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联合国  
粮食及  
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Food  
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Agriculture  
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Organisation  
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pour  
l'alimentation  
et  
l'agriculture

Продовольственная и  
сельскохозяйственная  
организация  
Объединенных  
Наций

Organización  
de las  
Naciones  
Unidas  
para la  
Agricultura  
y la  
Alimentación

# COMMITTEE ON FISHERIES

## Twenty-ninth Session

Rome, Italy, 31 January – 4 February 2011

### **FISHERIES AND AQUACULTURE IN OUR CHANGING CLIMATE: ADAPTATION AND MITIGATION MEASURES IN FISHERIES AND AQUACULTURE**

The Twenty-eighth Session of COFI, held in March 2009, reiterated the importance of climate change and its increasing impacts on fisheries and aquaculture and noted that implementation of the FAO Code of Conduct for Responsible Fisheries would increase resilience of the sector to climate change. COFI supported the conclusions and recommendations of the April 2008 Expert Workshop and called for FAO to play an active role in this area, especially where FAO has comparative advantages. Active collaboration with other organizations was advocated to avoid duplication of efforts.

At this Session, the Committee will receive updated information on activities undertaken by FAO to address this request as well a roadmap for priority activities to be undertaken.

The Committee will then be invited to: (i) Comment on the inter-sessional work undertaken by the Fisheries and Aquaculture Department (FI); (ii) Consider and comment on the roadmap proposed within the FI Strategy for Fisheries, Aquaculture and Climate Change, (iii) Consider, modify and supplement as necessary the recommendations to COFI Members; and (iv) Provide recommendations and guidance on future activities to be undertaken by FI.

## INTRODUCTION

1. During the Twenty-seventh Session of the FAO Committee on Fisheries (COFI), which took place in March 2007, it was requested that “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.” The subject was again raised during the thirty-fourth session of the FAO Conference, which “expressed particular concern over the impact of climate change, especially on the poorest and most vulnerable countries and populations” and that “agriculture, while itself contributing to greenhouse gas emissions, was also likely to be one of the sectors most affected by climate change and could also offer possible solutions”. In this regard, the Conference stressed the “need for strategies to avert and mitigate the effects of climate change and emphasized the importance of sustainable management of fisheries”.

2. In addition, recognizing that fisheries and aquaculture are of special food security importance to almost 3 billion people who depend on these resources as a significant source of protein and hundreds of millions that are linked to fisheries and aquaculture as a form of livelihood, the sector was accorded its own expert workshop within the preparations for the June, 2008 High Level Conference on World Food Security and the Challenges of Climate Change and Bioenergy. In preparation for the Conference, the FAO Fisheries and Aquaculture Department held an Expert Workshop on Climate Change Implications for Fisheries and Aquaculture convened in April 2008. The workshop identified and reviewed the key issues of climate change in relation to fisheries and aquaculture - from the physical changes, the impacts of these changes on aquatic resources and ecosystems, and how these ecological impacts translate into human dimensions of coping and adapting within fisheries and aquaculture. Conclusions of the workshop and the three background papers have been published as a seminal work on potential impacts of climate change on fisheries and developing and implementing adaptation and mitigation frameworks<sup>1</sup>. The workshop participants provided the High Level Conference with recommendations on priority areas for action by the international community to help minimize negative impacts as well as capitalize on new opportunities related to climate change, improve on mitigation and prevention, and maintain and build adaptive capacity to climate change.

3. The Twenty-eight Session of COFI, held in March 2009, reiterated the importance of climate change and its increasing impacts on fisheries and aquaculture and noted that implementation of the FAO Code of Conduct for Responsible Fisheries would increase resilience of the sector to climate change. COFI supported the conclusions and recommendations of the April 2008 Expert Workshop and called for FAO to play an active role in this area, especially where the Organization has comparative advantages. Active collaboration with other organizations was advocated to avoid duplication of efforts.

