

**FAO INPUTS IN RELATION TO RESOLUTION A/RES/69/245
CONCERNING “OCEANS AND THE LAW OF THE SEA”
FOR THE REPORT OF THE SECRETARY-GENERAL TO THE SEVENTIETH SESSION OF THE
UNITED NATIONS GENERAL ASSEMBLY**

SUMMARY (400 WORDS)

Climate change, variability and extreme weather events are compounding threats to the sustainability of capture fisheries and aquaculture development in marine and freshwater environments. Impacts occur as a result of both gradual atmospheric warming and associated physical and chemical changes of the aquatic environment. Fisheries and aquaculture-dependent economies, coastal communities, fishers, fish farmers and workers along the value chain are expected to experience the effects of climate change in a variety of ways.

The FAO Fisheries and Aquaculture Department has undertaken significant initiatives to address climate change, climate-related disasters and their impacts on the fisheries and aquaculture sector. These include awareness raising through the release of policy briefs and knowledge products intended for policy makers and providing an overview of climate change implications and vulnerabilities, as well as potential adaptation and mitigation options. In addition to raising the profile of the fisheries and aquaculture sector in the international dialogues and negotiations on climate change, for instance in the framework of the UNFCCC and the Sendai Framework for Disaster Risk Reduction, the FAO carried out global reviews on climate and disaster-related topics and was involved in the organization global conferences on climate change.

Even though the understanding of climate change impacts on the sector is improving; local information still needs to be built to foster adaptation planning at the community and national level. FAO invested efforts in downscaling the available knowledge at regional, sub-regional and national level in Asia, Africa, Latin America and the Caribbean. Member countries were also supported towards the development and implementation of their national adaptation plans and for access to financial resources for the implementation of field projects addressing the vulnerabilities identified.

In addition to covering all Regions, efforts are also invested in building knowledge on a number of relevant topics, laying the ground for guidance intended for Member Countries and their policies for the fisheries and aquaculture sector: vulnerability assessments, safety at sea, disaster risk management and reduction, resilience, insurance schemes, ocean acidification, fisheries and aquaculture communities in the drylands, fuel and energy use in the sector, legal implications of climate change.

Future actions will be guided by the strategy endorsed by the Member Countries through the FAO Committee on Fisheries. They include the strengthening of the knowledge base on climate change, such as environmental and economic impacts of El-Niño-Southern Oscillation and of ocean acidification; the synthesis of climate change impacts on inland fisheries. In addition, Member Countries will be supported in the identification and implementation of adaptation and mitigation measures at local and national level. . In addition, the Fisheries and Aquaculture Department contributes to FAO’s corporate efforts to develop and institutionalize an information system on damages and losses caused by disasters on the agricultural sectors, including fisheries and aquaculture. Finally, efforts will be invested in ensuring a proper representation of the fisheries and aquaculture sector in the international climate arena and financial mechanisms

(i) Key interactions between oceans and climate change

Climate change – alongside climate variability events such as El Niño-Southern Oscillation and extreme (weather) events – is affecting the abundance and distribution of fisheries resources and

suitability of geographical locations for aquaculture. Climate-related physical and chemical changes are linked to yet growing carbon dioxide emissions, which are being absorbed in large part by the aquatic systems and trigger substantial shifts of aquatic ecosystems and related services important for food security and livelihoods around the globe.

Climate-related changes that affect ecological functions and the frequency, intensity and location of extreme weather events include changes in salinity and freshwater content, oxygen concentration, carbon uptake and acidification, temperature and thermal stratification, sea level, ocean circulation, surface wind, storm systems and waves. A range of direct and indirect impacts on fisheries and aquaculture can be expected.

Evidence exists that climate change is modifying the distribution of marine species. Many species are migrating towards the poles and deeper waters to follow their ideal habitat with regard to, as for example, oxygen levels. These migratory shifts cause changes in interaction dynamics, trophic linkages and food webs. Where migration is not possible, many aquatic species are likely to experience changes in their size, reproductive cycles and survival rates. The impacts, both positive and negative, will depend on the region and latitude. Where favored commercial species are moving offshore and away from traditional fishing grounds, new invasive species are likely to enter the vacuum. The encroachment of species tolerant of higher temperatures, altered riverine flows and freshwater runoff, and changing coastal and freshwater quality will all affect ecosystem productivity. Overall, the expected impact in most tropical and subtropical marine environments, seas and lakes will be reduced productivity. A similar impact of decreased productivity is expected in low/mid latitudes. Conversely, high-latitude systems are predicted to experience increased productivity of capture fisheries. Freshwater systems are vulnerable to seasonal or long term temperature changes and altered precipitation, with limited prospects for adaptation or shifting ranges for the species involved. Coastal systems are particularly vulnerable to temperature increases, hypoxic zones, acidification, and extreme (weather) events such as sea level rise and storms.

