COFI/2016/SBD.19 E

July 2016

COMMITTEE ON FISHERIES

Thirty-third Session

Rome2016

FISHERIES AND AQUACULTURE IN OUR CHANGING CLIMATE: FAO SUPPORT TO ADAPTATION AND MITIGATION MEASURES

This background paper provides an overview of FAO support to countries regarding climate change adaptation and mitigation measures from 2011-2016.

This paper is an update of COFI/2011/6[1] presented at the Twenty-ninth Session of the FAO Committee on Fisheries.

[1] http://www.fao.org/docrep/meeting/021/k9668E.pdf

Introduction

Climate change will compound existing pressures on fisheries and aquaculture and the question of how to meet increasing demand for fish in the face of climate change poses a great challenge to fisheries and aquaculture management. For example, changes in temperature can have significant influences on the reproductive cycles of fish, including the speed at which they reach sexual maturity, the timing of spawning and the size of the eggs they lay. The projected increasing temperatures will likely result in changes in distributions of both freshwater and marine species, with most marine species ranges being driven toward the poles, expanding the range of warmer-water species and contracting that of colder-water species. Greenhouse gas (GHG) accumulation is also increasing the acidification of oceans, with potentially severe consequences for shellfish and squid, mangroves, tropical coral reefs and cold water corals and with unknown impacts on finfish and other aquatic resources. Rising sea levels will displace brackish and fresh waters in river deltas, wiping out some freshwater aquaculture practices and destroying wetlands, but also creating new environments and some opportunities (e.g. for brackish aquaculture species). Changes in precipitation or in storm activity (intensity and occurrence) endanger the lives of fishers, fishfarmers and coastal/riparian/lacustrine communities directly, can cause damage to fisheries and aquaculture infrastructure and housing, and presents additional threats for coral reefs and mangroves.

Fisheries, and aquaculture-dependent economies, coastal communities and fishers and fishfarmers and workers along the value chain are expected to experience the effects of climate change in a variety of ways. In addition to climate change impacts not stemming from the aquatic systems that they may face, such as increased risks of human diseases relating to increased temperatures, these communities are closely tied to changes in the aquatic world. These might include displacement and migration of human populations from low-lying areas to less risky areas or to follow changes in fish distributions; effects on coastal communities and infrastructure due to sea level rise and wave surges; and increased losses throughout the production and distribution chain due to changes in the frequency, distribution or intensity of weather events. One must note that many fishing and coastal communities already subsist in precarious and vulnerable conditions because of poverty and rural underdevelopment, with their well-being often undermined by overexploitation of fishery resources and degraded ecosystems. As the vulnerability of fisheries and fishing communities depends not only on their exposure and sensitivity to change, but also on the often lacking ability of individuals or systems to anticipate and adapt, these communities tend to be among the most vulnerable.

In 2007, COFI identified the need to address threats posed by climate change in fisheries and aquaculture. "(...) FAO should undertake a scoping study to identify the key issues on climate change and fisheries, initiate a discussion on how the fishing industry can adapt to climate change, and for FAO to take a lead in informing fishers and policy makers about the likely consequences of climate change for fisheries" (paragraph 76, Report of the 27th Session of the Committee on Fisheries).

The conclusions and recommendations of Expert Workshop on Climate Change Implications for Fisheries and Aquaculture were discussed within the agenda item on climate change during the twenty-eighth session of COFI in 2009, raising interest and gaining support from many countries, in particular Small-Island Developing States (SIDS) and countries from the Sahel. As a result, COFI noted climate change to be one of the Fisheries and Aquacultures Department's priority areas of work. Since then, the twenty-ninth, thirtieth and thirty-first sessions of COFI have reiterated the need to improve understanding of the implications of climate change and ocean acidification on fisheries and aquaculture.