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<sup>1</sup> Cochrane, K.; De Young, C.; Soto, D.; Bahri, T. (eds). 2009. Climate change implications for fisheries and aquaculture: overview of current scientific knowledge. *FAO Fisheries and Aquaculture Technical Paper*. No. 530. Rome, FAO. 212p. Available at <http://www.fao.org/docrep/012/i0994e/i0994e00.htm>. The report of the expert workshop: Report of the FAO Expert Workshop on Climate Change Implications for Fisheries and Aquaculture. Rome, Italy, 7-9 April 2008. *FAO Fisheries Report*. No. 870. Rome, FAO. 2008. 32p. <http://www.fao.org/docrep/011/i0203e/i0203e00.htm>

4. The Fifth Session of COFI Sub-Committee on Aquaculture, held in October 2010, welcomed the inclusion of climate change in the meeting agenda. It recommended both short and long-term climate change adaptation and mitigation strategies. Short-term adaptation could include changes in management, improved zoning for aquaculture, aquatic health management and the development of monitoring and early warning systems. Longer-term strategies could include the use of new technologies, domestication and development of new aquaculture species, and aquaculture systems. A key aspect for mitigation will be to reduce the emission of greenhouse gases in the sector. It was recognized that an ecosystem approach will need to be pursued with the aquaculture sector as a key stakeholder. The Sub-Committee also recommended expanding the knowledge-base on climate change and its impacts.

5. Recent sessions of Regional Fishery Bodies (RFBs), such as the Asia-Pacific Fishery Commission (APFIC), the Committee for Inland Fisheries and Aquaculture of Africa (CIFAA) and the South West Indian Ocean Fisheries Commission (SWIOFC), have recognized the potentially serious impacts of climate change and vulnerabilities of fisheries and aquaculture systems particular to their regions. They have called for work on downscaling global scientific models and information, especially in areas not covered in current large-scale research programmes, and for the communication of scientific information in forms that are useful for decision-making and policy development. These RFBs also reiterated the need for: (i) supporting policy, legal and implementation frameworks at local, national and regional levels; (ii) reinforcing capacity of regional and national agencies and institutions to address climate change issues; (iii) planning for adaptation and mitigation within Members' fisheries and aquaculture sectors; and (iv) integrating fisheries and aquaculture into national climate change adaptation and mitigation plans and enabling financial mechanisms, such as through the National Adaptation Programmes of Actions (NAPA) and the supporting Least Developed Countries Fund (LDCF).

6. The Conference of African Ministers of Fisheries and Aquaculture (CAMFA), held in September 2010, discussed a background paper prepared by FAO on climate change consequences for the region's fisheries and aquaculture sector and recommended that its "Member States, Regional Economic Commissions and Regional Fisheries Bodies mainstream climate change in fisheries policies, development and management programmes"<sup>2</sup>.

7. The Asia-Pacific Economic Cooperation (APEC) ministers responsible for fisheries and marine resources conservation adopted the Paracas Declaration in October, 2010, which includes the impacts of climate change on the oceans as one of its four focus themes; calling for "a better understanding of the nature and magnitude of these changes and their effects and insights on what policy approaches will best allow our people and economies to adapt to these changes"<sup>3</sup>.

#### **FI AND FAO ACTIVITIES ON CLIMATE CHANGE IN 2009-2010**

*Publication of a report on the implications of climate change for fisheries and aquaculture and of the Blue Carbon report*

8. As reported in the Introduction, FAO published a Technical Paper on "Climate Change implications for fisheries and aquaculture: Overview of current scientific knowledge". In three parts, each authored by leading experts in the subject, the paper reviews the physical effects of climate change and their impacts on marine and inland capture fisheries and aquaculture; the consequences of these changes for fishers and their communities; and their implications for aquaculture specifically. The latter two chapters investigate options for adaptation as well as mitigation in the sub-sectors. The paper represents a synthesis of roughly 500 technical reports and articles on the subject and presents a comprehensive picture of what is known to date about the effects of climate change on fisheries and aquaculture.

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<sup>2</sup> See <http://camfa2010.wordpress.com/>

<sup>3</sup> See <http://www.apec.org/> for the text of the Paracas Declaration.

9. In addition, in collaboration with GRID-Arendal, UNEP, the UNESCO International Oceanographic Commission and other institutions, FAO co-authored a Rapid Response Assessment, Blue Carbon<sup>4</sup>, which highlights the critical role of the oceans and ocean ecosystems in maintaining our climate and providing food and livelihood security as well as provides a road map for policy makers to mainstream an oceans agenda into national and international climate change initiatives.

