methodology by which the entire UN system would work towards the advancement of women and gender equality goals (Chapter 9). Gender mainstreaming was understood as the process of assessing the implications for women and men, of any planned action, including legislation, policies or programmes. Gender mainstreaming was understood as a strategy for making women’s as well as men’s concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres so that women and men benefit equally and inequality is not perpetuated. The ultimate goal of mainstreaming was to achieve gender equality.

The State of World Fisheries and Aquaculture 2012 (FAO, 2012, pp. 107 ff.) draws attention to the fact that the issues of women, gender¹⁷ and fisheries have been highlighted in a series of international and global symposiums and other related initiatives. These include the Global Conference on Aquaculture 2010, which recommended action to support gender-sensitive policies and implement programmes in line with globally accepted principles of gender equality and women’s empowerment, and the 2011 Special Workshop on Future Directions for Gender in Aquaculture and Fisheries Action, Research and Development, held in Shanghai, China.

¹⁷ See also FAO’s policy briefs on gender policies for responsible fisheries in support of gender equality and livelihoods in SSFs (FAO, 2007b), and Bennet (2005), who elaborates on gender, fisheries and development.

The workshop produced a working draft of a working vision statement for mainstreaming gender in the aquaculture and fisheries sectors, i.e. to promote and achieve gender equity in the aquaculture and fisheries sector in support of responsible and sustainable use of resources and services for food and nutrition security, quality of life of all stakeholders, primarily women, children, vulnerable and marginalized groups/communities.

With a view to achieving gender equality, FAO, its Members and stakeholders proposed that governments, the international community and civil society should work together to:

- eliminate discrimination under the law, improving women's endowments, opportunities and agency to help shape more positive outcomes for the next generation;
- promote equal access to resources and opportunities, reducing barriers to more efficient allocation of women's skills and talents and helping to generate large (and growing) productivity gains;
- ensure that policies and programmes are gender-aware, increasing women's individual and collective agency to produce better outcomes, institutions and policy choices;
- make women's voices heard as equal partners for sustainable development, in addition to helping to achieve the MDG of promoting gender equality;
- empowering women, mainstreaming gender is an essential component of alleviating poverty, achieving greater food and nutrition security, and enabling sustainable development of fisheries and aquaculture resources.

FAO proposed further that gender considerations should be firmly placed on all fisheries and aquaculture policy agendas at all geographical and institutional scales and that a coalition of gender champions, informed researchers, expert networks and policy advocates would be necessary to accomplish the task.

The FAO Policy on Gender Equality (FAO, 2013c, p. 5) highlights that clear synergies exist between FAO's mandate and its gender equality goal and objectives. FAO believes that progress towards eliminating hunger and poverty will result from: (i) ensuring that its programmes and projects, as well as its normative work, reduce the gap between rural women and men in access to productive resources and services; (ii) ensuring that women and men have the ability to influence programme and policy decision-making, and building institutional responsiveness and accountability (voice); and (iii) ensuring that rural women and men can take up economic opportunities to improve their individual and household well-being.

Women's ability to articulate their needs and priorities will facilitate the ability of rural institutions in member countries to address women's needs and become more accountable to both women and men farmers. Both women and men need an enabling environment to exercise choices and transform them into desired actions and outcomes.

The following objectives, to be achieved by 2025, will guide FAO's work in advancing equality of voice, agency and access to resources and services between women and men (FAO, 2013c, p. 7):

- Women participate equally with men as decision-makers in rural institutions and in shaping laws, policies and programmes.
- Women and men have equal access to and control over decent employment and income, land and other productive resources.
- Women and men have equal access to goods and services for agricultural development, and to markets.
- Women's work burden is reduced by 20 percent through improved technologies, services and infrastructure.
- The share of total agricultural aid committed to projects related to women and gender equality is increased to 30 percent.

Women's productive tools and role in fisheries management

A global review of women's access to productive tools and their roles in fisheries management (Lentisco and Lee, 2015) found that some women have direct access to natural and economic resources. However, there are many challenges that limit women's access to and control of fishery resources and the ownership of productive tools. The challenges identified by the review include women's own perception of themselves and those of others, taboos, lack of recognition as a professional activity, or the lack of representation in fisheries organizations and of access to credit, technology, information and capacity building.

The review suggests that it is important to continue and improve support to women's post-harvest activities, microfinance, and access to markets. However, this should be complemented by facilitating women's access to productive assets such as boats and fishing gear, technology, and services such as technical skills, guaranteeing their rights of access and control, and enhancing their full participation in decision-making. The review suggests that by being a primary producer, i.e. vessel owner, women's rights to access and control of the resource management decisions are better guaranteed. This could be achieved by an enabling policy and legislative environment, through determining fishing gear and methods and licensing processes with a gender perspective. The review also observes that management arrangements such as co-management can actively increase the participation of women in decision-making.

10.1 Asia

Gender audit of BOBLME project

Despite the above proclamations, a recent gender audit of the FAO-supported Bay of Bengal Large Marine Ecosystem (BOBLME) project found uneven progress in tackling gender inequalities and accounting of gender issues (BOBLME, 2012). The gender audit noted a cultural and institutional environment in the eight BOBLME member countries that may not be at all times conducive to gender mainstreaming initiatives. The partner countries of the BOBLME are Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka, and Thailand.

More specifically, the majority of the BOBLME project documents audited were found to be gender-blind. Notwithstanding the fact that the BOBLME project is already quite advanced, the auditor identified entry points to mainstream gender in the project's SAP. These include:

- addition of a statement of political will or commitment to gender;
- consideration of gender-sensitive actions;
- addition of a section on cross-cutting issues covering gender training, communication, legislation, capacity building at the field level, gender-disaggregated data collection and research on gender issues;
- consideration of incentives and accounting mechanisms;
- earmarking of a specific budget for gender-related activities at project level and strategic actions;
- addition of a pathway to impact;
- use of outcome mapping as a form of monitoring and evaluation.

10.2 Africa

Gender perspective on adaption to climate change

While sub-Saharan Africa does not contribute significantly to greenhouse gas emissions, it is one of the regions that may be hardest hit by the impacts of climate change. Climate change is projected to intensify floods and droughts in Ghana, a region in which these climate extremes already pose severe economic hardships. Codjoe, Atidoh and Burkett (2012) assess the preferred adaptation strategies during floods and droughts of males and females in three different occupations, i.e. farming, fishing, and charcoal production. Their findings are based upon an analysis of focus group discussions and a

ranking of preferred adaptation options in three communities in the Afram Plains of Ghana. The authors hope that their assessment will aid in the selection and implementation of adaptation options for communities and households, which is the level at which climate change adaptation is likely to occur in West Africa.

The authors found that the three preferred adaptation strategies for female fishers during drought were seasonal forecasts, post-harvest technology and fish pond, in that order. Male fishers chose fish pond, fish culture and crop insurance as adaptation strategies.¹⁸ The authors concluded that weather forecasts were more important for female fishers as access to daily weather information will help them to know when to go fishing. Male fishers who venture out farther into the lake do not rely as much on weather forecast. However, this could also be interpreted as female fishers being more careful and thoughtful than their male counterparts.

Female fishers also scored higher in the need for post-harvest technology as the second preferred adaptation because during drought, post-harvest fisheries activities provided a wide range of full-time and seasonal livelihoods opportunities such as salting, smoking and the subsequent sale of fish during the lean season to provide extra income. Moreover, the authors observed that male fishers scored fish ponds and fish culture as their first and second adaptation strategies for drought because they are both regular sources of income. Male fishers stated that fish could be used as barter for vegetables and other food crops during periods of drought to supplement household food requirements. In addition, a fish pond as an adaptation strategy during drought will create employment for local community members who are involved in fish processing and selling. Male fishers also expressed concern about the sustainability of fishing activities on the Volta Lake during drought, which helps explain why they preferred fish ponds and fish culture as an adaptation to drought.

10.3 Latin America

Changes in division of labour and social status through seaweed cultivation

Brennan (2013) studied the implementation of a seaweed cultivation project in a Brazilian artisanal fishing community in Guajiru. The fishing community is about 120 km from the city of Fortaleza, Ceará, where increased tourism, depleted wild fish populations, and land reassignment have caused negative socio-environmental changes. The author observes that the seaweed project is innovative in two respects. First, it blends traditional ideologies and skills with new technologies to produce an alternative source of income, one with the potential to be both renewable and environmentally responsible. Second, it encourages women to take part in the cycle of production as both participants and leaders, and in doing so gives them greater access to community resources, from finances, to government benefits and legal rights, to educational opportunities, to raw seaweed and its derivative products. This increased access should allow women to elevate their social status and improve their quality of life, as long as seaweed cultivation can be as culturally valued and as economically profitable as fishing has been for men.

The author concludes that the project has improved the availability and value of communal resources and lessened habitually gendered labour divisions. As a result, women have begun to elevate their social status and shift the community's main livelihoods from fishing to sustainable aquaculture. It is finally concluded that the future success of the seaweed project hinges on women's increasing involvement as participants and leaders.

10.4 Summary

Table 7 summarizes the major findings on gender equality in fishing communities.

