



COMMITTEE ON FISHERIES

Thirty-third Session

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Climate change and other environment related matters

Executive Summary

This document provides an overview of work carried out by FAO on climate change in relation to fisheries and aquaculture, as well as work on a number of environmental issues, such as biodiversity conservation, bycatch reduction and aquatic pollution. A number of actions are described, in particular the work carried out in relation to the assessment of impacts of climate change globally and regionally, with the Convention on Biological Diversity (CBD) on threatened species in trade, the international negotiations held to agree on standards and best practices on bycatch and on abandoned, lost or otherwise discarded fishing gears (ALDFG), and actions dealing with pollutants. The document reports on normative work in response to the Committee's recommendations to address the issues mentioned above and on direct support to countries through field projects.

The report is complemented by the following documents that contain additional relevant information: Working Paper on Global and Regional Processes (COFI/2018/8), Information paper on Climate change (COFI/2018/Inf.23) and Technical paper on impacts of climate change (COFI/2018/SBD.22), Biodiversity (COFI/2018/Inf.28), Session Background Document (COFI/2018/SBD.20), CITES (COFI/2018/Inf.12); Marine mammal bycatch (COFI/2018/SBD.19), Bycatch and discards (COFI/2018/Inf.26), Trawling best practice (COFI/2018/Inf.27), ALDFG (COFI/2018/Inf.24); (COFI/2018/Inf.25); (COFI/2018/Inf.30) (COFI/2018/SBD. 17) and (COFI/2018/SBD.18), Information paper on microplastics (COFI/2018/Inf.31), Technical paper on microplastics in fisheries and aquaculture (COFI/2018/SBD.21).



Suggested action by the Committee

The Committee is invited to:

- Comment on the intersessional work undertaken on climate change and provide guidance on future activities to be undertaken by FI in order to enhance the support to Member Countries in addressing the responses to climate change impacts and increasing the ambition of their Nationally Determined Contributions to the implementation of the Paris Agreement.
- Offer guidance to the FAO's Biodiversity Platform initiative, to help shape its cross –sectoral objectives and be relevant to fisheries and aquaculture.
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- Comment on the effectiveness of implementation of the FAO - CITES MOU signed in 2006, and advise on challenges in relation to differing communication on the status of commercially exploited aquatic species, including in relation to CITES, IUCN Red List assessments and Convention on Biological Diversity Aichi Target reporting.
- Consider the outcomes of the three expert workshops on the “Use of Best Available Science in Developing and Promoting Best Practices for Trawl Fishing Operations” (COFI/2018/Inf.27) and provide recommendations on the role of FAO in the development of trawling best practice guidelines.
- Note the reports of the Expert Workshop on Means and Methods for Reducing Marine Mammal Mortality in Fishing and Aquaculture Operations (COFI/2018/SBD.19) and the Global Assessment of Marine Fisheries Discards (COFI/2018/Inf.26) and provide guidance on further actions.
- Welcome the work of the Technical Consultation on the Marking of Fishing Gear and consider its recommendations including endorsement of the Voluntary Guidelines on the Marking of Fishing Gear and provide further guidance for FAO's ongoing work on ALDFG including the proposed development of a global umbrella programme to support the implementation of the Guidelines.
- Provide recommendations on the appropriate role and functions FAO should be taking to address pollution-related issues (including microplastics, mercury and methylmercury, contaminants) and related measures on food safety and environmental management for the protection of fisheries and aquaculture resources.
- Provide recommendations on current and additional thematic areas and activities, including regional hotspots, regional collaboration and opportunities for partnerships, inter-agency cooperation and multi-stakeholder initiatives.
- Advise on future support and potential extra-budgetary funding for the work programme.

I. INTRODUCTION

1. World leaders including those of the G20 agree that “climate change is one of the greatest challenges of our time”, as it adds considerable stress to our societies and to the environment, with impacts that are compounding and potentially unprecedented. In the fisheries and aquaculture sector, climate change adds to existing stresses that the sector is already facing. Climate change, along with other anthropogenic impacts on aquatic environments, from increasing levels of pollution to decreases and losses in biodiversity reduces options to effectively safeguard the health of aquatic ecosystems and resources, to make the livelihoods of fishery and aquaculture communities more resilient, and to ensure food security. As a result, the fishery and aquaculture sector needs to broaden its perspective of management and conservation to mainstream these additional stressors in practice. During the inter-session period, FI has undertaken a number of activities to help communities to (i) understand, respond and cope with climate change and other environmental impacts; (ii) benefit from opportunities associated with climate change and effectively manage its negative impacts; and (iii) reduce the contributions of the sector to climate change, biodiversity loss and ecosystem disturbances by improving fishing practices, increasing knowledge on emerging issues related to pollution and addressing biodiversity in relation to food production.