*Creation of the Global Partnership on Climate, Fisheries and Aquaculture*

10. As advocated by the twenty-eighth Session of COFI, partnerships and collaboration are of prime importance in addressing the complex and cross-cutting challenges of climate change. Recent initiatives include, the development of the Global Partnership on Climate, Fisheries and Aquaculture (PaCFA)<sup>5</sup>, a voluntary partnership comprising 20 international organizations and sector bodies sharing a common concern for climate change interactions with global waters and living resources and their resulting social and economic consequences<sup>6</sup>. The partnership was borne from a mutual desire to draw together potentially fragmented and sometimes duplicating climate change activities through a multi-agency global programme of coordinated actions and to address the pressing need to raise the profile of fisheries and aquaculture in the global climate change discussions. An initial high priority activity for the partnership was to prepare a joint policy brief<sup>7</sup> for distribution at the 2009 UN Framework Convention on Climate Change (UNFCCC) meetings including COP15 in Copenhagen to raise awareness of the issues facing the sector, as described in the next section. The Partnership aims to continue supporting country-driven efforts through the sensitization of and liaison with relevant line ministries within and outside the sector about the need to participate in the negotiating process and by providing a neutral forum for the exchange of technical information regarding the possible impacts and appropriate strategies necessary in a world of increasing change.

11. Other examples of the work of the Partnership include the development of a Wikipedia page on climate change and fisheries<sup>8</sup> and of joint project proposals based on a priority analysis undertaken by PaCFA in 2009. In addition, PaCFA has begun the development of a global strategic framework, which lays the groundwork for a coordinated response from the fisheries and aquaculture sector to climate change, notably through a strategic approach to maintain or enhance the health and resilience of global oceans and waters, and strengthening the capacity of dependent people and communities, integrating these closely into broader development strategies.

12. The desire for and interest in such coordinated action is manifest through multiple requests for information regarding the partnership, for other agencies and institutions to join the informal partnership and for the development of a UN-Oceans PaCFA-related Task Force. Further support to this partnership, both in terms of the partnership itself and the support to the implementation of the PaCFA global strategic framework, is warranted.

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<sup>4</sup> <http://www.grida.no/publications/rr/blue-carbon/>

<sup>5</sup> <http://www.climatefish.org>

<sup>6</sup> Current members of PaCFA are BCC, CBD, EBCD, FAO, GLOBEC, ICES, ICFA, ISDR, NACA, NACEE, OECD, OSPESCA, PICES, SEAFO, SPC, UNDP, UNEP, UNESCO-IOC, World Bank, WorldFish Centre

<sup>7</sup> [ftp://ftp.fao.org/FI/brochure/climate\\_change/](ftp://ftp.fao.org/FI/brochure/climate_change/)

<sup>8</sup> [http://en.wikipedia.org/wiki/Fisheries\\_and\\_climate\\_change](http://en.wikipedia.org/wiki/Fisheries_and_climate_change)

*Increasing the visibility of fisheries and aquaculture in the global climate change discussions and funding mechanisms*

13. Although fishing and aquaculture communities tend to be among the highly vulnerable, global awareness and understanding of climate change impacts on the aquatic systems and the special needs of those who depend on aquatic resources for their food and livelihoods was very low in 2009. In the same vein, international climate discussions were not well informed about the role of the aquatic systems in the carbon cycle and how fisheries and aquaculture can support these mitigation potentials. Therefore, FAO and its partners targeted the 2009 UNFCCC meetings to support the call of the Manado Ocean Declaration<sup>9</sup> to reflect the specific ocean and coastal dimensions into the UNFCCC decisions.