¹⁸The ponds in question are referred to as controlled ponds, reservoirs and artificial lakes, which also hold water during periods of drought.

Table 7

Summary overview of the major findings on gender equality in fishing communities

Subsector / area of study	Findings
• <i>Gender mainstreaming</i>	
	<ul style="list-style-type: none"> • is a strategy for making women's as well as men's concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres so that women and men benefit equally and inequality is not perpetuated;
• <i>Women's productive tools and role in fisheries management</i>	
	<ul style="list-style-type: none"> • there are many challenges that limit women's access to and control of fishery resources and the ownership of productive tools; • the challenges include women's own perception of themselves and those of others, taboos, lack of recognition as a professional activity or the lack of representation in fisheries organizations and to credit, technology, information and capacity building; • support to women's post-harvest activities, microfinance, and access to markets should continue and improve; • women's access to productive assets, such as boats and fishing gear, technology, and services, such as technical skills training should be facilitated, guaranteeing their rights of access and control, and enhancing their full participation in decision-making;
• <i>Gender perspective on adaptation to climate change</i>	
	<ul style="list-style-type: none"> • climate change is projected to intensify floods and droughts in Ghana, a region in which these climate extremes already pose severe economic hardships; • studies identified gender-specific differences among males and females in three different occupations in the preferred adaptation strategies during floods and droughts;
• <i>Changes in division of labour and social status through seaweed cultivation</i>	
	<ul style="list-style-type: none"> • seaweed cultivation project in a Brazilian artisanal fishing village has improved the availability and value of communal resources and lessened habitually gendered labour divisions; • as a result, women have begun to elevate their social status and shift the community's main livelihoods from fishing to sustainable aquaculture.

PART 3

11. ISSUES IN COASTAL COMMUNITIES IN SELECTED DEVELOPED COUNTRIES

This chapter provides an overview of how indigenous and coastal fishing communities in selected developed countries in some regions, i.e. the Pacific Northwest, East Asia and the North Atlantic arc, have tried to adapt themselves to the challenges posed by overfishing, degradation of coastal ecosystems, demographic changes, population growth and industrial development, shipping, oil and natural gas exploration, tourism, housing and urban development in coastal and riparian areas, and other changes. The chapter attempts to identify lessons that might be useful for fishing communities in developing countries that are or will be facing similar challenges.

11.1 Transition and status of coastal fishing communities in Japan and the Republic of Korea

The Republic of Korea: coastal fishing communities in transition

Degradation of marine ecosystems, development of tourism and privatization of common property resources

As in other countries, maritime waters in the Republic of Korea are common property, publicly owned and controlled by the government. Government regulations stipulate that permits granted by the national or local governments allow occupancy and/or use of public waters for a specific purpose. Licensing is frequently used as a means to control and to manage the public waters of the Republic of Korea. Similar to the case of Japan, the government grants use rights or permits to local fisheries cooperatives, which conduct the actual management and exercise the use right.

In the Republic of Korea, as in Japan, the law gives fishery cooperatives a major role in fisheries management and regulation. Access to the fishery requires membership of a cooperative. The system of rights gives the fishers the right to determine their own fishery resource management approaches suitable to local conditions. This type of institutional arrangement portrays an active involvement of the cooperative and the substantial support from government.¹⁹

As in other countries, coastal fisheries in the Republic of Korea have been adversely affected by fishery resource depletion, outmigration, degradation of the coastal and aquatic environment, and coastal development. Kim *et al.* (2007) provide evidence that marine ecosystems, including the fish community in the waters of the Republic of Korea, have been seriously affected by oceanographic changes caused by climate variability and change. The authors observe that, while each species has responded differently, species diversity is generally lessening, and the mean trophic level of each ecosystem has decreased in the last three to four decades.

At the same time, the size and capacity of the fishing fleet of the Republic of Korea has increased considerably in the course of the expansion of offshore fisheries, the establishment of a 200-mile exclusive economic zone, and a rapid commercialization of coastal fisheries. This has led to overfishing, a decrease in fish stocks and depletion of fish resources for small-scale artisanal fishers. In response to this situation, the government has embarked on a fishing vessel buyback programme (FAO, 2000a, p. 80). Among the vessels removed were as many as 397 coastal fishing vessels, which represented 64 percent of all vessels in terms of numbers and 15 percent in terms of tonnage.

Cheong (2001) observes that incomes of fishers have declined compared with farm or urban household incomes. The relatively low income is the main driver for people moving to another sector and for leaving their fishing communities and migrating to cities where job opportunities are better. By age, people under 40 opt to relocate most frequently. As a result, the fisherfolk population in Korea is

¹⁹ In the Republic of Korea, three major types of fisheries management regimes exist, i.e. fishing rights, fishing permits and fishing reports, along with geographic categories of fishing ranging from near-water and coastal-water to distant-water fishing (Cheong, 2001). Unlike European and North American countries, the Republic of Korea did not adopt fisheries catch quota systems to control fishing effort but rather used entry limitations as primary measure for fishing effort control. However, after ratifying the United Nations Convention on the Law of the Sea (UNCLOS) in 1996, the government adopted a fisheries management system based on total allowable catch (TAC), which was implemented in 1999. However, this system has encountered a number of difficulties (Zhang *et al.*, 2009, p. 32).

rapidly ageing. With respect to gender, the author observes that male fishers dominate the fishing industry until age 29, and then the ratio of male and female workers becomes almost even as women married to fishermen tend to take on the identity of fishermen and work as fishermen.

According to studies cited by the author, major reasons given by fishers for outmigration are low income, lack of opportunity for their children, and lack of development potential. Those who chose to stay in their fishing village tended to be older and were optimistic about the future as long as they persevere. They were also found to lack skills to start a new job and were attached to their hometown. The author finds that, as a result of these processes, those who remain living in coastal fishing communities are turning to tourism as a secondary source of income. Taking advantage of rising tourist demand, coastal areas have been turned into recreational areas in the Republic of Korea with greater public access to the shore. Fishers open their fishing grounds to tourists, take them fishing and diving, and provide accommodation.

Cheong (2001) studied the pattern of institutional change, i.e. increasing privatization of common property resources and accelerated tourism development, which took place in response to economic and environmental changes in the country's fisheries sector. The study finds that economic and environmental changes in the fisheries sector were dire enough to necessitate responses from the government and the fishing village cooperatives. However, the responses of government and cooperatives were found to differ. The government's interventions and regulations were found to lag behind the fast-changing response of the fisheries cooperatives to the economic change.

The major government response identified by the study was to revive fishing village economies with revitalization projects in an attempt to revive depressed fishing communities and by changing regulations. The new regulations were favourable to the cooperative, as the cooperative instead of local government authorities or individuals now received external financial assistance. By issuing new regulations and giving financial aid to cooperatives, the government intended to strengthen and promote collective ownership of the fishery resources. The author highlights that, conversely, the responses of the cooperative favoured some privatization of local common property resources in order to meet the changing circumstances.

Incurred by acute labour shortage because of outmigration of fishermen and women, leasing of commonly held fishing grounds became a popular practice, although long-term leasing of common property is considered privatization and, therefore, illegal. The author observes that national legislation is of limited relevance to actions at the local level in this case, as local people do not uphold this law. The State has not responded to this management practice with stricter enforcement or new legislation.

The cooperative-driven institutional change lifted the ban on water access to outsiders in some fishing communities. The long-term leasing of the fishing ground allowed the management of fishing grounds by non-members, and the flexible use of the fishing ground for purposes other than fishing also opened access to the space. This provided an opportunity for water-borne recreational activities and generated ripple effects to other tourist services such as accommodation and restaurants.

The author further observes that investments made by government to cooperatives for constructing tourist facilities such as inns and restaurants for collective benefit actually passed over to individuals. Cooperatives either built the facilities as a small inn or a restaurant and rented it out or just held the title to the facility, which was in reality owned and operated by an individual. Many cooperatives lack the capacity to operate tourism facilities, which is the primary reason why they are rented out or operated by private individuals.

There are observers who note that while there are successful examples, it seems that fishing communities in the Republic of Korea are still at a very early stage of transition to tourism and many of them might not be prepared to undertake it. However, private operation of tourist activities under the supervision or ownership of the cooperative seems to be the current trend in fishing communities pursuing tourism.

Challenges to common property-based management of marine living common resources: the women divers' communities in Jeju, the Republic of Korea

Ko, Jones and Heo (2010) provide another example of the challenges coastal fishing communities face in the Republic of Korea and the changes they undergo. The authors examine the conditions of common property-based management for coastal marine living resources by women divers' communities on Jeju Island, the Republic of Korea. The authors note that, due to their tight social network and work rules, the women divers have harvested coastal marine living resources with limited fishing pressure exclusively from their village fishing grounds for more than 400 years.

The authors find that their harvest patterns have been mostly reactive to market prices and demand, and sometimes not taken into consideration a sustainable use of resources, eventually requiring direct governmental regulations to limit catches. The authors also observe that, more recently, the women divers and their communities have been experiencing similar challenges as the ones described by Cheong (2001), i.e. their ageing population, water pollution in the coastal zone, competition with cultured products and imported seafood, and expanding barren fishing grounds. The authors conclude that these challenges demand a multiscale/multidimensional response if the women divers' communities are to keep their village fishing grounds and communities sustainable.