2. This paper describes the main challenges related to climate change and other environmental matters and the work done by FI during the inter-session period to address them within the overall framework of the current Sustainable Development Goals (SDGs). In addition to supporting the achievement of SDG 2, 13 and 14, the work implemented is in line with SDG 17 that calls for partnerships for sustainable development, and in particular for support to capacity building in developing countries (SDG17.9) and the promotion of effective public, public-private and civil society partnerships (SDG17.17), building on the experience and resourcing strategies of partnerships.

II. UNDERSTANDING AND COPING WITH CLIMATE CHANGE IMPACTS

3. Climate change has a growing impact on the four pillars of food security (availability, access, utilization and stability) because of the consequences on species sustaining the fisheries and aquaculture sector and the implications for the communities that rely on them. Moreover, changes in frequency, intensity, geographical distribution and timing of extreme events, which may be a result of climate change, put the lives of fishers, fish farmers and coastal/estuarine/riparian/lacustrine communities at risk in addition to causing damage and loss to the sector. Small-scale fishers and fish farmers are especially vulnerable to climate change and extreme events because of both their geographical locations and their socio-economic status.

4. The 2015 Paris Climate Agreement recognizes the need for effective and progressive responses to the urgent threat of climate change, through mitigation and adaptation measures, while taking into account the particular vulnerabilities of food production systems. The Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAPs) processes offer opportunities for fishery and aquaculture to be part of the solution. The threats of climate change to fisheries and aquaculture have been recognized by some countries and, as of September 2017, of the 155 countries that had submitted their NDCs, 87 addressed fisheries and aquaculture, of which 55 reported impacts of climate change on their fisheries and aquaculture sector.

5. The level of uncertainty on climate change impacts on the fisheries sector is still relatively high because of the low spatial and temporal resolution of the models used to examine and project impacts and the relevant management scales, and the diversity of climate change emission scenarios available for projections. However, the thirty second session of COFI requested FAO to draw up efficient climate change adaptation and mitigation strategies for the fisheries and aquaculture sectors including guidelines on responses and to increase its leadership role in UN fora and global processes

devoted to climate change. Based on COFI's request and taking the aforementioned gaps into account, and on, FI implemented a range of activities aiming at supporting Member Countries and partners to effectively mitigate and adapt to the impacts of climate change for fisheries, aquaculture and aquatic ecosystems, through knowledge development and exchange, policy development, practical demonstration, and capacity building. The work carried out is in line with the new corporate Strategy on Climate Change endorsed by the FAO 156th Council session after a yearlong cross-organizational consultation involving COFI and other Governing Bodies (COFI/2018/Inf.23).

A. Strengthening the knowledge base and guidance for policy development

6. During the intersession period, FAO and its partners have been working to identify climate change implications, vulnerabilities and context-specific adaptation and disaster risk management strategies to improve the resilience of aquatic systems and their dependent communities. Regional and sub-sectoral reviews and analyses were carried out for sub-Saharan African aquaculture,¹ African coastal fisheries,² Asia and the Pacific Region,³ adaptation strategies for aquaculture,⁴ environmental monitoring systems for the Lower Mekong Basin,⁵ as well as global assessments, such as the analysis of impacts of disasters on agriculture.⁶

7. Based on lessons learned from these assessments and building on the scoping study published in 2009,⁷ a thorough analysis of existing knowledge on climate change impacts on the fisheries and aquaculture sector, as well as suitable adaptation and mitigation responses was compiled in a comprehensive technical paper⁸ addressing marine fisheries, inland fisheries and aquaculture. The publication fills in major gaps and includes for instance (i) assessment of marine catch potential changes by EEZ and regional expert assessments; (ii) the first assessment of climate change implications for the inland fisheries sub-sector at national and river basin level; and (iii) assessment of impacts on aquaculture, including impacts from adaptations to other agricultural sectors. The publication consists of 28 chapters that cover a broad range of topics from the nexus between food security and poverty in the climate change context, supported by an analysis of the global reliance on fish products and potential consequences of climate change on consumption and trade, and including a compilation of adaptation and mitigation responses. It is expected that this landmark publication will be of direct relevance to Member Countries for policy development; it provides substantial material that can support the inclusion of the fisheries and aquaculture sector in the NDCs and can inform the

¹ FAO. 2017. Report of the Workshop on Climate Proofing Aquaculture in sub-Saharan Africa: Review of Policies and Production Systems for Climate Change Resilience. Addis Ababa, Ethiopia, 9–10 June 2016. FAO Fisheries and Aquaculture Report No. 1201. Rome, Italy. www.fao.org/3/a-i6907e.pdf

² Anderson, J. & Andrew, T. eds. 2016. Case studies on climate change and African coastal fisheries: a vulnerability analysis and recommendations for adaptation options. FAO Fisheries and Aquaculture Circular No. 1113. Rome, Italy. www.fao.org/3/a-i5612e.pdf

³ Workshop on “Building Climate Resilient Fisheries and Aquaculture in the Asia-Pacific region”, 14–16 November 2017, Bangkok, Thailand

⁴ Bueno, P.B. & Soto, D. 2017. Adaptation strategies of the aquaculture sector to the impacts of climate change. FAO Fisheries and Aquaculture Circular No. 1142. Rome, Italy. www.fao.org/3/a-i6943e.pdf