14. During the 2009 UNFCCC meetings, in addition to the joint policy brief mentioned above, FAO and PaCFA worked to raise awareness of the issues facing the sector up to and during the UNFCCC COP15 in Copenhagen. For example, FAO and PaCFA were organizing members of the first UNFCCC Ocean's Day; organized a side event to present the implications of climate change for sustainability of fisheries and aquaculture and impacts on food and livelihood security to the UNFCCC delegations; presented the PaCFA during a Faroe Islands UNFCCC side event as an example of coordinated efforts; and provided continued assistance to UNFCCC delegates in their attempts to advocate for the inclusion of oceans and coasts in the negotiated texts. It is also important to underscore the role of the sector to understand relevant climate change issues and to encourage their inclusion in national and international climate change discussions and actions. To promote this role, a joint letter from the Executive Director of UNEP and the Assistant Director-General of the Fisheries and Aquaculture Department of FAO to their respective members called on States to include aquatic ecosystems, fisheries and aquaculture issues when formulating actions to combat climate change in general and to acknowledge and emphasize the multiple benefits of well-managed aquatic ecosystems which include food security, livelihoods and disaster risk preparedness and risk reduction in their statements to the UNFCCC meetings.

15. In addition, FAO also reported on fisheries and aquaculture in various policy-oriented international conferences in which climate change holds increasingly high level attention, including the Global Oceans Conference (Paris, 10 May 2010), the European Commission's European Maritime Day Stakeholder Conference (Gijon, 18-21 May 2010) and the Conference of African Ministers of Fisheries and Aquaculture (CAMFA, Gambia, 20-23 September 2010).

16. As climate change is already having effects on fisheries and aquaculture systems and communities, it is imperative that steps to improve the adaptive capacity and resilience of these vulnerable systems be implemented without delay, especially in those economies and communities deemed most vulnerable to change. To this end, a number of adaptation-specific global funds have been created under the UNFCCC, such as the Adaptation Fund of the Parties to the Kyoto Protocol of the UNFCCC and the Global Environment Facility (GEF) administered Special Climate Change Fund (SCCF) and Least Developed Countries Fund (LDCF)<sup>10</sup>. As LDCs tend to be among the most vulnerable countries, FAO is paying particular attention to the LDCF and has a two-pronged approach to increasing the visibility of fisheries and aquaculture in these funds: (i) sensitizing national climate change focal points through participation in LDCF meetings and trainings; and (ii) encouraging members to mainstream fisheries and aquaculture into the National Adaptation Programmes of Action (NAPA) and their projects, the basis of LDCF funding outlays. An analysis of the incidence of fisheries and aquaculture in current NAPA, as well as whether gaps may exist, has been undertaken by FAO<sup>11</sup> and will be used to develop a global programme of adaptation assistance in priority areas.

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<sup>9</sup> <http://www.cep.unep.org/news-and-events/manado-ocean-declaration>

<sup>10</sup> <http://www.adaptation-fund.org/>, <http://www.thegef.org/gef/SCCF>, and <http://www.thegef.com/gef/lDCF>, respectively.

<sup>11</sup> Vadachino, L. and De Young, C. In preparation. Mainstreaming fisheries and aquaculture into the Least Developed Countries National Adaptation Programmes of Action. FAO Fisheries and Aquaculture Circular.

17. Coordination of attempts to include food security, agriculture, forestry and fisheries into the UNFCCC discussions as well as to develop FAO-wide mitigation and adaptation strategies is led by the FAO Inter-departmental Working Group on Climate Change (IDWG-CC). The IDWG-CC has developed the FAO Profile for Climate Change<sup>12</sup>, which outlines its priorities for current and future work and it is currently developing the FAO Framework Programme on Adaptation. The Fisheries and Aquaculture Department is an active member of the IDWG-CC and its sub-groups and currently co-chairs the Adaptation sub-group; further supporting the integration of fisheries and aquaculture in cross-cutting programmes. These efforts ensure coherence and enhance collaboration for integrated approaches across the food production sectors.

#### *Linking Science to Policy*

18. Continuing the focus on FAO's comparative advantage, FAO further fostered the link between climate change science and policy. Explicit links between policy and science need to be strengthened further at national, regional and global levels in order for well informed public policy to address mitigation of GHG emissions and to support climate change adaptation. A strengthened science-policy link will need to provide information for planning and stimulating adaptation, for guiding decision-making under uncertainty and addressing important cross linkages among relevant sectors and to ensure that adaptation actions do not negatively affect other ecosystem services and the longer term viability of fisheries and aquaculture.