(ii) Effects of climate change on the oceans, including environmental, social and economic implications

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, fish farmers 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 fish farmers 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.

The broader development and food security threats of climate change are increasingly well recognized and are now a major priority for local, national and international action. The issues and implications relating to fisheries and aquaculture in general and for coastal and riparian communities in particular, are enormous and yet poorly identified, ranging from distributional shifts, productivity and seasonality changes, to habitat restructuring. The sector, and the aquatic environments on which it depends, also have potentially important roles in greenhouse gas emission, management and mitigation, with significant issues and impacts of fuel and energy use, and major implications in 'blue carbon' management and its global ecosystem value. Though often overlooked or neglected amidst broader development concerns, the fisheries and aquaculture sectors have unique issues and vulnerabilities with respect to climate change, and these require specific and well considered responses.

(iii) Actions and activities that have been undertaken to address the effects of climate change on the oceans and to foster climate resilient sustainable development of oceans and seas

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 Brief¹ to inform the UNFCCC as the first thematic sectoral outline of issues, 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 Aquaculture². In 2009, FAO helped to form the Global Partnership for Climate, Fisheries and Aquaculture (PaCFA)³, 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 2011-2016⁴ 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 sector⁵ and the recent assessment of the Intergovernmental Panel on Climate Change (IPCC) from the fisheries and aquaculture perspective⁶. The FAO was represented in the IPCC 2014 assessment and participated in scoping and expert meetings in preparation of the up-coming IPCC

¹ <http://www.fao.org/docrep/010/a1115e/a1115e00.pdf> and <http://www.fao.org/docrep/010/a1115e/a1115e00.pdf>

² <http://www.fao.org/docrep/011/i0203e/i0203e00.pdf>

³ <http://www.fao.org/pacfa/en/>

⁴ ftp://ftp.fao.org/fi/brochure/climate_change/stragegy_fi_aq_climate/2011/climate_change_2011.pdf

⁵ <http://www.fao.org/docrep/012/i0994e/i0994e00.htm>

⁶ 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>

Special Report on climate change and oceans and the cryosphere (SROCC) and the IPCC Special Report on Climate Change, Land Use and Food Security.

To support the downscaling of knowledge and planning within the sector, thirteen regional or sub-regional workshops⁷ were organized around the globe in Africa⁸, Latin America⁹, Benguela Current¹⁰, Pacific SIDS¹¹, Caribbean¹², Lake Chad Basin¹³, APFIC region¹⁴, Near East/North Africa¹⁵ as well as a national workshop in Vietnam along the lower Mekong Delta and in Myanmar. These workshops brought together climate change experts with fisheries and aquaculture experts to review current scientific knowledge and define priority activities to guide actions and investments in the near future.

The EAF-Nansen Project “Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries”, a long standing programme implemented by FAO with funding from the Norwegian Agency for Development Cooperation (Norad), contributes to increasing global knowledge on climate change by monitoring the oceans around developing nations. The expectation is to enhance the management of fisheries in developing countries including taking into consideration the risks and opportunities related to climate, pollution and other environmental and anthropogenic stressors.

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.

Strengthening institutional and management adaptations

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 fisheries and aquaculture, in April, 2013¹⁶; providing experiences¹⁷ and guidance on assessments and from which a technical report on VA methodologies has been published¹⁸. In addition, a global compilation of Adaptation Strategies of the Aquaculture Sector is underway and will provide guidance on how to cope with climate change impacts. National and local scale VA have been supported in Kenya¹⁹, in Peru and in the Benguela²⁰ region to guide adaptation planning.