⁵ Virapat, C., Wilkinson, S. & Soto, D. 2017. Developing an Environmental Monitoring System to Strengthen Fisheries and Aquaculture Resilience and Improve Early Warning in the Lower Mekong Basin. Bangkok, Thailand, 25–27 March 2015. FAO Fisheries and Aquaculture Proceedings No. 45. Rome, Italy. www.fao.org/3/a-i6641e.pdf

⁶ FAO. 2018. 2017 - The impact of disasters and crises on agriculture and food security. www.fao.org/3/I8656EN/i8656en.pdf

⁷ 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. 2009. 212p. www.fao.org/docrep/012/i0994e/i0994e00.htm

⁸ Barange, M., Bahri, T., Beveridge, M., Cochrane, K., Funge-Smith, S. & Poulain, F. eds. 2018. Impacts of Climate Change on fisheries and aquaculture – Synthesis of current knowledge, adaptation and mitigation options. FAO Fisheries and Aquaculture Technical Paper. No. 627. Rome, Italy.

development of NAPs for the sector, including a toolbox of existing and recommended fisheries and aquaculture adaptation tools and approaches, as well as guidance for the development and implementation of sectoral adaptation

8. As regards the integration of fisheries and aquaculture in the formulation of NAPs, specific guidelines⁹ were developed as a supplement to FAO's *Addressing agriculture, forestry and fisheries in National Adaptation Plans – Supplementary guidelines*.¹⁰ They are intended for policy makers and government officers responsible for NAP planning, as well as for fisheries and aquaculture officers. The guidelines collate and analyse relevant information from fisheries and aquaculture to support the sector's ability to take part in national climate change adaptation planning processes.

9. In addition, FAO launched a revised online Climate Smart Agriculture (CSA) Sourcebook that comprises a wide range of knowledge and expertise on the concept of CSA to better guide policy makers and practitioners to make the agricultural sectors, including fisheries and aquaculture, more sustainable and productive, while responding to the challenges of climate change and food security. The module B4 of the Sourcebook is dedicated to climate-smart fisheries and aquaculture.¹¹

10. The sustainability of the fisheries and aquaculture sector also depends on the protection and maintenance of aquatic systems and hence the sector is constrained to the availability of surface waters. Building on lessons learned from water accounting,¹² a methodological framework intended for countries, provides elements to improve the understanding of the economic, social and nutritional contributions of capture fisheries and aquaculture and their links to available inland water resources.¹³ The publication contributes to allocating space to the fisheries sector in the water arena where it currently stands in a vulnerable and isolated position.

11. The level of uncertainty concerning the implications of climate change for the fisheries and aquaculture sector is still high. However, observations and evidence are growing, as demonstrated during the fourth FAO-ICES-PICES-IOC/UNESCO symposium "impacts of climate change on the world's oceans" that gathered over 700 scientists who presented the most updated scientific information on the topic. Pre-symposium workshops were convened by FAO and its partners to share experience and discuss adaptation responses addressing fishery livelihood sustainability, poverty reduction and resilience.¹⁴ In terms of adaptation, the FishAdapt conference¹⁵ gathered over 200 fisheries and aquaculture practitioners to share experiences and lessons learned (8–10 August 2016, Bangkok, Thailand). At regional level, a session on fisheries was organized in March 2018 within the Regional Conference on "Strengthening Resilient Food and Agriculture Systems – Implementing the Sendai Framework for Disaster Risk Reduction in the Agriculture Sector in Asia and the Pacific"¹⁶ (15–16 March 2018, Ha Noi, Viet Nam) to analyse existing and evolving risks to the fisheries sector and identify priority actions to strengthen resilience.

⁹ Brugère, C. & De Young, C. 2018. Addressing Fisheries and Aquaculture in National Adaptation Plans – Supplementary guidelines. FAO, Rome (in press).

¹⁰ Karttunen, K., Wolf, J., Garcia, C. & Meybeck, A. 2017. Addressing agriculture, forestry and fisheries in national adaptation plans – supplementary guidelines. FAO, Rome. 101 pp. www.fao.org/3/a-i6714e.pdf

¹¹ www.fao.org/climate-smart-agriculture-sourcebook/production-resources/module-b4-fisheries/b4-overview/en/

¹² Ottaviani D., Tsuji S. & De Young C. 2016. Lessons learned in water accounting: the fisheries and aquaculture perspective in the System of Environmental-Economic Accounting (SEEA) framework. FAO Fisheries and Aquaculture Technical Paper No. 599. Rome, Italy. www.fao.org/3/a-i5880e.pdf

¹³ Ottaviani, D., De Young, C. & Tsuji, S. 2016. 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. www.fao.org/3/a-i5878e.pdf. Supplementary material: www.fao.org/3/a-i6681e.pdf

¹⁴ <http://meetings.pices.int/meetings/international/2018/climate-change/Background>

¹⁵ www.fishadapt.com/modules/conference/

¹⁶ www.fao.org/asiapacific/events/detail-events/en/c/1472/

12. In addition, FAO and the Memorial University in Canada co-organized the Fifth International Fishing Industry Safety and Health Conference¹⁷ (10–13 June 2018, St. John's, Newfoundland and Labrador, Canada) of direct relevance to the increased vulnerability of fish workers in the face of climate variability resulting from changes in frequency and severity of storms. A pre-symposium workshop on Recent Global Conventions and Resolutions Targeting Improved Safety, Health and Sustainability at Sea in the Fisheries Sector, was organized as side event of the conference.