#### *Reducing vulnerability of fishing and fish farming communities to natural disasters*

19. Disaster Risk Management (DRM) is a key approach for reducing vulnerability of fishing and fish farming communities to the impacts of natural disasters. As reported in COFI/2009/8, climate change is forecast to increase the frequency and intensity of weather-related natural disasters. The interconnectedness of livelihoods, hazards and climate change means that disaster risk management, climate change adaptation and mitigation need to be integrated into a single strategy which increases efficiency, reduces costs, and increases effectiveness and sustainability of actions. Despite the growing understanding and acceptance of the importance of disaster risk reduction and increased disaster response capacities, the management and reduction of risk continue to pose a global challenge.

20. In response to these issues, as part of the ongoing reform and also to fulfil its commitment to the Hyogo framework<sup>13</sup>, FAO has for the first time developed cross-departmental organizational objectives aimed to support reducing the vulnerability of fishing and fish farming communities to the impacts of natural disasters, including those that are climate change-induced. As part of this programme, the Fisheries and Aquaculture Department is developing partnerships at global, regional and national levels to improve preparedness for and response to disasters, which will explicitly link to climate change-induced impacts. To date, the Department has carried out one global<sup>14</sup> and three regional<sup>15</sup> 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 funded TCP's with NR Department in Saint Lucia, Dominica, Philippines and Belize. Additional funding for global actions is anticipated in 2011.

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<sup>12</sup> <ftp://ftp.fao.org/docrep/fao/012/i1323e/i1323e00.pdf>

<sup>13</sup> Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters. <http://www.unisdr.org/eng/hfa/hfa.htm>

<sup>14</sup> 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.

<sup>15</sup> The consultations took place on 5 October in Bangkok, Thailand, 11 October in Maputo, Mozambique, and 19 October in San José, Costa Rica. The reports are under preparation.

21. At the same time, the Department continues its efforts to support member countries in reducing risks to fishing and fish farming communities. For example, through capacity building, the inclusion of DRM in the development of good management practices and approaches, such as the EAF/EAA and co-management at community levels, safety at sea and early warning for fish disease epizootics. The challenges at policy level remains to link the disaster risk reduction and management and climate change mitigation and adaptation into fisheries and aquaculture planning, and to mainstream fisheries and aquaculture into disaster risk management planning.

22. Further key areas for future cooperation include support to adaptation efforts of small island developing States vulnerable to climate change-induced natural disasters. The Department will also support disaster risk management programmes identified by countries in their national medium term priority frameworks (UNDAF) and their (NAPA) to the extent which available resources allow.

*Implementing the ecosystem approach to fisheries and aquaculture (EAF/EAA) as a means of climate proofing the fish production sector*

23. A key step in the EAF/EAA process described in the FAO Guidelines<sup>16 17</sup> includes the identification of issues (and their prioritisation through risk analysis) that need to be addressed by management. This step helps identify the specific issues to be managed in the EAF/EAA process, including all direct and indirect impacts of the fishery or farm on the broader system. Climate change is an extra-sectoral driver alongside impacts on the system from other aquatic and coastal resource users, impacts of changes in prices, and other social, political and economic aspects impacting the fisheries and aquaculture but outside the direct mandate of fisheries and aquaculture management. Using the identification of biophysical changes due to climate change expected for the fishery or farm (e.g. changes to water surface temperature, pH levels, and sea level, extreme events), their impacts on the ecosystem well-being, human well-being and governance can be identified in a systematic manner and then analysed in terms of their risks along with other issues identified during the issue identification step; providing a means to prioritize management responses in the short- and long-terms.

24. In addition, the EAF/EAA can be used to address climate change issues within the sector. In terms of mitigation - increased sequestration and decreased emissions - fuel efficiency for the sector as a whole can be improved by EAF/EAA management. For example, current over-capacity and excess effort lead to lower catches per unit effort and, therefore, lower fuel efficiency. EAF/EAA would reinforce the sector's move to environmentally friendly and fuel-efficient fishing. The EAF/EAA lends itself as the approach to attain these mitigation goals by directly promoting improved governance, innovative technologies and more responsible practices that generate increased and sustainable benefits from fisheries. In addition, the EAF/EAA would help to reduce any negative impacts the sector may have on aquatic systems that play an important role as natural carbon sinks, such as mangroves and seagrasses.