The FAO Fisheries and Aquaculture Department has undertaken significant initiatives with respect to climate variability, change, ocean acidification and fisheries and aquaculture, including an initial, joint Policy Brief[2] to inform the UNFCCC as the first thematic sectoral outline of issues,

[2] http://www.fao.org/docrep/010/a1115e/a1115e00.pdf and http://www.fao.org/docrep/010/a1115e/a1115e00.pdf

interactions and potential responses. This was further developed within the FAO-wide preparatory work on climate change and emergency responses and with the 2008 FAO Expert Workshop on Climate Change Implications for Fisheries and Aquaculture[3]. In 2009, FAO helped to form the Global Partnership for Climate, Fisheries and Aquaculture (PaCFA)[4], a voluntary grouping of over 20 international and regional organizations and sector bodies sharing a common concern for climate change interaction with global waters and living resources and their social and economic consequences. Since then, the FAO has continued to support the knowledge base on climate change implications for fisheries and aquaculture with the aim to support members' climate readiness both in terms of climate change adaptation as well as greenhouse mitigation from within the sector. The Fisheries and Aquaculture department developed a climate change strategic framework for 2011-2016[5] that guided its work on awareness raising, adaptation options, mitigation potentials and fostering partnerships within climate change.

Understanding vulnerabilities/risks and adaptation options

FAO and partners have been working to identify climate change implications, vulnerabilities and context-specific adaptation and disaster risk management strategies to improve the resilience of vulnerable aquatic ecosystems and their dependent communities, and that provide shoreline and riverine protection, food and nutrition security, maintenance of water quality, income and livelihoods services. Examples of related activities include the first global review of climate change implications for the sector[6] and the recent assessment of the Intergovernmental Panel on Climate Change (IPCC) from the fisheries and aquaculture perspective[7]. The FAO was represented in the IPCC 2014 assessment and will support the up-coming IPCC special reports on oceans and food security.

To support the downscaling of knowledge and planning within the sector, thirteen regional or sub-regional workshops[8] were organized around the globe in Africa[9], Latin America[10], Benguela Current[11], Pacific SIDS[12], Caribbean[13], Lake Chad Basin[14], APFIC region[15], Near East/North Africa[16] as well as a national workshop in Vietnam along the lower Mekong Delta. These workshops brought together climate change experts with fisheries and aquaculture experts to review current scientific knowledge and define priorities activities to guide actions and investments in the near future.

Moreover, FAO has been supporting the IAEA-led efforts on understanding food security implications of ocean acidification and a global assessment of the implications of ocean acidification and fisheries and aquaculture is also underway.

Support for understanding vulnerabilities specific to the sector include a global expert workshop, organized jointly with PaCFA, to climate change vulnerability assessment (VA) methodologies in

[3] http://www.fao.org/docrep/011/i0203e/i0203e00.pdf
[4] http://www.fao.org/pacfa/en/
[5] ftp://ftp.fao.org/fi/brochure/climate_change/stragegy_fi_aq_climate/2011/climate_change_2011.pdf
[6] http://www.fao.org/docrep/012/i0994e/i0994e00.htm
[7] For the complete report, see http://www.fao.org/3/a-i5707e.pdf; for a brief, see http://www.fao.org/3/a-i5871e.pdf
[8] For proceedings of a Near East/North Africa workshop, see http://www.fao.org/docrep/014/i2146e/i2146e.pdf. For the Asia/Pacific workshop see http://www.apfic.org/uploads/2011-17.pdf
[9] http://www.fao.org/3/a-i3843b.pdf; http://www.fao.org/3/a-i3239b.pdf; http://www.fao.org/3/a-i3756e.pdf; and http://www.fao.org/3/a-i3753e.pdf
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[13] http://www.fao.org/3/a-i4369e.pdf
[14] http://www.fao.org/docrep/017/i3037e/i3037e.pdf
[15] http://www.fao.org/docrep/015/ba0084e/ba0084e00.pdf
[16] http://www.fao.org/docrep/014/i2146e/i2146e00.htm

fisheries and aquaculture, in April, 2013[17]; providing experiences[18] and guidance on assessments and from which a technical report on VA methodologies has been published[19]. In addition, a global aquaculture vulnerability assessment and an assessment of the vulnerability of African aquaculture are underway and will provide further information on potential impacts to the sector and priorities for action. National and local scale VA have been supported in Kenya[20], in Peru and in the Benguela[21] region – as well as in our adaptation project development efforts - to guide adaptation planning.