13. Collaboration with the International Labour Organization (ILO) and the International Meteorological Organization (IMO) is continuing on a range of global initiatives related to fishing vessel design, fishing safety, sustainable fishing practices and fisheries management and their relationship to safety and working conditions in fisheries from different regions of the world.

B. Reducing vulnerability of fishing and fish farming communities to climate change and natural disasters

14. The observed notable increase in the frequency of climate-related events over the past decades poses a significant challenge to fishery and aquaculture systems, given their crucial reliance on climate. A review of post-disaster needs assessments (PDNAs) conducted between 2006–2016 shows that agriculture (crops, livestock, fisheries, aquaculture, and forestry) absorbed 23 percent of all damage and loss caused by medium to large-scale natural disasters and 26 percent of those resulting from climate related disasters.¹⁸ The impact of disasters on subsectors, such as fisheries and aquacultures, is typically under-reported. This is largely because baseline data as well as data on the impact of disasters are neither collected nor recorded in a systematic way. FAO seeks to continue providing updated and systematic data and analysis in order to build a holistic information system on the impact of disasters on agriculture in developing countries, and contribute to implementing and monitoring the three main 2015 international agendas (SDGs, the Paris Agreement and the Sendai Framework for Disaster Risk Reduction), which recognize resilience as fundamental to their achievement.

15. In support of disaster risk management (DRM), a guide on *Spatial technology for emergency preparedness and response for aquaculture* is under preparation to provide an overview of systems and tools that acquire, manage and analyse geo-referenced data. This Guide identifies the most suitable spatial technology¹⁹ within DRM for aquaculture, which considers factors such as accessibility, features and limitations, complementary data and tools, human resources and expertise, and material and financial resource requirements.

16. Innovative models of fishery mutual insurance and aquaculture group insurance (a private company in partnership with a farmers' cooperative) in China provide examples on how insurance systems could be established to help fisheries and aquaculture enterprises recover faster from disasters and adapt better to climate risks. FAO conducted two case studies and have been assessing the

¹⁷ <https://ifishconference.ca/program/pre-conference-workshop/>

¹⁸ FAO. 2018. 2017 – The impact of disasters and crises on agriculture and food security. www.fao.org/3/I8656EN/i8656en.pdf

¹⁹ Spatial technology refers to systems and tools that acquire, manage, and analyse data that has geographic context. This includes satellite remote sensing technologies, aerial surveys, global positioning systems (GPS), geographic information systems (GIS), information and communication technology, and other data gathering sensors used in meteorology.

potential at country level to develop insurance for small producers.^{20 21} The assistance includes facilitating the knowledge and experience sharing among countries and providing technical support on development of strategic guidelines for insurance programmes.²²

C. Developing and implementing projects

17. A number of projects to support adaptation, risk reduction and resilience building were developed or implemented with the support of FAO during the intersession period. Global Environment Fund (GEF)-funded projects through the Special Climate Change Fund (SCCF) and/or the Least Developed Countries Fund (LDCF) are underway in the Benguela Current, Malawi, Eastern Caribbean, Chile and Myanmar; the projects are currently in different stages of implementation. Other LDCF projects are in the pipeline or last approval stage in Bangladesh, Cambodia, Timor Leste and the Lao People's Democratic Republic. GEF-International Waters funded projects covering Large Marine Ecosystems (LME), which also address climate change, are at various stages of implementation in the Bay of Bengal, Indonesian Seas and Canary Current LME.

18. Ad hoc interventions include TCP and Regular Programme projects providing direct assistance to countries, such as the Regional TCP on rice-fish and climate resilient tilapia (covering Bangladesh, Indonesia, Philippines, Sri Lanka and Viet Nam), rice-fish farming projects (the Lao People's Democratic Republic and Myanmar), the blue carbon project on integrated mangrove-shrimp project in Viet Nam, and the development of Cambodia national climate change strategy for fisheries.