Focus on aquaculture versus capture fisheries

Aware that the capture fisheries sector in the Republic of Korea both inshore and offshore has reached and overreached its limits, the government is promoting alternative sources of income for coastal fishing communities, as shown in the case of promotion of tourism, and also introducing regulations to limit fishing effort, as shown in the case of women divers' communities on Jeju Island.

At the same time, government is actively promoting the development of aquaculture and supporting the transition from capture fisheries to aquaculture. This provides another opportunity for coastal fishing communities to change their livelihoods and occupations in a more sustainable and beneficial direction. Lee and Yoo (2013) note that transition from capture fisheries to aquaculture is occurring in terms of production trends. The authors highlight aquaculture production in the Republic of Korea increased by 2.9 percent annually from 0.77 million tonnes in 1990 to 1.36 million tonnes in 2010. Capture fisheries production decreased at an average annual rate of 1.3 percent from 1.47 million tonnes in 1990 to 1.13 million tonnes in 2010.

The authors further note that the rapid growth trend of aquaculture production since 2000 comes from an increase in the production of seaweed such as laver and sea mustard supported by incentive policies of the government for the aquaculture industry. The Ministry for Food, Agriculture, Forestry and Fisheries of the Republic of Korea has conducted aquaculture development projects based on the second basic development plan for the aquaculture industry. In order to strengthen competitiveness, the plan focuses on the development of ecofriendly aquaculture farms, the installation of open-sea cultivation, the establishment of sea-farming areas, the expansion of insurance against natural disasters and the development of new culture technologies.

The authors report further that the government has tried to reorganize the fisheries industry and construct productive fishing villages. If successful, this effort should provide ample opportunity for coastal fishing communities and their organizations to become involved and benefit from these efforts. The authors report that the third master plan for the fisheries industry development deals with issues such as the shift to low-carbon green fisheries, and support for the vitalization of fishing villages, including financial support, which should support the transition of coastal fishing communities to more sustainable occupations and livelihoods.

An ecosystem-based fisheries assessment approach for the fisheries of the Republic of Korea

Zhang *et al.* (2009) developed an ecosystem-based fisheries assessment approach for fisheries of the Republic of Korea and applied it to the Tongyeong marine ranch and the country's large purse seine fishery. The intent was to provide policy advice for the development and management of sustainable

aquaculture and capture fisheries in the Republic of Korea that will also benefit coastal fishing communities and their transition to more sustainable livelihoods. The purpose of their study was to develop a pragmatic ecosystem-based fisheries assessment approach that integrates ecosystem considerations into the fishery assessment process, in order to facilitate the realization of the government's desire to improve management of its fishery resources. According to the authors, this approach is accomplished by defining management objectives, developing indicators and identifying reference points for assessment.

The operation of the Tongyeong marine ranch involves small-scale coastal fishers. The Tongyeong marine ranch, which covers an area of 20 km² located on the country's south coast, is the venue of a pilot marine ranching project started by the government in 1998 to enhance marine fishery resources, and to protect and recover marine environments and fish habitats. The project included scientific studies, creating artificial reefs, constructing seaweed beds to restore fish habitat, and releasing jacobever rockfish (*Sebastes schlegeli*) larvae and juveniles.

The Tongyeong Marine Ranch Management Council, which is composed of various stakeholders including representatives of local fishermen and women, central and local government officials, scientists, and NGOs, was given the authority to manage the fishery and other activities. The creation of this marine ranching area provides an opportunity for the authors to test the utility of the proposed ecosystem-based fisheries assessment approach and to evaluate impacts on the ecosystem.

The authors concluded that their proposed method is useful. Results of the calculations indicated that, in both cases, most risk indices were reduced significantly between the two reference years chosen. Improvements identified in the various indices were due to a number of factors, which are listed below for the case of the Tongyeong marine ranch:

- More science-based management using intensive stock assessment results improved sustainability.
- A local management body (Tongyeong Marine Ranch Management Council) was formed and fishers actively participated, causing self-regulation that reduced the use of illegal fishing gear and decreased illegal fishing operations in prohibited areas, which improved sustainability and biodiversity.
- Reduced waste dumping and the implementation of debris removal programme improved habitat quality.
- Releasing of larvae and juveniles of some species improved sustainability.
- Creating artificial reefs and artificial seaweed beds improved habitat quality.
- Restricted fishing gear regulations improved biodiversity and improved sustainability.

Community-based fisheries management and the well-being of fishery-dependent coastal communities in Japan

Schmidt (2003) observes that fisheries in Japan are very important; first, because of the importance of fish in the national diet and hence a strong demand for fish, and, second, because of the fact that Japan has a long tradition of community-based coastal fisheries management that has been used to ensure that the resource base is harvested in a sustainable manner. The author highlights that the community-based fisheries management system has been of key importance for the well-being of fishery-dependent coastal communities and that in the development of the Japanese coastal fisheries management systems, the coastal communities play a key resource management role.²⁰ Schmidt (2003) observes that in this process several additional functions have developed that are also of importance for the livelihoods of fishers.

²⁰ Detailed overviews of fisheries and fisheries management in Japan including legal, institutional and international aspects is provided by FAO (2006b, pp361 – 395), by Uchida and Wilen (2004) and by Makino and Matsuda (2005).

According to the 2000 Japanese census of the fishing sector, the total number of fishing operators or enterprises amounted to 150 000, 140 000 or 93 percent of which operated in coastal fisheries. The coastal fishing operations employed a total of 240 000, or 85 percent of all fishworkers. Of the 240 000 persons working in coastal fisheries, 200 000, or 83 percent, were self-employed. Schmidt (2003) also notes that, in 1998, the fishing sector employed 230 000 male and 50 000 female workers.

In terms of households dependent on fisheries in Japan, the author reports that some 200 000 households with a total of 730 000 members are dependent on fishing activities as a direct source of income, and another 210 000 people work in the fish processing industry. These figures exclude post-harvesting activities such as transport and distribution, wholesale and retail sale of fish and fish products as well as the activities of the supply industries. The author estimates that it is likely that 1.5–2 million people depend directly or indirectly on fishing as a source of income, the majority associated with coastal fisheries. As is the case in the Republic of Korea, the fishing population in Japan is rapidly ageing. The demography of the fishing sector is undergoing considerable change as older people leave the industry but are not replaced by younger entrants.

Schmidt (2003) explains that the basis for the management of coastal fisheries in Japan is a fishery-right system divided into three types, i.e. common fishery rights, demarcated fishery right, and set-net fishery right. The common fishery right system is the most common practice. The demarcated right system is used in the mariculture industry, and the set-net fishery right is exclusively used in set-net fishing operations.

Coastal fisheries are characterized by small-scale operators with strong community links. These fisheries are of particular economic and social importance to coastal regions. Due to serious problems of depletion of some of the coastal resources, a system of total allowable effort has been introduced, an input-related rather than output-related fisheries management measure that limits fishing effort, as well as TACs in some cases.

Schmidt (2003) explains further that the right to fish is granted by the prefecture government to the local fishers' cooperative association (FCA) with responsibility for a particular geographical area, and whose members are fishers from communities within this area. These rights granted to the FCA are exclusive and the rights cannot be transferred to others. Only members of the FCA can fish in the area where the right is applicable.

Rights to fishing given by the prefectures specify season, area closure and other regulations but do not set harvesting limits. Subsequently, the FCA sets specific rules within the framework laid out by the prefectures. The FCAs often merge into fisheries management organizations that have the functions of management of fish stocks, fishing grounds and catch/harvest within their geographical areas.

Outcomes and results

Regarding the outcomes and results of the Japanese community-based fisheries management arrangements,²¹ the author makes reference to the publication *Towards sustainable fisheries* (OECD, 1997). Schmidt (2003) observes that the core outcome of the management arrangements are efficiency gains by having management decisions taken at the local level through a reduction in transaction costs related to both production and management.²² The author observes that co-managed fisheries such as the one in Japan allow more flexibility, which makes the fishery more profitable. By the same token, management objectives can be more precisely satisfied and can be geared to local conditions. The author also observes that co-management promotes voluntary compliance through peer-group pressure. Moreover, as fishers closely participate in the management process, they are more likely to be motivated in protecting fishing and fishing grounds.

²¹ Examples of successful coastal fisheries management in Japan are provided by Matsuda *et al.* (2010)

²² A brief analysis of fisheries transaction costs in Kanagawa Prefecture, involving payments by both the local government and fishers, is provided by Makino and Matsuda (2005).

Finally, the author highlights the multiple roles that the Japanese coastal fishing communities provide, in particular through the FCAs. In addition to fishing, they perform important socio-economic functions including training, post-harvesting activities, and financial services. These services are provided through the FCAs in addition to the core activity of managing the fishery resources in the FCA's geographical area of operation. The author further highlights the support provided by the central government to the FCAs. The support includes legal, technical and financial assistance, and may be an additional reason for the longevity of the community-based fisheries management system in Japan. The support to the FCAs and the financial transfers to port infrastructure in Japan are the principal government financial transfers to the fishing industry, which in 2001 totalled JPY313 billion.