25. In terms of climate change adaptation and building resilient systems (i.e. including reducing exposure and increasing adaptive capacities), the application of the EAF/EAA<sup>18</sup> would be an important contribution to maintaining biodiversity, preserving the resilience of human and aquatic systems to change, and improving our capacity to anticipate and adapt to inevitable climate induced changes in aquatic ecosystems and the related fisheries production systems.

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<sup>16</sup> FAO. 2003. Fisheries management 2. The ecosystem approach to fisheries. *FAO Technical Guidelines for Responsible Fisheries* No. 4, Suppl. 2. 112p.

<sup>17</sup> FAO. 2010. Aquaculture development. 4. Ecosystem approach to aquaculture. *FAO Technical Guidelines for Responsible Fisheries* No. 5, Suppl. 4. 53p.

<sup>18</sup> For further discussion on the application of the EAF/EAA, refer to COFI/2011/7 (FAO's role for improved integration of fisheries and aquaculture development and management, biodiversity conservation and environmental protection).

26. The FAO/WorldFish Centre workshop entitled, “Adapting to Climate Change: the Ecosystem Approach to Fisheries and Aquaculture in the Near East and North Africa Region (RNEA)” took place in Abbassa, Egypt in November 2009 to identify and address the impacts created by climate change in the RNEA and how the EAF/EAA can be used for the management and adaptation of fisheries and aquaculture in the face of these impacts. The conclusions from this meeting are directly relevant to many other regions as well. The workshop concluded that climate change impacts bring increasing pressure on the fisheries and aquaculture sectors in much of the region and climate change is understood to be an additional pressure on fisheries which are not adequately managed. Regarding capture fisheries, the Region as a whole is deemed not prepared to adequately cope with the additional pressures that climate change will create. The workshop noted that, while it is generally acknowledged throughout the region that preparation for climate change is necessary, the required capacity to effectively implement the appropriate strategies, including EAF/EAA, still needs to be developed. Information and experience sharing between countries and sub-Regions could reduce the negative impacts of this gap in capacity in certain countries. The workshop concluded that there is a general lack of reliable data in the capture fisheries industry, which needs to be addressed for the implementation of effective management strategies in general, as well as climate change adaptation strategies. Developing strategies to adapt to climate change will not only minimize the effects experienced by climate change impacts, but can also reduce vulnerability to other changes and increase resilience of the sector.

*Understanding the emissions and mitigation potentials from fisheries and aquaculture*

27. Net greenhouse gas (GHG) contributions of fisheries, aquaculture and related supply chain features are poorly studied but are considered to be relatively small in overall terms. However, as concerns increase regarding fuel prices, long-term energy availability, and climate change, greater attention is being given to conserving energy across the fisheries and aquaculture supply chain, including the catching, producing, farming, processing, packaging and distribution sub-sectors, as well as consumption and disposal of fishery products. In addition, it is important to understand how climate change mitigation could be complementary to and reinforce existing efforts to improve fisheries and aquaculture sustainability.

28. With no widely available cost effective, safe and practical alternative energy supply foreseen in the motorized capture sector, reductions in GHGs will need to be achieved through efficiency savings of conventional technologies and development of new, low impact and fuel efficient fishing systems. Currently, the harvest sector represents some 2.5 million vessels powered by fossil fuel burning engines consuming an estimated 41 million tonnes of fuel per year. Energy efficiency gains also need to be considered across the processing, packaging and distribution sub-sectors, especially in the face of globalization of fish and fish products.