19. Work is also ongoing in the framework of the mid-term strategy towards the sustainability of Mediterranean and Black Sea fisheries,²³ developed within the context of the FAO General Fisheries Commission for the Mediterranean (GFCM). A dedicated objective to prepare regional/subregional adaptation plan(s) for climate change has been agreed by riparian countries and the work has been launched including through a dedicated FAO-GFCM expert meeting on climate change implications for Mediterranean and Black Sea fisheries.²⁴

20. The current phase of the EAF-Nansen programme was launched in March 2017 with the signature of the programme agreement “Supporting the application of the ecosystem approach to fisheries management, considering climate and pollution impacts”. Climate change is one of the stressors addressed by the project, together with overfishing and pollution. The climate change component aims mainly at increasing the knowledge base on climate change impacts on structure, diversity and productivity of marine ecosystems, as well as supporting vulnerability assessments, in some of the least observed waters of the world’s ocean. It also relates to the project activities on improving fisheries management practices through Ecosystem Approach to Fisheries implementation, supported by the R/V Dr Fridtjof Nansen.

²⁰ Kim Anh Thi Nguyen, K.A.T. & Pongthanapanich, T. FAO. 2016. Aquaculture insurance in Viet Nam: Experiences from the pilot programme. FAO Fisheries and Aquaculture Circular No. 1133. Rome, Italy. www.fao.org/3/a-i6559e.pdf

²¹ Xinhua, Y., Pongthanapanich, T., Zongli, Z., Xiaojun, J. & Junchao, M. 2017. Fishery and aquaculture insurance in China. FAO Fisheries and Aquaculture Circular No. 1139, Rome, Italy. www.fao.org/3/a-i7436e.pdf

²² FAO. 2017. Report of the workshop on development of aquaculture insurance system for small-scale farmers, Bangkok, Thailand, 20–21 September 2016. FAO Fisheries and Aquaculture Report No. 1177. Rome, Italy. www.fao.org/3/a-i6823e.pdf

²³ www.fao.org/3/a-i7340e.pdf

²⁴ FAO. 2018. Report of the Expert Meeting on Climate Change Implications for Mediterranean and Black Sea Fisheries. Rome, 4 to 6 December 2017. Fisheries and Aquaculture Report No. 1233. Rome, Italy. www.fao.org/3/I9528EN/i9528en.pdf

21. Discussions are ongoing to mobilize resources through the development of new projects to be submitted to the Green Climate Fund (GCF). FAO held a workshop (21–23 March 2018, St George’s, Grenada) to, amongst other things, better understand the needs and capabilities of Caribbean countries to respond to the impacts of climate change on the fisheries and aquaculture sector in coastal zones. The workshop was aimed to identify specific opportunities for technical assistance and financial support from the GCF in the areas of readiness and project development. As a direct outcome of the workshop several of the 12 countries in attendance have already requested technical assistance for project development from FAO as a GCF implementing Accredited Entity, and similar workshops are being planned for other regions, including the Pacific.

22. In Africa, the joint effort of FAO, the World Bank and the African Development Bank led to the development of the African Package for Climate-Resilient Ocean Economies. The three agencies coordinate their planned assistance with access to technical expertise and funding valued at USD3.5 billion from 2017 to 2023. FAO has focused on strengthening this collaboration through the joint programme of work and the FAO Blue Growth Initiative. Through “The Package” the three organizations will provide coordinated technical and financial support to coastal and island states throughout Africa to address the challenges presented by climate change as they develop their ocean-based economies and implement their NDCs. The Package, capitalizes on the comparative advantages of the three organizations in order to achieve its ambitious objectives. Since its launch in 2016, FAO has invested more than 45M USD in delivering the package in 11 African countries to varying levels of engagement (Algeria, Cabo Verde, Côte d’Ivoire, Kenya, Madagascar, Morocco, São Tome e Príncipe, Senegal, Seychelles, Tunisia and Zambia).

D. Understanding the emissions and mitigation potentials from fisheries and aquaculture

23. Net greenhouse gas (GHG) contributions of fisheries, aquaculture and related supply chain features need further studies, even though they are considered to be relatively small in overall terms. However, as multiple concerns increase, 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. At the twenty-ninth session of COFI, it was recommended that FAO provides Members with information on possible fishing industry contributions to climate change and on technologies and ways to reduce the sector’s reliance on, and consumption of, fossil fuels. This led to the development of a global review of the use of fuel and energy across the sector.

24. Globally, fishing vessels (including inland vessels) consumed 53.9 metric tonnes of fuel in 2012, emitting 172.3 MT of CO₂, which is about 0.5 percent of total global CO₂ emissions that year. While fishing vessels are more efficient in recent years, significant opportunities exist for reduction in fuel use and greenhouse gas (GHG) emission in capture fisheries. A reduction of vessel emissions by 10 to 30 percent is achievable with efficient engines and larger propellers, better vessel shape and hull modifications, as well as use of fishing gears that require less fuel for harvesting (e.g. multi-rig gear, efficient otter boards, off-bottom fishing, high-strength materials, large mesh sizes and smaller diameter twines). The first step of emission reduction in capture fisheries is the auditing of energy use by fishing vessels to systematically evaluate the potential cost and environmental impacts of fuel saving practices. An energy audit project carried out by FAO in Thai trawl fisheries revealed that the judicious use of the throttle to regulate engine rpms was identified as the simplest option and was estimated to reduce fuel consumption by up to 35 percent when steaming. The use of a fuel flow meter and regular removal of hull fouling organisms were identified as low cost options that can reduce fuel consumption by an estimated 5 percent when fishing. It is recommended that similar projects be carried out in other developing countries to fully avail simple and cost-effective options for fuel-saving and reduction of emission.