Emerging issues

Overall, community-based fisheries management in Japan has positive results (Makino and Matsuda, 2005). However, there are several emerging issues in the Japanese institutional framework that merit recognition and discussion. The first concerns the observation that some fishers cooperatives or coordinating organizations have proved unwilling to introduce new technologies, thereby retarding technical progress. The authors observe, in particular, that successfully managed areas may have strong tendencies in this direction. However, this does not seem surprising because changing technologies when things are well managed and functioning might introduce unnecessary risk.

Second, the authors observe that, while the number of professional fishers in Japan is continually declining, the number of recreational fishers or pleasure-boat owners is growing. From the viewpoint of integrated coastal management, the authors suggest that these recreational users should be included in the decision-making processes.

Third, the authors identify a more basic issue, i.e. the issue of the justification of fishing rights. They observe that fishers use marine resources that are the common property of all citizens, but their benefits from fishing are protected by law. In addition, the authors mention the considerable expense accrued to the public purse through support of fishery activities. They acknowledge that part of the justification for the fishing rights/licences scheme, and the public expenditure related to fisheries, is provided by the social role of the fishery industry as a food supplier. However, with the increasing importance of imported seafood, and the emergence of environmental issues such as biodiversity conservation, it is their opinion that fishing operations that lack competition and responsibility cannot be justified in the long run, even where fishery management is effective. Therefore, the authors suggest that some measures pertaining to the legal responsibilities of environmental stewardship should be included in any statement of fishing rights.

Other authors/researchers hold the view that community-based fisheries management groups in Japan already pay due attention to conservation aspects. Iwasaki (2013) presents a case study of Lake Saroma, Japan that showcases the innovative efforts of fishers on the wise use of fishery resources and mainstreaming environmental conservation at the watershed level. These innovative efforts include the introduction of cultured scallop allowance limits, fishers' afforestation activities and multilevel collaborative partnership building.

11.2 Social and ecological changes in northern Atlantic fishing communities in Iceland, Norway and Newfoundland (Canada)

Newfoundland (Canada) and Iceland are small island societies with 560 000 and 270 000 inhabitants, respectively, that in many ways depend upon fishing. Norway, in contrast, is a more populous nation with a more diverse economy. Changes in the fishing industry thus present a lesser challenge to the Norwegian economy than to the economy of Iceland and Newfoundland but still threaten the viability of many communities along the west and north coasts of Norway (Hamilton and Otterstad, 1998).

Demographic changes and their relation to fisheries dependence

Population decline and ageing of the fisherfolk population, observed in the Republic of Korea and Japan, is also occurring in traditional coastal fishing communities living on the shores of the North

Atlantic arc (NAArc) in Iceland, Norway and Newfoundland (Canada). The NAArc refers to the coasts and islands across the northern rim of the Atlantic from Norway through Faroe Islands, Iceland and Greenland to Newfoundland (Hamilton and Haedrich, 1999). Hamilton (2003) observes that the timing of these population losses followed adverse fishery events such as the collapse of the cod fisheries and Canada's 1992 moratorium on fishing for northern cod, a fishery that has shaped Newfoundland society for centuries. The collapse affected some 40 000 workers, and undermined the traditional livelihoods of hundreds of coastal communities. The author further observes that Newfoundland's cod crisis²³ comprised only one facet of widespread, fisheries-influenced ecological transformations taking place in the northwest Atlantic. Cod fisheries off New England, Greenland, Nova Scotia and the Gulf of Saint Lawrence also collapsed in the early 1990s. Northeast Atlantic fisheries, including those of Iceland, Norway and Faroe Islands, also experienced crises in groundfish resources in the late 1980s or early 1990s, and populations of other species also declined steeply.

Similar to other rural-to-urban population flows of natural resources dependent communities and in accordance with findings of classic migration research, Hamilton (2003) observes that the demographic changes in fishing communities of the NAArc were caused and characterized by the following factors:

- Unreliability of resource jobs encouraged outmigration from fishing communities to urban centres, especially among females,²⁴ young families, and people with higher education or skills.
- Outmigration left fisherfolk populations, as other rural populations, not only smaller but also older and less skilled, affecting prospects for economic diversification. Outmigration of young women and professionals becomes a new "push" factor, giving other people reasons to move away.
- Declining rural areas created political pressure for central governments to: subsidize troubled economic activities; expand the public sector as an inducement to stay; subsidize diversification efforts, often unsuccessfully; and relax conservation-inspired limitations on fishing.
- Change creates winners as well as losers and often results in the regional centres benefiting more from government interventions and adapting better to new situations while communities in more remote locations decline.
- The government and service sector were essential in providing jobs for professional and women, without which communities would have been unlikely to thrive.
- Individuals, businesses and communities with higher education and skill levels, access to investment capital, and political influence or sophistication found it easier to adapt to the changes and new situations.

Fishers who did not leave their occupation adapted to declines in traditional catches by fishing for previously less fished species, often invertebrates such as lobster, crab and shrimp, some of which had once been the prey of groundfish (Hamilton and Haedrich, 1999).

Impact of privatization of fisheries through introduction of individual transferable quota

Olson (2011) notes that fisheries management around the world has experimented with regulations to promote privatization with a view to ending overfishing and reducing economic inefficiencies. The author surveyed a wide range of experiences in different contexts and countries around the world including Norway, Iceland and Canada, to identify consequences from privatization.²⁵ Her study

²³ Binkley (2000) describes the response of Novascotian coastal fishing dependent households to the fisheries crisis. The author finds that, in the past, households relied on long-term financial planning strategies, which have broken down and are being replaced by short-term coping mechanisms. The author also observes changing household livelihoods strategies such as spending and saving practices and changing work patterns inside and outside the home as well as within the household fishing enterprise.

²⁴ Neis (2000) describes the formation and work of the Newfoundland and Labrador Women's FishNet, a voluntary group of feminists, to empower its members and women from fishing communities and enable them to deal with the fisheries crisis.

²⁵ Carothers (2008) describes how the privatization of fishing rights has negatively affected the livelihoods of fishing communities in Kodiak, the United States of America.

concludes that negative impacts from privatization, such as the introduction of individual transferable quota (ITQs) systems, often fall on less powerful segments of the fishing industry, namely the crew, or the small business owners without a fleet of vessels or vertically integrated business. Those who are in a better position to take advantage of such measures are then increasingly able to exert control in various markets, such as leasing quota, hiring crew, or even affecting prices that fishers receive for their products.

The author observes further that these kinds of changes affect the structure of communities through changing relations between people and shifts in dominant values. The changes also affect the viability of fishing communities, as some are disproportionately affected by geographic shifts in fishing businesses, aspiring new participants find entry increasingly difficult, and smaller operations are increasing dominated by larger ones.

Changes in fishing communities of countries of the NAArc have also been caused through changes in fisheries management regimes, such as the privatization of fisheries through the introduction of ITQs. The privatization of Iceland's fisheries in the 1980s and 1990s through the introduction of ITQs marginalized existing small-scale fishers and excluded new entrants to the fishery as well as the public. The anticipated theoretical benefits of ITQs, including resource stewardship, fell short of expectations (Food & Water Watch, 2010).

Skaptadóttir (2000) studied the impact of the introduction of ITQs in an Icelandic fishing village on women's lives. The author finds that the new fisheries management system had a marked impact on the people who live in fishing villages. She observes that the inhabitants of the village had not been able to take advantage of the new system, in which fewer and larger companies were taking over. The inhabitants were faced with the process of increased marginalization that presented new challenges, to which men and women respond differently.²⁶ The coping mechanisms adopted by women stressed community and working together, whereas men respond more on an individual level. As far as women in Norwegian fishing communities are concerned,²⁷ Gerrard (2005) observes that the number of full-time registered women fishers has fallen by half since the introduction of the quota system in Norwegian fisheries.²⁸

Following privatization of fisheries in Iceland, anyone who wanted to fish had to pay private individuals or firms for their quota. Limited restrictions exist to protect small operators from industry consolidation and foreign ownership, but they are not very effective and did not prevent concentration of ownership. As of June 2008, the 15 largest quota holdings are from fishery companies owning 66 percent of the total.

Food & Water Watch (2010) observes further that, although the fish stocks of Iceland are a publicly owned resource, quota holders initially paid nothing to the public for the exclusive use granted them under the privatized catch share system. In an attempt to alleviate public tensions created by the unfair redistribution of wealth under the system, a catch fee was introduced starting at 6 percent in September 2004, which gradually increased to 9.5 percent by September 2009. The resource rent seen as payment to the public for utilizing their property is paid in addition to other fees to cover management costs for science and for enforcement of the management system.

²⁶ Davis (2000) describes gender-specific responses to the fishery crisis in Newfoundland.