The FAO is also working with member countries towards the development and implementation of their national adaptation plans (NAP and NAPA²¹), 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

⁷ 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>

⁸ <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>

⁹ <http://www.fao.org/docrep/018/i3356s/i3356s.pdf>

¹⁰ <http://www.fao.org/docrep/017/i3053e/i3053e.pdf>

¹¹ <http://www.fao.org/docrep/017/i3159e/i3159e.pdf>

¹² <http://www.fao.org/3/a-i4369e.pdf>

¹³ <http://www.fao.org/docrep/017/i3037e/i3037e.pdf>

¹⁴ <http://www.fao.org/docrep/015/ba0084e/ba0084e00.pdf>

¹⁵ <http://www.fao.org/docrep/014/i2146e/i2146e00.htm>

¹⁶ <http://www.fao.org/docrep/018/i3357e/i3357e.pdf>

¹⁷ <http://www.fao.org/docrep/018/i3315e/i3315e.pdf>

¹⁸ <http://www.fao.org/3/a-i5109e.pdf>

¹⁹ <http://www.fao.org/docrep/018/ap972e/ap972e.pdf>

²⁰ <http://www.fao.org/3/a-i5026e.pdf>

²¹ 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>

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 sector²², the co-organization of a global climate change adaptation in fisheries and aquaculture conference held in August, 2016²³, 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 change²⁴.

Legal aspects of climate change impacts were also tackled in support of Pacific Small Island Developing States (Pacific SIDS) threatened by sea level rise and implications for the areas under their jurisdiction. In particular, options for policy and legal mitigation and adaptation response were considered to address risks which sea level rise may pose by causing shorelines to recede thus decreasing the size of the sea areas under the jurisdiction of Pacific SIDS including the exclusive economic zones (EEZs). Existing marine jurisdictional areas of the Pacific SIDS, if not preserved, will negatively affect the ability and interest of the Pacific SIDS to continue to have access to and manage marine living resources.

Resilience/ Risk reduction

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 global²⁵ 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 as well as inform the development of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (the SSF Guidelines). At the national level, FAO provided support for the implementation of the programme in Saint Lucia, Dominica, Philippines and Belize. Fisheries and Aquaculture Emergency Response Guidance has²⁶ also been developed to improve the quality and accountability of emergency response in the fisheries and aquaculture sector. To date there have been no systematic guidelines to support those responding to emergencies involving the fisheries and aquaculture sector. Initial estimates of the global impact of natural hazards and disasters on agriculture and food and nutrition security²⁷ concluded that agriculture (including fisheries and aquaculture) absorbs 25 percent of all damages and losses for climate-related disasters such as floods, droughts and tropical storms. Recognizing that these numbers are under-estimates especially for the fisheries and aquaculture sector, the Fisheries and Aquaculture Department is currently working on a questionnaire and methodology to understand loss and damages due to natural hazards to the agriculture sectors.

²² <http://www.fao.org/docrep/019/i3569e/i3569e.pdf>

²³ www.fishadapt.com

²⁴ See, for example, <http://www.fao.org/3/a-i5509s.pdf>

²⁵ 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.

²⁶ <http://www.fao.org/3/a-i3432e/index.html>

²⁷ <http://www.fao.org/3/a-i4434e.pdf>

Moreover, FAO is developing guidelines on the use of “Spatial technology”, such as satellite remote sensing for disaster assessment and emergency preparedness for aquaculture; FAO is also developing a micronutrient rich fish based by product that can be used to increase nutrition in emergency context. FAO has completed a ‘Fisheries and Aquaculture Emergency Response Guidance’ including a training package to develop national and regional capacity and enhance the quality and accountability of response to emergencies affecting the fisheries and aquaculture sector along the value chain.

In addition, support was also provided to assess current practices of freshwater tilapia farming in the Philippines, identify critical gaps, and make appropriate recommendations to increase resilience to climate change and other natural disasters and ensure technical and economic successes.

In the context of supporting fishers and fish farmers to cope with disasters, guidance is being built on insurance. A global review in recognition of the opportunities fisheries insurance services can offer to the sustainable development of capture fisheries was carried out²⁸. Building on these efforts and broadening the thinking to aquaculture, a workshop was held with the purpose to recommend guidelines for policy and programmes to facilitate the development of aquaculture insurance for small-scale farmers. The purpose was to discuss how insurance can be made available and accessible to small-scale farmers, and identify policy and technical support needed to move the aquaculture insurance agenda forward. Discussions were based on case studies in China, Philippines, Thailand and Vietnam²⁹.

A report on the general resilience of fish resources to climatic variability, with a focus on the drylands of sub-Saharan Africa was produced³⁰. The publication reviews the importance of fisheries and aquaculture to the livelihoods of drylands communities; discusses future threats to human resilience; and identifies investment opportunities. The report is intended for policy makers and development practitioners to design and implement more effective policies, strategies and programmes that will contribute to reducing the food insecurity and conflicts that currently affect dryland environments in sub-Saharan Africa.