25. Aquaculture is not a major global producer of GHG, with emissions amounting around 7 percent of those from agriculture; the emissions originate from the production of raw feed materials and transport of raw materials and finished feeds to the farms. Despite its low contribution, there is room for reducing emissions from this subsector by improving technological efficiency, reducing reliance on fossil fuel, replacing fish-based feed ingredients and improving feed conversion rates. Combining these approaches would result in a reduction of 21 percent in CO₂ emission per tonne of fish produced. In support of the mitigation efforts, a joint FAO-Global Salmon Initiative workshop on “Reducing Feed Conversion Ratios in the Global Aquaculture to reduce carbon and other footprints and increase efficiency” (9–11 November 2015, Liberia, Costa Rica) led to the publication of a tool for quantifying greenhouse gas emissions arising from aquaculture together with the workshop report. The publication also provides an overview of concerted actions to reduce Feed Conversion Ratios in the global aquaculture industry and explores potential transfer of feed and feeding technologies and lessons learn from salmon farming to other species such as carps, catfishes, tilapia and marine shrimps.²⁵

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

26. During the intersession period, efforts were invested in gaining additional momentum on the inclusion of ocean issues in the UNFCCC climate change negotiations. FAO participated in the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea eighteenth meeting to discuss current actions and opportunities in addressing the effect of climate change on fisheries and aquaculture. During the 22nd Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC-COP22), oceans were officially recognized as being part of the climate action agenda, which translated into the hosting of the Oceans Day in the official zone of the COP22. This emphasis was confirmed during COP23, with more prominent discussions on oceans and their dependent communities in the climate negotiation process. As a result of this increasing interest for oceans, discussions in the international climate change fora involving the oceans community are now more focussed on showcasing concrete actions and initiatives to illustrate the potential responses of oceans-related sectors to climate change, rather than on advocacy. At these events, adaptation solutions were showcased by FAO with the support of partners and Member Countries’ representatives working to identify climate vulnerabilities and context-specific strategies to improve the resilience of dependent-communities and increase the relevant knowledge base. In the near future and in line with the ‘Global Action Programme’ for Small Island Developing States, FAO will support the Oceans Pathways Partnership, a Fiji-led initiative launched at COP23 and aiming at strengthening the international mobilization and cooperation for the conservation and enhancement of oceans’ resilience under the UNFCCC.

III. CONSERVING BIODIVERSITY AND MINIMISING SELECTED ENVIRONMENTAL IMPACTS OF FISHING AND AQUACULTURE

A. Supporting biodiversity conservation and sustainable use

27. Biodiversity mainstreaming, the consideration of biodiversity across fisheries (and aquaculture) has gained substantial profile since the 1992 adoption of the Convention on Biological Diversity (CBD). The working document COFI/2018/8, information paper COFI/2018/Inf.28 and the biodiversity session background document COFI/2018/SBD.20 highlight the procedural nature of progress that fisheries and aquaculture have made on these issues, with a description of programme

²⁵ Hasan, M.R. & Soto, S. 2017. Improving feed conversion ratio and its impact on reducing greenhouse gas emissions in aquaculture. FAO Non-Serial Publication. Rome, FAO. 33 pp. <http://www.fao.org/3/a-i7688e.pdf>

and project activity as well as future areas of focus. Of particular importance in furthering mainstreaming of biodiversity, is the opportunity for the Member Countries to influence the development and subsequent delivery of work for the FAO *Biodiversity Platform* initiative that is currently being established. The *Biodiversity Platform* could potentially offer a useful mechanism for fisheries and aquaculture to i) characterize sectoral pressures on the diversity of aquatic life and related ecological processes; ii) identify mechanisms to mitigate these pressures, including the development of quantitative goals around defined objectives and monitoring of cross-sectoral responses to such environmental challenges; and iii) highlight the critical role that biodiversity plays in sustainable fisheries and mobilize resources to support biodiversity mainstreaming in fisheries.

28. Mainstreaming of biodiversity considerations in fisheries and conservation across issues related to threatened species can be found in COFI/2018/Inf.28. Conventions and international processes focussing on threatened species (CITES, CMS, IUCN Red List) are also mentioned in COFI/2018/8. In this case FAO provides advice, relative to the listing criteria of conventions, on the status of commercially exploited marine species, and also assists members in implementing the provisions of such conventions.²⁶ In relation to the designation of commercially exploited marine species as threatened, FAO is working with IUCN (Red List and Red List Index) and CITES to better harmonize and communicate on threatened species status characterisations, especially in relation to Sustainable Development Goals 14.4, CBD Aichi Targets and market-related decisions such as CITES Appendix listings and IUCN Red List assessments. To this end FAO, IUCN and CITES are drafting a report, under the FAO-IUCN SDG 14.4 Ad Hoc Technical Working Group, on ways to address overlaps in practices, and how to better explain the different approaches taken by the various initiatives, and their market consequences.