²⁷ Britton (2012) examines the gender dimensions of well-being in fishing households in Northern Ireland, the United Kingdom of Great Britain and Northern Ireland. The impact of change in the fishing industry on women's well-being is analysed and linkages are made between having access to fish and changing roles of women in fishing households. Zhao *et al.* (2013) analyse the roles played by women in fishing communities in the north of England, the United Kingdom of Great Britain and Northern Ireland, and their contribution in capture fishing, families and communities, trading, processing and management/administration. The authors identify barriers that prevent women from equal treatment and full participation in the industry and from a more effective involvement in policy-making.

²⁸ Gerrard (2000) describes women's and men's political actions during the fishery crisis in north Norwegian communities. Munk-Madsen (1998) discusses the Norwegian fishing quota system from a gender perspective and comes to the conclusion that the system is patriarchal and excludes women from the ownership of fishing vessels and quotas.

Food & Water Watch Factsheet (2010) reports that Iceland's ITQ system has been repeatedly challenged in court. Ultimately, fishers took their case to the United Nations Human Rights Committee alleging that privatization violated the International Covenant on Civil and Political Rights, because the system forced fishers without quotas to pay money to a privileged group of citizens, the "holders" of quota, in order to pursue their occupation. In October 2007, the committee ruled that Iceland's privatized catch share market violated international law. The committee reasoned that the property entitlement privilege accorded permanently to the original quota owners was not based on reasonable grounds.

Food & Water Watch (2010) reports further that, following the ruling, the Government of Iceland has announced that it is considering reforms. One of the solutions being considered is a cap–rent–recycle catch share model. In such a system, the government retains management control over the fishery resources as a public good. It places a cap on catch levels, and rents catch shares on a fixed-term basis to eligible entities such as independent fishers, communities and firms. The government then invests the revenue in better management practices.

11.3 Indigenous fishing communities and marine ecosystem services in the Pacific Northwest

Contemporary Makah subsistence fishing and shellfish collecting practices and marine stewardship

Indigenous communities in Canada referred to as First Nations, and as Indian tribes in the United States of America, have lived for centuries on the shores, islands and inlets of the Pacific Northwest. In Washington State, the United States of America, and British Columbia, Canada, these communities have traditionally been involved in subsistence fishing, shellfish gathering as well as in hunting. Examples are the Makah tribe in Neah Bay and other coastal tribes of Washington State, the Nuuchah-nulth First Nation bands of Vancouver Island and the Namgis and Kwaskwaka'waka First Nations of the Pacific coast of British Columbia.

While nowadays members of these communities are involved in a variety of trades and occupations, subsistence as well as small-scale commercial fishing, shellfish gathering and farming and hunting still play an important role in their economic, social and cultural life. The access of these communities to their accustomed fishing, shellfish gathering and hunting grounds is guaranteed by treaties with national and state/provincial governments.

Sepez (2001) documents and analyses the subsistence fishing, shellfish gathering and hunting practices of the Makah living in their reservation in Neah Bay on the Pacific coast of Washington State in the period 1997–99. The author analyses contemporary uses of fish, shellfish, land mammals, marine mammals and birds by members of the tribe and identifies more than 50 different animal resource types, representing more than 80 species. The author finds that 99 percent of households, living in the reservation, participated in subsistence fishing, hunting and gathering activities.

The author also examines the importance of subsistence consumption as a proportion of the overall diet and finds that subsistence consumption plays a significant role in the local economy. Species are harvested from both marine and terrestrial environments. Halibut and salmon are the most frequently consumed fish, while clams and crab are the most frequently consumed shellfish. While subsistence and commodity foods coexist in Neah Bay, preferences of reservation residents indicate that, whenever subsistence resources are available, they are preferred over commercial sources for the same types of foods because of freshness, health and heritage. The author also observes the role of subsistence resources as a food security system and finds that some Makah families rely on these foods to make it throughout the winter, when jobs are least available. Others know that subsistence resources are a safety net, something they could rely upon if needed.

Sepez (2001) further examines contemporary subsistence in its political, economic and sociocultural contexts. A historical political ecology of tribal resource access with special attention to fishing, sealing and whaling suggests that government policies that affect resource access should be considered as much as ecological factors in order to understand subsistence dynamics. The author observes developments from the epic fishing rights struggles between tribe and state in the twentieth century to

a recent federal court decision. This decision confirms the rights of the Makah and other tribes in Washington State to collect shellfish in their traditional shellfish gathering areas, including those used for commercial shellfish farming. Tribes had always had to argue over the validity, scope and allocation of treaty resource rights. Enacting subsistence practices within this context has been a matter of perseverance, resistance, negotiation and litigation.

The author also examines sociocultural factors such as the values, knowledge and practices associated with the community's ongoing relationship with the local resource base. An in-depth analysis of sharing practices among members of the Makah indicates that these play a key role in the distribution of subsistence goods and the maintenance of community social ties. The author finds that harvesting and consumption depend on knowledge and practices that make subsistence possible. Traditional ecological knowledge, including detailed knowledge of animal behaviour, ecology and local places is accumulated over years of subsistence practice and is passed on to new generations of subsistence harvesters. This cultural transmission includes socialization into tribal identities and values, which promote sustainable use, spiritual beliefs, and social practices.

Sepez (2001) finds that extraordinary changes to Makah society as a result of colonization processes altered, but did not eradicate, the cultural web in which subsistence takes place. As stakeholders in the contemporary subsistence process, Makahs have an interest in being responsible stewards of the environment. Sustainable-use values increase the likelihood that subsistence resources will be available to Makahs in the future, while other cultural attributes ensure that subsistence consumption has a continuing place in community life.

The author concludes that subsistence activities are a pervasive and vital aspect of contemporary life in Neah Bay and contribute to the social, cultural, economic, nutritional and spiritual sustenance of the community as part of the long-term relationship between the tribe and its lands and waters.

First Nations fisheries-dependent communities in British Columbia (Canada)

For centuries before European settlement, salmon supported First Nations communities along British Columbia's coast and rivers.²⁹ Vodden (1999) observes that ties to the fishery among coastal peoples run much deeper than jobs and incomes, however important these economic aspects might be. Salmon remain an important component of the ecological, economic, social and cultural fabric of the First Nations communities. The author studied members of the Namgis and Kwakwaka'wakw First Nations, who live in the village of Alert Bay on Cormorant Island on the Pacific coast of British Columbia.

The author observes that, in British Columbia, fishery resource declines and resulting job losses in traditional coastal fishing communities have made the introduction of sustainable management practices an urgent issue. From the mid-1980s to the early 1990s, prices paid for salmon in British Columbia declined as global salmon supply increased because of record returns of wild salmon to Alaskan waters and a growing aquaculture industry in Norway, Chile, Scotland (the United Kingdom of Great Britain and Northern Ireland) and British Columbia itself. At the same time, return of many British Columbia's salmon stocks were declining because of poor survival rates, overharvesting and habitat destruction. Strict conservation measures were put in place to protect salmon in the mid-1990s, including closures and salmon fishing fleet reductions.

The author reports that, from 1995 to 1996, coast-wide employment related to the salmon fishery in British Columbia declined by more than 30 percent from 26 010 to 17 990 jobs. Of the jobs lost, many had disappeared permanently as a result of the fleet reduction policy while others were associated with low salmon catches. Coastal communities were not convinced that the conservation measures would achieve their objectives and were angry that they had not been consulted about the need for, or the design of, the conservation measures, and that the impacts on British Columbia's communities had not been adequately considered. The author further observed that the fleet reduction plan had initially not

²⁹ An overview of the history of aboriginal fisheries in British Columbia is provided by First Nations Studies Programme of the University of British Columbia (2009) and Harris (2007).

been coupled with an adjustment and transition programme. It was only in 1998 that the federal government announced a restructuring and adjustment programme worth C\$400 million. British Columbia's coastal communities were declared to be in a state of crisis, and it was in this context that efforts to find new fisheries management arrangements were made.

The author highlights that, while the study is case-specific, the findings are applicable to other communities with similar characteristics, i.e. rural, fishery-resource-dependent, communities with significant shares of First Nations population. This includes some 50 coastal communities once reliant on British Columbia's salmon fishery that are undergoing painful and unprecedented restructuring processes accompanied by feelings of disempowerment and uncertainty about the future.

The study found that the Kwakwa'wakw and Namgis First Nations have a long history of involvement in resource management and stewardship. The author observes that well-established and new organizations such as the Namgis First Nations share responsibilities for habitat protection and restoration, lobbying, education, communication and training. However, the author finds that, while the community of Alert Bay has a general vision aligned with that of sustainable fisheries and co-management, the community is still at an early stage in preparations for a significant co-management role. Cormorant Island organizations agree on the need for regional fisheries management and on many of the components of regional fisheries management system, but further discussion and a cooperative planning process are needed if this vision is to become a reality.

The results of the research suggest that fisheries co-management is essential for sustainable fisheries and fishing community management and development. The author also finds that co-management alone, however, does not result in community sustainability. Occupational diversification efforts are also needed within a framework of sustainable community economic development (SCED). The study illustrates that while co-management and SCED are important strategies for achieving sustainable development, there are many challenges and barriers to overcome. The challenges are both local and external to the community. At the local level, building social cohesion, improving skills, education and planning processes, creating organizational capacity and mechanisms for financing are critical steps to meeting the potential of SCED and fisheries co-management. The author also notes that increased cooperation from government agencies is required.