Greenhouse gas emissions and mitigation from within fisheries and aquaculture

Member countries recommended that FAO should provide them 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 systems³¹. Following the collection of data from specific seafood production systems, a second workshop (4-5 March 2013)³² 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

²⁸ <http://www.fao.org/docrep/011/i0744e/i0744e00.htm>

²⁹ <http://www.fao.org/3/a-i6823e.pdf>

³⁰ <http://www.fao.org/3/a-i5616e.pdf>

³¹ 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 1011 www.fao.org/docrep/017/i3062e/i3062e.pdf.)

³² <http://www.fao.org/3/a-i4697e.pdf>

fisheries and aquaculture³³ was produced to support these workshops, fuel/energy audits were piloted in Thailand³⁴.

In addition, FAO published a new manual on fuel savings for small fishing vessels³⁵. 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 on small fishing boats below 16 m in length with speed below 10 knots and covers therefore the majority of the world’s fishing boats.

A workshop on improving feed conversion ratios in aquaculture was held in 2015. The outputs from this work, currently being finalised, will help provide practical guidance to industry practitioners and will contribute to steering 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.

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

The FAO has been supporting the UNFCCC through technical submissions³⁶ 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”³⁷, a joint FAO/OECD workshop on “Building Resilience for Adaptation to Climate Change in the Agriculture Sector”³⁸ and a sourcebook on “Climate Smart Agriculture”³⁹. 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)⁴⁰ from the agriculture sectors is being finalized. The issues and priorities of the fisheries and aquaculture sector have been included in these efforts.

(iv) Suggestions for further action in this regard to address the effects of climate change on the oceans

The FAO’s Strategy for Fisheries, Aquaculture and Climate Change for 2017-2020 is under development. It will provide a strategic framework defining the perspectives and objectives of the

³³ <http://www.fao.org/3/a-i5092e.pdf>

³⁴ <http://www.fao.org/blogs/blue-growth-blog/improving-the-efficiency-of-thai-trawl-fishing-fleets-through-energy-audits/en/>

³⁵ <http://www.fao.org/docrep/017/i2461e/i2461e00.htm> (available in English, French, Spanish, Chinese)

³⁶ For the complete list of FAO submissions to the UNFCCC, see <http://www.fao.org/climate-change/international-fora/submissions/2016/en/>

³⁷ <http://www.fao.org/3/a-i5188e.pdf>

³⁸ <http://www.fao.org/docrep/017/i3084e/i3084e.pdf>

³⁹ <http://www.fao.org/docrep/018/i3325e/i3325e00.htm>

⁴⁰ <http://www.fao.org/3/a-i5687e.pdf>

FAO Fisheries and Aquaculture Department with respect to climate change issues and development responses, and its coherence and operational effectiveness with respect to more localized delivery through regional and subregional offices. The goal of the program is to enable people, communities and States to meet their social and development objectives effectively while responding to the additional challenges imposed by climate change on fisheries and aquaculture. The purpose of the program is to support Member States and partners in mitigating, and adapting effectively to, the impacts of climate change for fisheries, aquaculture and aquatic ecosystems, through policy development, knowledge development and exchange, normative outputs, practical demonstrations, and capacity building. The broad lines of the strategy were endorsed by COFI members.

In the near future, FAO will continue providing support to Member countries for the implementation of field projects aiming at strengthening the knowledge base on climate change impacts on the fisheries and aquaculture sector; identifying context-specific and suitable adaptation measures in close consultation with local communities; supporting the development of climate resilient policies and building capacity for climate change adaptation at local and national level. Ongoing projects in the Caribbean, Latin America, Africa and Asia will provide a set of lessons learnt that will be used to develop technical guidance on climate change adaptation for the fisheries and aquaculture sector. It is expected that adaptation guidance includes a toolbox describing suitable instruments that Member countries can use to foster institutional and management adaptation, strengthen the resilience of the fisheries and aquaculture sector, as well as dependent communities, and facilitate alternative or diversification of livelihoods.

A number of global reviews will be carried out with the purpose to provide scientific and technical knowledge and guide policy makers. A review of direct and indirect effects of ENSO (El Niño-La Niña) on marine and inland fisheries and aquaculture is underway. The review will also assess the economic impacts of ENSO on the sector and will identify potential actions to respond to the various phases of ENSO.