29. In addition to contributing to the sector’s mitigation efforts through energy consumption and emissions reductions, the sector can also contribute to mitigation through sequestration of carbon. For example, semi-intensively managed pond aquaculture (fish farming), which constitutes one of the most widespread farming systems in Asia, could make a significant contribution to the sequestration of carbon in freshwater systems through enhanced carbon management in such systems<sup>19</sup>. In addition, carbon sequestration can be achieved by replanting mangroves in many aquaculture and fisheries areas around the world. Enhanced carbon retention (although not carbon burial) and capture in coastal ecosystems could be achieved by conducting extractive aquaculture operations with seaweeds and filter feeders (molluscs). Cultivating seaweed can enhance primary production in coastal waters and contribute to increased carbon sequestration. It may be useful to understand the relative footprints and sequestration potentials among different aquatic food production systems and to analyze these in relation to other food production systems. For example, the culture of filter feeders and seaweeds and many small-scale

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<sup>19</sup> Bunting, S.W., Pretty, J. 2007. Global carbon budgets and aquaculture - emissions, sequestration and management options. Centre for Environment and Society Occasional Paper 2007-1. University of Essex, UK.

fisheries have minimal carbon footprints; while some other fisheries and aquaculture systems have higher energy input needs relative to the caloric energy outputs produced.

30. 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 the following could assist the sector in this regard: (i) standardized methodologies for energy and emissions calculations throughout the food chain; (ii) data to be collected within this framework; and (iii) the development of policy and technologies to support the transition to energy-efficient and low foot print aquatic food production systems.

#### *Project development and implementation*

31. Through a project funded by the Government of Japan, FAO began work toward the development of guidelines on climate change adaptation in fisheries and aquaculture through: (i) the development of national and regional case studies that identify impacts, vulnerabilities and adaptive strategies appropriate for the context; (ii) a global workshop on improving adaptive capacity in fisheries and aquaculture; and (iii) the development and review of technical guidelines. The project also plans to convene a special workshop to identify indicators of vulnerability for the sector to help in identifying vulnerable systems.

32. In collaboration with FAO and the Lake Tanganyika Authority, the Project also supported a study on surface temperatures changes in the East African Great lakes and the impact this has had on the fisheries of the lakes and developed a model that can be used to predict future changes in the lakes' temperatures. The project further co-funded the regional "Workshop on the Possible Impacts of Climate Change on the Fisheries of the African Great Lakes" held in April 2010. The workshop identified potential climate change adaptation mechanisms, knowledge gaps and pointed to the next steps that should be taken by governments, regional and international organizations with respect to research and towards building resilience at the community level.

33. In line with the FAO Strategic Framework, the PaCFA global framework and the Department's Climate Change Strategy, the Department is also actively exploring options for increasing its technical support to Members on climate change implications for fisheries and aquaculture, in cooperation with other relevant agencies. Implementation of this work is highly dependent on the availability of extra-budgetary funds.

#### **ROADMAP FOR PRIORITY ACTIONS**

34. Based on the climate change implications for fisheries and aquaculture enunciated in COFI/2009/8 and recognizing the comparative strengths and potential contributions of FAO's Fisheries and Aquaculture Department, a proposal for a five-year Strategy for Fisheries, Aquaculture and Climate Change has been developed, which is aligned with the Department's strategic and organizational objectives for the sector<sup>20</sup> and the recommendations stemming from the Fifth Session of the COFI - Sub-Committee on Aquaculture and the RFBs. This strategic framework is also linked with the global PaCFA strategic framework<sup>21</sup>, which provides an overarching framework for wider partnership-based development goals associated with climate change, fisheries and aquaculture, and is also consistent with FAO's broader cross-sectoral strategy for climate change and food security<sup>22</sup>.

35. The goal of the programme under the Department's climate change strategic framework is to assist people, communities and states to meet their social and development goals effectively; while taking into account and responding to the additional challenges imposed by climate change on fisheries and aquaculture.

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<sup>20</sup> See *FAO Strategic Framework 2010-2019*. <http://www.fao.org/about/19185-1-0.pdf>

<sup>21</sup> [ftp://ftp.fao.org/FI/brochure/climate\\_change/pacfa/pacfa.pdf](ftp://ftp.fao.org/FI/brochure/climate_change/pacfa/pacfa.pdf)

<sup>22</sup> FAO - Profile for Climate Change. 2009. <ftp://ftp.fao.org/docrep/fao/012/i1323e/i1323e00.pdf>