Framework and action plan for a new First Nations aquatic resource relationship with other jurisdictions in British Columbia

As far as regional fisheries management and future challenges are concerned, in 2012, the British Columbia First Nations Fisheries Council (FNFC) contracted the Institute on Governance to conduct an independent review of the FNFC's organizational structure and to offer strategic advice to advance First Nation governance of aquatic resources (Lefebvre, Richardson and Alexandra, 2012).³⁰

The governance review of the FNFC identified the following strengths of the current governance structure and processes: dedicated and committed staff of the FNFC; high level of trust by key stakeholders, including First Nations, regional fisheries organizations, and the department of fisheries and oceans; and high level of accountability and transparency.

Key challenges to the advancement of First Nations governance of aquatic resources were identified as: council outreach and representation; the role of rights and title in the FNFC's mandate; engagement with key funders such as the department of fisheries and oceans and exploration of other funding sources; differences in priorities within the First Nations communities being represented by the FNFC; and the development of a long-term strategic vision.

Recommendations put forward by the review to address the above challenges include, among other things, expanding the focus by starting to claim the governance space that First Nations aspire to occupy in terms of moving to joint management of aquatic resources and habitat protection. This could

³⁰ The draft 2012–15 strategic plan of the First Nations Fisheries Council is described in First Nations Fisheries Council (2011). See also British Columbia's First Nations Action Plan (2007).

be achieved by broadening the scope of FNFC interactions with other stakeholders at both the federal and provincial level.

Valuation of coastal ecosystem services of the Pacific Northwest

A century ago, the expansive wilderness of the Puget Sound Basin and of the Pacific coast of British Columbia, home to the Indian tribes and First Nations, was considered by many as virtually limitless and void of economic value. However, in the past century, the Pacific Northwest, as other parts of the globe, has shifted from a seemingly empty world of unlimited and stable natural resources to a full world scenario, where natural resource limits are more pressing, and global systems such as climate and ozone protection can be disrupted.

As ecosystems become threatened and degraded, the acknowledgement is growing that ecosystems, including the coastal ecosystems of the Pacific Northwest, provide valuable services without which the monetary economy could not function properly.

Ecosystem services, also referred to earlier as ecosystem benefits, are defined as a wide range of services provided by ecosystems that are of fundamental importance to human well-being, health, livelihoods and survival (Costanza *et al.*, 2014). The valuation of such services has been overlooked by traditional economics. The more recent discipline of ecological economics sees ecosystem services increasingly as constituting natural capital, which merits economic valuation so that they can be compared with the value of built capital and their value can be taken into consideration in decision-making.³¹

Decisions on where and how to develop, on how much pollution is tolerable, how to handle flood waters, procure drinking-water, manage land and waters and aquatic resources, build infrastructure, and how much to invest in protecting and restoring the environment require information on the value that ecosystems provide (Batker *et al.*, 2008).

Batker *et al.* (2010), of the Puget Sound based non-profit organization Earth Economics, undertook a valuation of the ecosystem services provided by the Puget Sound Basin in Washington State. The ecosystem goods and services provided by the Puget Sound Basin include: drinking-water production, storage and filtration; flood protection; provision of pharmaceuticals; food including various kinds of fish, shellfish and other aquatic organisms; provision of building materials; recreation; waste treatment; climate stability; habitat; biodiversity; nutrient cycling; and aesthetic value.

The authors found that, when treated as economic assets, the natural systems of the Puget Sound Basin, from alpine snow fields to marine waters, would be valued between US\$300 billion and US\$2.6 trillion. They also concluded that nature as an economic asset in the Puget Sound Basin delivers a flow of benefits between US\$9.7 and US\$83 billion in economic value to people every year. The authors conclude that nature's enormous economic value must be built into economic analysis or the economy. A more prosperous, dynamic, and sustainable economy can be built by including it into accounting, cost-benefit analysis, environmental assessment, ROI calculations, and job analysis, and by rationalizing tax districts and securing funding mechanisms to restore natural capital assets.

Earth Economics, in partnership with the David Suzuki Foundation, also undertook a valuation of the aquatic benefits of British Columbia's lower mainland (Molnar, Kocian and Batker, 2012). The authors note that, whereas 100 years ago, the natural systems of British Columbia were conceived to be abundant and healthy, today British Columbia's ecosystems are under stress caused by rapid population growth and widespread development in the province's temperate southern region. The authors foresee that the continuing influx of people into the lower mainland affects all aspects of sustainability and that the region's natural resources will be drawn down to create more jobs, more housing and businesses, goods and services, transportation facilities, and recreational space. The study aims to contribute to better design the economy to be more compatible with natural systems. It shows

³¹ The concept of ecological economics is discussed in Graf and Batker (2011).

the connections between the economy and the aquatic ecosystems of British Columbia's lower mainland, and identifies and places a value on the non-market goods and services sustained by these ecosystems and provided to 2.5 million residents.

Eight ecosystem services across nine land classes are valued in the lower mainland. Through benefits such as protecting against flooding, assuring water supply, buffering climate instability, supporting fisheries and food production, maintaining critical habitat, providing waste treatment, and more, the lower mainland's aquatic ecosystems are providing C\$30 billion to C\$60 billion in benefits every year. The authors were only able to value 30 percent of known ecosystem services; thus the valuation is a significant underestimate of the true value of the ecosystem services provided by the aquatic ecosystems of British Columbia's lower mainland.

12. ANALYSIS AND COMPARISON BETWEEN SELECTED DEVELOPED AND DEVELOPING COUNTRIES

When comparing the challenges facing small-scale fishing communities in developing countries with those in the developed countries of the NAArc, East Asia and the Pacific Northwest, it is clear that small-scale fishers and fishing communities in both developing and developed countries are facing many similar challenges, i.e.: the degradation of coastal and riparian aquatic ecosystems because of pollution, population growth; decline of fishery resources because of overfishing, degradation and loss of habitats and impacts of climate change; gender inequality; competition with large-scale industrial operators; competition for space with tourism, housing development and urbanization as well as oil, gas and exploitation of other natural resources and shipping; and lack of secure use rights for aquatic resources, with the exception of the Republic of Korea and Japan.

However, the responses to these challenges differ, as can be seen from the country reviews in this publication. First, members of small-scale fishing communities in developed countries such as the East Asian countries and the countries of the NAArc have responded to the challenges to some extent by taking up other occupations and moving to other areas, thereby escaping unemployment, vulnerability and poverty. This was possible because of higher educational attainments, which support occupational mobility and the existence of alternative employment opportunities, government support, and access to credit facilities, vocational training and advice. These opportunities do not exist to the same extent in many developing countries, where economic growth and opportunities in rural areas are more limited.

Second, case studies in East Asian and other developed countries have shown that those members of small-scale fishing communities in developed countries who opted to stay within their traditional occupation received special government support. This support helped them to adjust to a changing environment. In all developed countries, a social safety net including unemployment insurance, health insurance, access to institutional credit as well as various welfare schemes protected livelihoods and prevented poverty and vulnerability, which was not the case in most developing countries because of limited financial resources of national governments. In the case of the Republic of Korea and Japan, and to some extent in the Pacific Northwest, systems of secure fishery resource-use rights and their full participation in managing fishery resources further helped small-scale fishing communities to adapt to a changing environment.

Based on these experiences, developing countries could help small-scale fishing communities in adapting to changes and reducing their vulnerability and poverty by providing the communities with secure resource-use rights and allowing them to fully participate in the management of fishery resources and conservation of coastal and riparian ecosystems. Moreover, a social security system including health and accident insurance, unemployment and pension schemes for small-scale fishers and their household members need to be introduced and the fishers need to be integrated into existing programmes. Efforts are already under way in some developing countries, as examples from India and China show.

PART 4

13. CONCLUSIONS: CHALLENGES AND OPPORTUNITIES

This publication identifies common challenges and barriers to poverty alleviation and empowerment of small-scale fishers and to make recommendations for overcoming these challenges and barriers so that small-scale fishers and their communities can be lifted out of poverty, food insecurity and vulnerability and participate on equal terms in the management and conservation of the ecosystems which host their livelihoods.

Most of the studies reviewed for this document show that SSFs are generally profitable and generate enough gross revenue to cover their costs of operation as well as to generate some profits. However, this does not mean that the earnings from fishing alone are sufficient to sustain households at a level above the poverty line or at or above a country's minimum wage level. Particularly during bad fishing seasons and poor catches, households are very dependent on income from non-fishery-related activities and on government assistance.

Furthermore, small-scale fishing operations take place in an environment where fishery resources are either heavily fished or overfished, and where coastal and riparian ecosystems are rapidly degrading. In many cases, there are no adequate fisheries management mechanisms in place. Under these conditions, the sustainability and economic viability of SSFs become seriously threatened. There is a need for an integrated ecosystem-based management plan for fisheries and coastal zones and for long-term management strategies that aim to enhance ecological and economic sustainability.