A global review on ocean acidification impacts on the fisheries and aquaculture sector will take stock of the current scientific knowledge available and will assess the vulnerability of the sector and the potential impacts throughout the value chain and the estimated economic costs. The review will also propose methodologies to measure ocean acidification.

FAO will support the development of a review on climate change impacts on inland fisheries, pulling out the outcomes of various initiatives and efforts and providing a global assessment of inland vulnerabilities to climate change.

Collaboration with partners will continue for the development of global conferences and regional workshops, in support of knowledge exchange on impacts of climate change and response actions.

During UNFCCC COP22, the role and importance of oceans in climate change adaptation and mitigation was reiterated and the fisheries and aquaculture sector gained more visibility. As a result, FAO will strengthen its support to Member countries in their efforts to mobilize financial and technical resources for the identification and implementation of adaptation and mitigation measures. Efforts will be pursued to ensure a proper representation of the fisheries and aquaculture sector in Green Climate Fund project proposals.

Relevant publications include:

Assessing water availability and economic, social and nutritional contributions from inland capture fisheries and aquaculture: an indicator-based framework. FAO Fisheries and Aquaculture Technical Paper No. 602. Rome, Italy. 2016.

FAO Workshop on Developing an Environmental Monitoring System to Strengthen Fisheries and Aquaculture Resilience and to Improve Early Warning in the Lower Mekong Basin. FAO Fisheries and Aquaculture Proceedings No.45. Rome, Italy. (In preparation).

Developing an Environmental Monitoring System to Strengthen Fisheries and Aquaculture Resilience and to Improve Early Warning in the Lower Mekong Basin. FAO/NACA Workshop 25-27 March, 2015. FAO Fisheries and Aquaculture Proceedings 45.

2017. <http://www.fao.org/3/a-i6641e.pdf>

Assessing water availability and related economic social and nutritional contributions provided by inland capture fisheries and aquaculture: an indicator-based framework - A compilation of water-related indicators in selected African and Asian countries. FAO Fisheries and Aquaculture Circular No. 1116. (In press)

Lessons learned in water accounting: the fisheries and aquaculture perspective. FAO Fisheries and Aquaculture Technical Paper No. 599. Rome, Italy. 2016.

Aquaculture diversification as an adaptation approach to climate change and other external forcing factors. FAO Fisheries and Aquaculture Technical Paper. Rome, Italy. (In preparation).

Proceeding of FAO/GSI Joint Workshop on Reducing Feed Conversion Ratios in the Global Aquaculture to reduce carbon and other footprints and increase efficiency. FAO Fisheries and Aquaculture Proceedings No.45. Rome, Italy. (In preparation).

Climate change and food security: risks and responses. Rome, FAO. 2016. <http://www.fao.org/3/a-i5188e.pdf>

Climate change implications for fisheries and aquaculture: Summary of the findings of the Intergovernmental Panel on Climate Change Fifth Assessment Report. FAO Fisheries and Aquaculture Circular No. 1122. Rome, Italy. 2016. <http://www.fao.org/3/a-i5707e.pdf>

Desarrollo de un sistema de monitoreo ambiental para mejorar la prevención y capacidad de adaptación al cambio climático de las comunidades pesqueras y acuícolas: caso de estudio estero real Nicaragua. FAO Fisheries and Aquaculture Circular No. 1112. Rome, Italy.

2016. <http://www.fao.org/3/a-i5509s.pdf>

Assessing climate change vulnerability in fisheries and aquaculture: available methodologies and their relevance for the sector. FAO Fisheries and Aquaculture Technical Paper 586.

2015. <http://www.fao.org/3/a-i5109e.pdf>

Community-level socio-ecological vulnerability assessments in the Benguela Current Large Marine Ecosystem. FAO Fisheries and Aquaculture Circular No. 1110. Rome, FAO.

2015. <http://www.fao.org/3/a-i5026e.pdf>

Fuel and energy use in the fisheries sector – Approaches, inventories and strategic implications.

FAO Fisheries and Aquaculture Circular No. 1080. Rome, FAO. 2015. <http://www.fao.org/3/a-i5092e.pdf>

Report of the Expert Workshop on Strategies and Practical Options for Greenhouse Gas Reductions in Fisheries and Aquaculture Food Production Systems. Bergen, Norway, 4-5 March 2013. FAO Fisheries and Aquaculture Report. No. R1073. Rome, FAO.