The FAO is also working with member countries towards the development and implementation of their national adaptation plans (NAP and NAPA[22]), supporting the effective participation of the sector in national and regional climate change discussions and is also assisting members in the development and implementation of adaptation projects under the GEF climate change funds for adaptation (SCCF, LDCF) and other forms of adaptation funding, such as in Bangladesh, the Benguela current countries, the Eastern Caribbean, Chile, Malawi, and Myanmar. Additional requests for such support have been received from countries and are being addressed as far as resources allow. Each project proposal development process has implemented a participatory approach and has supported national and regional workshops, which have contributed to broadened understanding of climate change implications and to strengthened government capacities. Climate variability and change are also being incorporated into fisheries and aquaculture development projects, such as the EAF Nansen and GEF International Waters projects (e.g. Bay of Bengal LME and the Canary Current LME) as well as through the work of the Department to implement the Ecosystem Approach to Fisheries and Aquaculture.

Support to adaptation actions has also been provided by initial reviews of adaptation actions in the sector[23], the co-organization of a global climate change adaptation in fisheries and aquaculture conference to be held in August, 2016[24], and piloting of integrated environmental monitoring systems to assist early warning and prevention for the sector with the purpose of developing guidelines and or manuals for environmental monitoring that takes in consideration climatic variability and climate change[25].

In addition, the Fisheries and Aquaculture Department is developing partnerships at global, regional and national levels to improve preparedness for and response to disasters, which explicitly link to climate change-induced impacts. To date, the Department has carried out one global[26] and three regional consultations with key partners to identify priority areas of action relating to DRM, fisheries and climate change-induced disasters. These regional consultations have been carried out in Africa, Asia-Pacific and Latin American and the Caribbean. The outputs of these meetings have been used to further focus and develop the programme. At the national level, the programme is currently supported by FAO in Saint Lucia, Dominica, Philippines and Belize. Fisheries and Aquaculture Emergency Response Guidance has[27] also been developed as Disaster Risk Management (DRM) is a key approach for reducing vulnerability of fishing and fish farming communities to the impacts of natural disasters. Initial estimates of the global impact of natural

[17] http://www.fao.org/docrep/018/i3357e/i3357e.pdf
[18] http://www.fao.org/docrep/018/i3315e/i3315e.pdf
[19] http://www.fao.org/3/a-i5109e.pdf
[20] http://www.fao.org/docrep/018/ap972e/ap972e.pdf
[21] http://www.fao.org/3/a-i5026e.pdf
[22] For a review of the sector in NAPA, see FAO Fisheries and Aquaculture Circular No. 1064 http://www.fao.org/docrep/014/i2173e/i2173e.pdf
[23] http://www.fao.org/docrep/019/i3569e/i3569e.pdf
[24] www.fishadapt.com
[25] See, for example, http://www.fao.org/3/a-i5509s.pdf
[26] FAO. 2009. Report of the Inception Workshop of the FAO Extrabudgetary Programme on Fisheries and Aquaculture for Poverty Alleviation and Food Security. Rome, 27–30 October 2009. *FAO Fisheries and Aquaculture Report*. No. 930. Rome, FAO. 2010. 68p.
[27] http://www.fao.org/3/a-i3432e/index.html

hazards and disasters on agriculture and food and nutrition security[28] have provided a methodology for understand loss and damages due to natural hazards to the agriculture sectors, including fisheries and aquaculture.

The first global conference on climate change adaptation in fisheries and aquaculture will be held in Bangkok from 8-10 August, 2016[29] and continued collaboration in the development of global conferences with partners will continue.