B. Reducing bycatch, discards and ecosystem impact

29. At the 30th Session of COFI (2012) the Committee stressed that attention was required to ensure that bycatch and discards were addressed comprehensively in conservation and management assessments, within an ecosystem approach. In order to address these issues, FAO has been actively engaged in strengthening the capacity of Member Countries by developing tools and projects at both global and regional levels.

30. The new Global Assessment of Marine Fisheries Discards and FAO's collaboration in the European Union project DiscardLess²⁷ (Strategies for the gradual elimination of discards in European fisheries) are contributions to an ongoing FAO process to focus attention on the scale of discards, trends in discarding and on fisheries management issues and practices associated with discards. Further information on the new Global Assessment of Marine Fisheries Discards is available in document COFI/2018/Inf.26.

31. At regional level, two projects are under implementation to develop trawl fisheries management plans incorporating ecosystem approach to fisheries (EAF) principles. One of them is ongoing in Latin America and Caribbean (REBYC-II LAC project) and the other one took place in Southeast Asia (REBYC-II CTI project) and was completed in 2017. Progress made in the implementation of the REBYC-II LAC project, as well as the main achievements from REBYC-II CTI are provided in document COFI/2018/Inf.26 as well as in their respective websites.²⁸ In addition, a dedicated regional project to establish a bycatch monitoring programme, addressing both discards and

²⁶ FAO Expert Advisory Panel: www.fao.org/fishery/cites-fisheries/ExpertAdvisoryPanel/en; Sharks Measures Database; www.fao.org/ipoa-sharks/database-of-measures/en/; Publication to stimulate understanding of implementation: DOI: 10.1111/faf.12281.

²⁷ www.discardless.eu/

²⁸ REBYC-II LAC: www.fao.org/in-action/rebyc-2/en/
REBYC-II CTI: www.rebyc-cti.org/

incidental catches of vulnerable species has been launched in the Mediterranean and Black Sea by FAO and GFCM.

32. FAO convened an Expert Workshop on Means and Methods for Reducing Marine Mammal Mortality in Fishing and Aquaculture Operations (20–23 March 2018, in Rome, Italy). The workshop recommended that FAO develops Technical Guidelines on means and methods for prevention and reduction of marine mammal bycatch and mortality in fishing and aquaculture operations to support FAO's Code of Conduct for Responsible Fisheries and to supplement International Guidelines on Bycatch Management and Reduction of Discards. The Workshop also recommended that FAO considers establishing a global capacity development programme to support developing Countries in the application of the proposed guidelines. The full report of this workshop including its additional recommendations is available as COFI Session Background Document COFI/2018/SBD.19.

33. FAO held three expert workshops on the “Use of Best Available Science in Developing and Promoting Best Practices for Trawl Fishing Operations” to assess the impact of bottom trawls on a global scale and to develop trawling best practices (described in Document COFI/2018/Inf.27). The workshops identified several best practice measures that may limit or reduce impact of trawling, including gear design and operation, spatial control, impact quotas, and effort control. The workshops established a set of performance metrics of management measures and industry practices that would compare the efficacy of different approaches. One of the resulting recommendation is that the work should be continued towards Best Practice Guidelines for Trawling to support FAO's Code of Conduct for Responsible Fisheries.

C. Assessing and minimising the impacts of abandoned, lost or otherwise discarded fishing gear

34. FAO convened a Technical Consultation on the Marking of Fishing Gear (5 – 9 February 2018). The Technical Consultation adopted the Voluntary Guidelines on the Marking of Fishing Gear and recommended that COFI consider the endorsement of these guidelines. The Voluntary Guidelines are considered an important tool in minimizing the impact of ALDFG and ghost fishing, and in combating Illegal, Unreported and Unregulated (IUU) fishing. The Report of the Technical Consultation is available as COFI/2018/inf.25 and the Voluntary Guidelines for the Marking of Fishing Gear are available as COFI/2018/Inf.30.

35. As per request of COFI32, FAO supported two pilot projects associated with gear marking and ALDFG. The first is a global feasibility study focusing on the marking of fish aggregating devices (FADs) (COFI/2018/SBD.17). The second is a field project in Indonesia focused on the practical application of gear marking in small-scale coastal gillnet fisheries (COFI/2018/SBD.18). The Technical Consultation welcomed the outcome of FAO pilot projects and recommended that additional pilot projects be developed and implemented in other regions and fisheries.

36. The Technical Consultation also recommended that COFI consider the development of a global strategy to address ALDFG and that Member Countries should consider the development and implementation of national action plans to address ALDFG. In this regard, FAO has prepared a discussion document for the development of a global “umbrella” programme to prevent and reduce ALDFG (COFI/2018/Inf.24). It is expected that proposed projects within the framework of this global programme will support the implementation of the Voluntary Guidelines on the Marking of Fishing Gear, as well as other measures and relevant instruments to prevent and reduce ALDFG, progressing towards achieving SDG14.1. FAO will also seek to strengthen collaborations between relevant and interested partners, including other UN agencies and programmes, on this matter.