Women play an active role in SSFs, particularly in the post-harvest and pre-harvest sector, including as financiers of fishing operations. However, globalization and regionalization of trade seem to threaten their role in fish marketing in some countries. The challenges and barriers to poverty alleviation and empowerment of small-scale fishers identified in the document are manifold and include: environmental challenges; challenges related to governance, management and conservation of fisheries and other natural resources; challenges posed by acquiring and improving fishing technologies and operations; challenges inherent in the use of fishery and aquatic resources such as how they are handled, processed and distributed; in the way of marketing and utilizing fishery products; and in the socio-economic status of fishers.

However, there are also many opportunities to overcome these challenges. First, SSFs have many advantages when compared with large-scale industrial fisheries. Small-scale fisheries are typically more selective, use less-destructive fishing gear, and have less bycatch and fewer negative impacts on ecosystems than do industrial fisheries.

Small-scale fisheries require less investment and working capital than industrial fisheries. They are more environmentally friendly because of lower fossil fuel consumption and emissions. They also generate more employment than do industrial fisheries. Their limited operational range when compared with industrial fisheries results in closer cultural and social ties of SSFs with the coastal and riparian areas where they operate, which in turn encourages a more responsible relationship with natural resources and local ecosystems. However, too many fishers in a very limited area can have very negative effects on the fisheries resources and on the environment.

All these features can provide a sound basis for SSFs to increase their contribution to food security and poverty alleviation in the areas where they operate. The task can only be accomplished in cooperation with other sectors and stakeholders including local and central government authorities. An important task is the conservation and restoration of coastal and riparian ecosystems. The SSF sector needs to be incorporated in integrated coastal and riparian zone management programmes. Measures need to be implemented to effectively reduce land, water and air-based pollution and fight causes of ocean and inland water acidification. More MPAs and reserves need to be established as nursery grounds as well as protected areas in lakes, rivers and wetlands while protecting the livelihoods of artisanal fishers at the same time.

There is also a need for the establishment of more artificial reefs and fish aggregating devices. However, this should be done in the first place for ecosystem protection, e.g. to restrict bottom trawling, without interfering with natural reefs and not to increase fishing effort unless there are underfished resources that could be aggregated and attracted with the help of these devices. There is also a need for restoration, enhancement and improvement of degraded coastal and riparian habitats and ecosystems including habitats in rivers, floodplains and other inland waterbodies.

Small-scale fishers need to participate fully in the governance, management and conservation of fisheries and the supporting natural resources. This participation requires the improvement of fisheries management strategies. As experiences in developing as well as in developed countries suggest, these strategies need to include ecosystem and precautionary approaches, to end the free and open access to fishery resources and, at the same time, to introduce community/user rights-based management arrangements.

Specifically, there is an urgent need for greater participation of SSF stakeholders, including SSF associations at the national and regional levels, in fisheries legislation, policy development and all stages of fisheries management cycle including generation and analysis of data and information for better advice and decision-making and the implementation, review, evaluation and adaptation of fishery management measures. There is a need for strengthening small-scale fishers' organizations to enhance their ability to participate in policy development and decision-making processes and for capacity building of small-scale fishers' representatives.

Despite many efforts in the past decades to adequately inform fisheries management and conservation arrangements, there remains a need for upgrading fishery and ecosystem data collection systems, their analysis and eventual sharing at the national and regional levels. In particular, the sharing of information at the regional level for management of shared fish stocks is an urgent issue that needs to be addressed. As far as transboundary and international legal aspects are concerned, some countries still need to ratify multilateral fisheries and environmental treaties, and demarcate their maritime boundaries with neighbouring countries.

In many countries, there is ample scope for improvements in fishing technology and operations, which would ultimately generate long-term and sustainable economic benefits. These include: the adjustment and/or reduction of fishing capacity and elimination of illegal, unreported and unregulated (IUU) fishing; the assessment of offshore fishery resources, the eventual promotion of offshore fishing if feasible; and the related transfer and promotion of responsible and safe fishing technologies and operations.

In conjunction with the promotion of offshore fishing, there is a need for the provision of accurate marine weather forecasts and communication, marine rescue services and other safety-at-sea measures. Where bycatch from SSFs is composed of both high-value juvenile species and low-value juvenile and mature species, strategies and fishery/bycatch management plans should be implemented. Where bycatch is inevitable and chronic food insecurity exists, there is also some scope for better value-added utilization of bycatch.

Many opportunities exist for improvements in fishery products, marketing and utilization. A top priority should be the reduction of waste and addition of value to fishery products through provision of improved onshore infrastructure for landing, storage, processing and transportation of fish, as well as training and capacity development of fish processors and traders. This should be accompanied by provision of information to SSFs processors and traders on fish product regulations including import and export regulations, Hazard Analysis and Critical Control Point (HACCP), ecolabelling and traceability of fishery products and by provision of market and price information to small-scale fishers, fish processors and traders as well as by strengthening their bargaining power in the value chain through promotion of associations and creating market access linkages to exporters and traders in the market chain.

A core area for alleviating poverty and vulnerability in fishing communities, improving food security and empowering them to improve their lives through diversification of livelihoods and occupational and geographic mobility is the improvement of the socio-economic status of fishers. The first task is the integration of SSFs in national and regional strategies to reduce poverty and hunger.

The provision of education, health, garbage disposal and sewage facilities, safe drinking-water, electricity and other rural infrastructure to all fishing villages is an essential precondition for making small-scale fishers equal members of society, and forms the foundation for all other efforts including educational efforts and capacity development. Unless fishing communities have basic and essential facilities, they will not be able to take full advantage of other opportunities.

Another important opportunity to improve the sector's capability to contribute to poverty alleviation and food security is capacity development and training. This should include the acquisition of non-sector-specific knowledge and skills such as business management, socio-economics and marketing knowledge and skills, besides fishery-specific skills, with a special focus on gender equality and the empowerment of women in fishing communities. Promotion of gender equality with regard to participation in management and conservation of aquatic resources, ownership of fishery assets, occupational participation and remuneration, as well as the adoption of family planning, will go a long way in contributing to poverty alleviation and food security in small-scale fishing communities.

Keeping in mind limited fishery resources and increasing population, both within and outside fishing communities, it is essential to provide opportunities for occupational diversification. This can be done through vocational training programmes and financial support, including support for self-employed or group-operated microenterprise development. The promotion of family planning is important for giving women greater power in decision-making in reproductive matters.

Important areas for government support in conjunction with the private sector and NGOs are the provision of access to accident and life insurance and social security programmes, such as unemployment and pension programmes and benefits, and the provision of access to affordable credit and microfinance facilities. Considering the impacts of climate change and variability in coastal and riparian areas, and the resulting increased occurrence of natural calamities such as storms and floods, there is an urgent need for providing accurate and adequate weather forecasts and early warning systems.

While many studies have been conducted on SSFs, particularly on socio-economic aspects as shown by this review, there is still a need for empirical studies in the following areas, among others things:

- impact of changes of management and conservation regimes on livelihoods of small-scale fisherfolk and on poverty and vulnerability;
- impacts of land- and sea-based human activities on habitats, life cycles and food webs of species fished by SSFs;
- economic valuations of coastal and riparian ecosystems that host SSFs;
- case studies of successful diversification of small-scale fishing effort to offshore resources;
- case studies of successful occupational diversification of small-scale fishers' livelihoods;
- methodologies on how to calculate the balance between fishing effort and food security and poverty alleviation;
- continuation of global monitoring of technoeconomic performance of capture fisheries.

Drawing conclusions from the findings of the studies reviewed in this document, Table 8 summarizes the challenges, barriers and opportunities for increasing the contribution of SSFs to poverty alleviation, food security and sustainable fisheries.