36. The purpose of the programme is to support member states and partners in their efforts to effectively mitigate and adapt to the impacts of climate change for fisheries, aquaculture and aquatic ecosystems, through policy development, knowledge development and exchange, normative outputs, practical demonstration, and capacity building.
37. The proposed key objectives for FAO and COFI members are:
- (a) Set up and develop global, regional and local climate change action partnerships, across public, private community and NGO sectors, to support regional and sub-regional cooperation and to develop inter-regional and global policy and management initiatives within the sector.
  - (b) Establish the knowledge base for local, national and international policy development for climate change and the fisheries and aquaculture sector; specifically to raise awareness of the importance of the sector with respect to climate change mitigation and adaptation, its contribution to Millennium Development Goals, the vulnerability of its communities at various scales, and the potential ways in which climate change responses can be developed.
  - (c) Identify and develop the fisheries and aquaculture sector's climate change mitigation actions at global, regional and national levels, support their implementation within and across the sectors, and identify resources to support prioritized actions.
  - (d) Identify and promote effective climate change adaptation strategies within the fisheries and aquaculture sector development frameworks at global, regional and national levels, and identify resources to support prioritized actions at all levels.
  - (e) Establish lesson learning and capacity building processes with partners to build more effective climate change and sectoral knowledge and response capacity through specific tools, such as the development of strategies and best practices, as well as strengthening country capacities to plan and implement climate change mitigation and adaptation measures in the sector and in collaboration with other sectors.
  - (f) Develop and implement a communication strategy for climate change mitigation and adaptation, for a range of audiences, to increase and disseminate knowledge and develop a coordinated approach to global planning and feedback

## **RECOMMENDATIONS TO COFI MEMBERS**

38. The implementation of the Code of Conduct for Responsible Fisheries, including the ecosystem approach to fisheries (EAF) and aquaculture (EAA) should increase the resilience and adaptive capacities of aquatic ecosystems, fisheries and aquaculture production systems, and of aquatic resource-dependent communities. Moreover, investing in protecting and building resilient marine, coastal and freshwater ecosystems alongside restoring fisheries and improving fishing operations and technology and fish farming, which could contribute to reducing greenhouse gas levels.
39. In order to improve adaptation the knowledge base should be developed on exposure, sensitivity and adaptive capacity at local, national and regional scales. Understanding the emissions and mitigation potentials from appropriate fisheries and aquaculture would also contribute to fill an important gap in the current knowledge.
40. Policy, legal and implementation frameworks should be developed at national, regional and international level to address the complexities of climate change interactions and their possible scale of impacts.
41. Climate change adaptation and mitigation, taking into account social implications as appropriate, need to be integrated into a single strategy which increases efficiency, reduces costs, and increases effectiveness and sustainability of actions. A challenge at policy level remains to link the disaster risk reduction and management and climate change mitigation and adaptation into fisheries and aquaculture planning, and to mainstream fisheries and aquaculture into disaster risk management planning.

42. States should ensure that fisheries and aquaculture are mainstreamed into their National Adaptation Programmes of Action (NAPA) and projects. Development of adaptation programmes within the NAPA and national communications to the UNFCCC frameworks that target fisheries and aquaculture communities could play an important role in mainstreaming the sector into climate change discussions and programmes.

43. States should ensure that aquatic ecosystems, fisheries and aquaculture issues are included when formulating action to combat climate change within the UN Framework Convention on Climate Change (UNFCCC). Members may wish to advocate for the integration of fisheries and aquaculture in the climate change negotiations by fostering synergies with the National Ministries of Environment who are involved in the UNFCCC negotiation process. The full value and global importance of aquatic ecosystems, fisheries and aquaculture needs to be recognized and the multiple benefits of well-managed aquatic ecosystems should be acknowledged and emphasized in planning and implementation.

#### **FOR DISCUSSION BY COFI**

44. The Twenty-ninth Session of COFI is invited to:

- (a) Comment on the inter-sessional work undertaken by FI.
- (b) Consider and comment on the roadmap proposed within the FI Strategy for Fisheries, Aquaculture and Climate Change.
- (c) Consider, modify and supplement as necessary the Recommendations to COFI Members provided here.
- (d) Provide recommendations and guidance on future activities to be undertaken by FI.