D. Preventing and understanding the impacts of selected marine pollutants

- *Understanding the impacts of microplastics*

37. As a follow-up to the recommendations of the global oceans action summit for food security and blue growth²⁹ (The Hague, Netherlands, 22–25 April 2014) and in response to the concern voiced by COFI 32 about microplastics contamination, FAO carried out an assessment study on microplastics in fisheries and aquaculture³⁰ (COFI/2018/ Inf.31; COFI/2018/SBD.21) with the support of UN Environment and funds provided by the Government of Norway. The study built on and benefited from a global assessment carried out by the Joint Group of Experts on Scientific Aspects of Marine Environment Protection (GESAMP).³¹

38. The potential impact of microplastics and related contaminants on fish consumers' health and the consequences on fish productivity were analysed. Although plastic pollution is known to affect wild aquatic animals, the results show no evidence that microplastics ingestion has negative effects on wild or farmed aquatic organisms. While humans can be exposed to microplastics through fish consumption, current scientific evidence shows that the effects are negligible for the largest size range of microplastics compared to the benefits of a fish diet. However, the report highlights some knowledge gaps, in particular regarding smaller sized microplastics and nanoplastics. Eventual health risks linked to nanoplastics are likely to be higher than for microplastics, and detection technology is not yet available for this fraction. Nonetheless, measures should be taken at international, governmental and consumer levels to reduce plastic use and encourage the use of alternative materials, recycling and the adoption of sustainable practices in using plastics and managing plastic pollution.

- *Collecting data on nutrients and contaminants*

39. Fish plays a central role in nutritional security; is an excellent source of fats, proteins and a unique source of micronutrients. Having relevant, reliable and up-to-date food composition data is the basis for assessing nutrient intake. Under the EAF-Nansen programme, iodine concentration has been recently analysed in several lean fish species from waters around Norway, but further food composition data of seafood from other areas such as Africa is necessary in order to assess these fish resources from a nutritional and food security point of view. Furthermore, food composition data of unexploited fisheries resources such as mesopelagic fish is needed to evaluate their possible contribution to diets.

40. In addition, food safety of fish can be affected by several factors, including chemical contaminants, such as heavy metals and persistent organic pollutants (POPs), but little information is currently found on levels of contaminants of fish from the coasts of Africa and Asia. The EAF-Nansen programme is carrying out baseline surveys with the primary objective of documenting not only nutrients, but also contaminant composition in edible parts of fish used in the local diets. The results

²⁹ www.globaloceansactionsummit.com/

³⁰ Lusher, A.L.; Hollman, P.C.H.; Mendoza-Hill, J.J. 2017. Microplastics in fisheries and aquaculture: status of knowledge on their occurrence and implications for aquatic organisms and food safety. FAO Fisheries and Aquaculture Technical Paper. No. 615. Rome, Italy. www.fao.org/3/a-i7677e.pdf

³¹ GESAMP (The Joint IMO/FAO/UNESCO-IOC/UNIDO/WMO/IAEA/UN/UNEP/UNDP Group of Experts on the Scientific Aspects of Marine Environmental Protection) produced two assessment reports on the sources, fate and impacts of microplastics in the marine environment.

www.gesamp.org/data/gesamp/files/file_element/0c50c023936f7ffd16506be330b43c56/rs93e.pdf

www.gesamp.org/data/gesamp/files/media/Publications/Reports_and_studies_90/gallery_2230/object_2500_large.pdf

will inform national food authorities and provide information on overall food composition and food safety of fish in the selected regions.

- ***Addressing mercury/methylmercury***

41. FAO has been providing scientific advice on mercury related matters based on a risk-benefit exercise carried out during the Joint FAO/WHO Expert Consultation on the Risks and Benefits of Fish Consumption since 2010. Since then, FAO has supported Codex Alimentarius on mercury related issues and has provided scientific advice to the Codex Committee on Fish and Fishery Products and the Codex Committee on Contaminants in Foods.

42. Fish may accumulate contaminants, such as methyl-mercury from the environment. The concentrations of these contaminants in fish vary based on their nature of the contaminant, the type of fish and the habitat from which it comes. High methyl-mercury levels are found in large predators such as swordfish and tuna.

43. In the context of climate change, with higher seawater temperatures, the availability and toxicity of certain contaminants such as mercury may increase. Methylation of mercury to form methyl-mercury, which is readily absorbed by the gastrointestinal tract, has been found to increase when temperatures rise. Higher concentrations of methyl-mercury in fish can consequently increase human exposure to this neurotoxic contaminant. Bioaccumulation and toxicity of other heavy metals can also increase with warmer seawater temperatures in marine organisms, including crustaceans, echinoderms and molluscs.