Table 8

Challenges, barriers and opportunities for increasing the contribution of small-scale fisheries to poverty alleviation, food security and sustainable fisheries

Key issues	Challenges and barriers	Opportunities
1. Environmental challenges and barriers	1.1 Pollution caused by the discharge of sewage, discharge of industrial and agricultural fertilizers, nutrients, pesticides, herbicides, insecticides and other chemical substances into marine and inland waters that are toxic both to aquatic life as well as human life and result in eutrophication, paralytic shellfish poisoning, death zones and other harmful effects.	1.1.1 Reduce land, water and air-based pollution and causes of ocean acidification by introducing effective legislation, science-based standards, and enforcement tools to ensure their compliance. Tools may include: increase public awareness and education; develop adequate fines to promote deterrence; and incentives for achieving or surpassing the standards. 1.1.2 Restoration and improvement of degraded coastal and riparian habitats and ecosystems including habitats in rivers, estuaries, floodplains and other inland waterbodies.
	1.2 Coastline erosion in marine and inland waters, deforestation, siltation, modification of fish habitat and reduction of survival space for aquatic organisms, caused by urban development, mining and other industrial activities in the coastal and riparian zone.	1.2.1 Introduction of sustainable land-use planning in riparian areas and watersheds, including among others, sustainable development standards, permanent protection for ecologically important areas, and restoration of critical aquatic habitats.
	1.3 Degradation/destruction of estuaries, mangroves, coral reefs and other aquatic, coastal and riparian ecosystems.	1.3.1 Undertake economic valuations of coastal and riparian ecosystems that host SSFs, and subsequent actions to restore critical aquatic habitats.
	1.4 Climate change and variability resulting in changes of ocean currents, ENSO, rainfall, evaporation, river flows, lake levels, thermal structure, storm severity and frequency, ocean acidification, salinity, temperature and ice cover.	1.4.1 Provision of accurate marine weather forecasts and communication facilities, marine rescue services and other safety-at-sea measures including provision of early warning systems.
	1.5 Reduction of biodiversity and changes of coastal and marine trophic webs.	1.5.1 Case studies on the impact of changes of management and conservation regimes on livelihoods of small-scale fisherfolk and on poverty and

Key issues	Challenges and barriers	Opportunities
		<p>vulnerability.</p> <p>1.5.2 Case studies on impacts of land and sea based human activities on habitats, life cycles and food webs of species fished by SSFs.</p> <p>1.5.3 Use the above case studies to implement solutions that would increase both the biodiversity and resilience of coastal and marine trophic webs such as establishment of fish refugia and other types of MPAs, protecting critical habitat.</p>
2. Governance, management and conservation of fisheries and other natural resources	2.1 Exclusion of fishers from management of fisheries resources; lack of information, consultation and participation in governance, management and conservation arrangements in many countries.	2.1.1 Inclusion of SSF sector representation in integrated coastal and riparian zone management programmes.
	2.2 Lack of secure use rights of fishers to fishery and aquatic resources.	<p>2.2.1 Strengthen small-scale fishers organizations to enhance their ability to participate in policy development and decision-making processes and capacity development of representatives.</p> <p>2.2.3 Regular monitoring of the impact of fisheries management measures on the livelihoods of small-scale fishing communities. Increase the capacity of fishers to assist in the monitoring efforts.</p>
	2.3 Outdated (or lack of) fisheries laws, regulations and management plans in some countries and at regional levels that do not incorporate the precautionary approach and ecosystem approach to fisheries management.	2.3.1 Improve fisheries management strategies to include ecosystem management and the precautionary approach, ending free access to fishery resources and introducing community/user rights-based management arrangements.
	2.4 Lack of integration of fisheries into coastal and riparian zone management programmes.	2.4.1 Greater participation of SSF stakeholders in fisheries legislation, policy development and all stages of fisheries management cycle, i.e. generation and analysis of data, generation of management advice, decision making,

Key issues	Challenges and barriers	Opportunities
		implementation, review, evaluation and adaptation.
	2.5 Lack of adequate systems for fishery and ecosystem data collection, analysis and sharing at national and regional levels.	2.5.1 Coordinate with local universities and government agencies to introduce state of the art fishery and ecosystem data collection systems, analysis and sharing at national and regional levels.
	2.6 Lack of ratification of multilateral fisheries and environmental treaties by national governments.	2.6.1 Ratification of multilateral fisheries and environmental treaties by national governments and delimitation of maritime boundaries in some countries.
	2.7 Lack of delimitation of maritime boundaries in some countries.	2.7.1 Delimitation of maritime boundaries and conclusion of fishing agreements between neighbouring countries.
3. Fishing technology, operations, fishery resources	3.1 Use of destructive fishing methods.	3.1.1 Establishment of artificial reefs and fish aggregating devices for ecosystem protection, e.g. to restrict bottom trawling without interfering with natural reefs.
	3.2 Fleet overcapacity and overcapitalization.	3.2.1 Assessment of offshore fishery resources, promotion of offshore fishing and development and diversification of fishing effort, transfer and promotion of responsible and safe fishing technologies and operations; adoption of precautionary approaches to fisheries management.
	3.3 IUU fishing.	3.3.1 Implementation of measures to end IUU fishing and participation in International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing.
	3.4 Conflicts and competition for space in coastal waters with industrial fleets, aquaculture, urban development, oil drilling, tourism.	3.4.1 Case studies of successful diversification of small-scale fishing effort to offshore resources. Develop a marine and shoreline zoning plan to establish separate areas and limits to uses in the zones.

Key issues	Challenges and barriers	Opportunities
	3.5 Overfishing and depletion of fishery resources.	3.5.1 Establishment of MPA and reserves to both maintain recruitment over time while protecting the livelihoods of artisanal fishers for future generations.
	3.6 Bycatch and discards of fish, although limited in SSFs.	3.6.1 Reduction and better utilization of bycatch.
	3.7 Negative impacts of climate change on fish abundance and migration.	<p>3.7.1 Mitigation of climate change impacts through reduction of CO₂ emissions.</p> <p>3.7.2 Monitoring and mitigating the effects of ocean acidification.</p> <p>3.7.3 Case studies/economic valuations of the consequences of current ocean acidification on fisheries and aquaculture and potential benefits of preventing further acidification.</p>
	3.8 Negative impacts of climate change on fishing operations through more severe storms, flooding and other impacts.	<p>3.8.1 Mitigation of climate change impacts by encouraging the implementation and enforcement of The Kyoto Protocol to the United Nations Framework Convention on Climate Change as the primary means of reducing CO₂ emissions, and encouraging local efforts to reduce emissions.</p> <p>3.8.2 Implementation of coastal protection measures such as locating new development with an adequate set back from the shore and construction of adequate infrastructure such as levees and dykes as necessary.</p> <p>3.8.3 Improvement in fisherfolk housing and community infrastructure, which may include re-establishing communities inland to ensure safety.</p> <p>3.8.3 Protection/restoration of coastal wetlands, which can serve as flood protection buffers.</p> <p>3.8.4 Construction of protected</p>

Key issues	Challenges and barriers	Opportunities
		<p>fishing ports and breakwaters.</p> <p>3.8.5 Improving safety-at-sea measures, including vessels monitoring systems for small- and medium-scale fishing vessels, as well as sea rescue operations.</p>
4. Fishery products, marketing and utilization	4.1 Poor handling and conservation methods/infrastructure resulting in high losses, low quality and low prices.	4.1.1 Reduction of waste and addition of value to fishery products through provision of improved onshore infrastructure for landing, storage, processing and transportation of fish as well as training and capacity building of fish processors and traders.
	4.2 Lack of marketing information and bargaining power.	<p>4.2.1 Provision of information to SSF processors and traders on fish product regulations including import and export regulations, HACCP, ecolabelling and traceability of fishery products.</p> <p>4.2.2 Promotion of domestic fish marketing strategies that complement export-oriented fish marketing strategies.</p> <p>4.2.3 Provision of market and price information to SSF fish processors and traders, strengthening their bargaining power through promotion of associations and capacity development.</p>
	4.3. Information asymmetry and lack of transparent price, demand and market information along the value chain.	4.3.1 Function and process upgrading along the value chain.
	4.4 Lack of fish wholesale markets in large urban areas and efficient assembly markets at important fish landing sites.	4.4.1 Establishment of fish wholesale markets in large urban areas, establishment of well-functioning assembly markets at important fish landing sites.
	4.5 Lack of legal/regulatory framework for the operations of fish wholesalers, lack of efficient fish market price information systems.	4.5.1 Improvement of the legal and regulatory framework for the operations of fish wholesalers, establishment of fish market price information systems.

Key issues	Challenges and barriers	Opportunities
5. Socio-economic status of fishers	5.1 Poverty, vulnerability, low living standards in terms of sanitation, health, education, housing.	<p>5.1.1 Integration of SSFs in national strategies to reduce poverty and hunger.</p> <p>5.1.2 Provision of adequate infrastructure to all rural fishing villages, providing services for improved education, health, garbage disposal, sewage facilities, safe drinking-water, and electricity.</p>
	5.2 Displacement and deprivation of land use and access.	5.2.1 Securing legal rights of fishers regarding tenure and access to traditional fishing grounds and riparian and coastal areas.
	5.3 Gender inequality.	<p>5.3.1 Promotion of gender equality with regard to participation in management and conservation of aquatic resources, ownership of fishery and other assets, occupational participation and remuneration and other aspects.</p> <p>5.3.2 Promotion of women's reproductive rights and access to family planning services.</p>
	5.4 Lack of access to insurance, credit, microfinance and social security services.	<p>5.4.1 Provision of access to accident and life/medical insurance and social security programmes such as unemployment and pension programmes and benefits.</p> <p>5.4.2 Provision of access to affordable credit and microfinance services.</p>
	5.5 Lack of occupational mobility and supplemental and alternative employment opportunities.	<p>5.5.1 Capacity development and training including non-sector specific knowledge and skills such as business management, socio-economics and marketing, besides fishery specific skills, with a special focus on gender equality and the empowerment of women in fishing communities.</p> <p>5.5.2 Conduct new, if needed, and/or apply existing if available, case studies of successful</p>

Key issues	Challenges and barriers	Opportunities
		occupational diversification of small-scale fishers livelihoods to aquaculture and to non-fisheries economic activities. Implement best solutions adapted to the specific communities, based on the outcome of case studies.

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