2014. <http://www.fao.org/3/a-i4697e.pdf>

Disaster risk management and climate change adaptation in the CARICOM and wider Caribbean region – Formulating a strategy, action plan and programme for fisheries and aquaculture.

Regional workshop 10–12 December 2012, Kingston, Jamaica. FAO Fisheries and Aquaculture Proceedings. No. 35. Rome. 2015. <http://www.fao.org/3/a-i4369e.pdf>

Climate Change Adaptation in Fisheries and Aquaculture- Compilation of initial examples. FAO Fisheries and Aquaculture Circular C1088. Rome, FAO.

2014. <http://www.fao.org/docrep/019/i3569e/i3569e.pdf>

Gap analysis of national and regional fisheries and aquaculture priorities and initiatives in Southern and Eastern Africa in respect to climate change and disasters. FAO Fisheries and Aquaculture Circular No. 1095. Rome, FAO. 2014. <http://www.fao.org/3/a-i3756e.pdf>

Gap analysis of national and regional fisheries and aquaculture priorities and initiatives in Western and Southern Africa in respect to climate change and disasters. FAO Fisheries and Aquaculture Circular No. 1094. Rome, FAO. 2014. <http://www.fao.org/3/a-i3753e.pdf>

Report of the FAO/NEPAD Workshop on Climate Change, Disasters and Crises in the Fisheries and Aquaculture Sector in Southern and Eastern Africa, Maputo, Mozambique, 22 to 24 April 2013. Rapport de l'Atelier FAO/NEPAD sur le changement climatique, les catastrophes et les crises dans le secteur des pêches et de l'aquaculture en Afrique australe et orientale, Maputo, Mozambique, 22-24 avril 2013. FAO Fisheries and Aquaculture Report/FAO Rapport sur les pêches et l'aquaculture No. 1055. Rome, FAO. 2014. <http://www.fao.org/3/a-i3843b.pdf>

Report of the FAO/NEPAD Workshop on Climate Change, Disasters and Crises in the Fisheries and Aquaculture Sector in West and Central Africa, Accra, Ghana, 1–2 November 2012. FAO Fisheries and Aquaculture Circular No. 1037. Rome, FAO. 2014. <http://www.fao.org/3/a-i3239b.pdf>

Implementation Guidelines on Part B of the Code, the Voluntary Guidelines and the Safety Recommendations. Rome, FAO. 2014. (in English, French and Spanish. In addition, draft versions are available in Arabic and Chinese.)
<http://www.fao.org/3/contents/abac9d1c-c266-4024-ac84-c41f02ca7375/i3662e00.htm>

Report of the FAO/PaCFA Expert Workshop on Assessing Climate Change Vulnerability in Fisheries and Aquaculture: Available Methodologies and their Relevance for the Sector, Windhoek, Namibia, 8–10 April 2013. FAO Fisheries and Aquaculture Report No. 1047. 2013. <http://www.fao.org/docrep/018/i3357e/i3357e.pdf>

Priority adaptations to climate change for Pacific fisheries and aquaculture - reducing risks and capitalizing on opportunities. FAO Fisheries and Aquaculture Proceedings 28. 2013. <http://www.fao.org/docrep/017/i3159e/i3159e.pdf>

Social-ecological vulnerability of coral reef fisheries to climatic shocks. FAO Fisheries and Aquaculture Circular C1082. 2013. <http://www.fao.org/docrep/018/ap972e/ap972e.pdf>

Vulnerability assessment methodologies: an annotated bibliography for climate change and the fisheries and aquaculture sector. FAO Fisheries and Aquaculture Circular 1083. 2013. <http://www.fao.org/docrep/018/i3315e/i3315e.pdf>

Climate Smart Agriculture Sourcebook. FAO. 2013. <http://www.fao.org/docrep/018/i3325e/i3325e.pdf>

Cambio climático, pesca y acuicultura en América Latina - potenciales impactos y desafíos para la adaptación. FAO Actas de Pesca y Acuicultura No 29. 2013. <http://www.fao.org/docrep/018/i3356s/i3356s.pdf>

Cinner, J., McClanahan, T., Wamukota, A., Darling, E., Humphries, A., Hicks, C., Huchery, C., Marshall, N., Hempson, T., Graham, N., Bodin, Ö., Daw, T. & Allison, E. 2013. *Social-ecological vulnerability of coral reef fisheries to climatic shocks*. FAO Fisheries and Aquaculture Circular No. 1082. Rome. <http://www.fao.org/3/a-ap972e.pdf>