Greenhouse gas emissions and mitigation from within fisheries and aquaculture

COFI 29 recommended that FAO should provide Members with information on possible fishing industry contributions to climate change, and on ways to reduce the sector's reliance on, and consumption of, fossil fuels, respecting the principles embodied within UNFCCC. The paucity of data on GHG emissions across fisheries and aquaculture supply chains is a key factor constraining the development of strategies to address energy use and, therefore, the FAO has initiated assistance in the following areas: (i) understanding methodologies for energy and emissions calculations throughout the food chain and (ii) the development of policy and technologies to support the transition to energy-efficient and low foot print aquatic food production systems. To this end, two global expert workshops were convened. The first workshop's (23 to 25 January 2012) aim was to develop and progress an agreed methods framework to assess Green House Gases (GHG) emissions and the implications of different methods in the quantification of GHG from different seafood production systems.[30] Following the collection of data from specific seafood production systems, a second workshop[31] was held to present the findings, validate and confirm potential methodologies for wider use, and discuss the potential for reducing GHG emissions through changes in technology and practices and the impacts such changes may have on the system. A review of fuel and energy use in fisheries and aquaculture[32] was produced to support these workshops, fuel/energy audits were piloted in Thailand, and a workshop on improving feed conversion ratios in aquaculture will be held in 2016. The outputs from this work will help provide practical guidance to industry practitioners and will steer FAO activities in support of Member States on understanding and enabling mitigation of GHG emissions in fisheries and aquaculture production systems and supply chains. They will also inform further support in capacity building, policy development and strategic investment.

In addition, FAO published a new manual on fuel savings for small fishing vessels[33]. This manual is based on a previously published FAO Fisheries and Aquaculture Technical Paper 383: "Fuel and financial savings for operators of small fishing vessels" published in 1999 and on the Bay of Bengal Programme publication BOBP/WP/27: "Reducing the fuel costs of small fishing boats" published in 1986. The new manual aims to provide practical advice to fishing boat owners and crew on how fuel cost, and thereby GHG emissions, can be reduced. The manual, which makes extensive use of illustrations in order to make the information more easily understandable, focuses of small fishing boats below 16 m in length with speed below 10 knots and covers therefore the majority of the world's fishing boats.

[28] http://www.fao.org/3/a-i4434e.pdf
[29] www.fishadapt.com
[30] FAO. 2012. Report of the Expert Workshop on Greenhouse Gas Emissions Strategies and Methods in Seafood. Rome, 23–25 January 2012. FAO Fisheries and Aquaculture Report No. (also available at 1011www.fao.org/docrep/017/i3062e/i3062e.pdf (.
[31] http://www.fao.org/3/a-i4697e.pdf
[32] http://www.fao.org/3/a-i5092e.pdf
[33] http://www.fao.org/docrep/017/i2461e/i2461e00.htm (available in English, French, Spanish, Chinese)

Increasing the visibility of fisheries and aquaculture in cross-sectoral and global climate change discussions

The FAO has been supporting the UNFCCC through technical submissions[34] on adaptation in the agriculture sectors, National Adaptation Plan (NAP), National Adaptation Plans of Action (NAPA), extreme events, vulnerability assessments, etc, sharing of knowledge through the Nairobi Work Plan, as well as participating in the work of the UNFCCC Least Developed Countries Expert Group. FAO regularly participates in the formal meetings of the UNFCCC and its subsidiary bodies, providing technical support when requested. Fisheries and aquaculture are regularly integrated into the broader, cross-sectoral activities. The FAO has supported the development of Agriculture Sectors' guidelines for NAP development and will develop more detailed guidance on the incorporation of fisheries and aquaculture in the NAP process.

FAO has also led cross-sectoral activities and reports including a seminal report "Climate change and food security: risks and responses"[35], a joint FAO/OECD workshop on "Building Resilience for Adaptation to Climate Change in the Agriculture Sector"[36] and a sourcebook on "Climate Smart Agriculture"[37]. In addition, the up-coming State of Food and Agriculture will concentrate on climate change and the agriculture sectors and a review of initial UNFCCC Intended Nationally Determined Contributions (INDCs)[38] from the agriculture sectors is being finalized. The issues and priorities of the fisheries and aquaculture sector have been included in these efforts.

[34] For the complete list of FAO submissions to the UNFCCC, see http://www.fao.org/climate-change/international-fora/submissions/2016/en/
[35] http://www.fao.org/3/a-i5188e.pdf
[36] http://www.fao.org/docrep/017/i3084e/i3084e.pdf
[37] http://www.fao.org/docrep/018/i3325e/i3325e00.htm
[38] http://www.fao.org/3/a-i5687e.pdf