



联合国
粮食及
农业组织

Food and Agriculture
Organization of the
United Nations

Organisation des Nations
Unies pour l'alimentation
et l'agriculture

Продовольственная и
сельскохозяйственная организация
Объединенных Наций

Organización de las
Naciones Unidas para la
Alimentación y la Agricultura

منظمة
الغذية والزراعة
للأمم المتحدة

COMMITTEE ON FISHERIES

Thirty-fourth Session

1–5 February 2021

ADDRESSING CLIMATE CHANGE AND OTHER ENVIRONMENT RELATED MATTERS

Executive Summary

This document provides an overview of the work carried out by FAO on climate change in relation to fisheries and aquaculture, as well as other environment-related matters, in particular abandoned, lost or otherwise discarded fishing gear, marine litter, anthropogenic underwater noise and harmful algal blooms. The document reports on normative work in response to the Committee's recommendation to address these issues through direct support to Member Nations with field projects, and contribution to relevant global processes.

The document is complemented by the following documents: Working paper on developments in global and regional processes (COFI/2020/8); Information paper Responsible Fishing Operations Workplan (COFI/2020/Inf. 15.4); Session Background Document on the Report of the 2019 FAO/GGGI Regional Workshops on Best Practices to Prevent and Reduce Abandoned, Lost and otherwise Discarded Fishing Gear (COFI/2020/ SBD.6); Second Interim Report of GESAMP Working Group 43 (COFI/2020/ SBD.8); IMO-FAO GloLitter Partnerships Programme (COFI/2020/SBD.13).

Suggested action by the Committee

The Committee is invited to:

- comment on the intersessional work undertaken on climate change and provide guidance on future priorities to be addressed by FAO in order to enhance the support to Member Nations in fostering responses to climate change impacts, including actions targeting fisheries and aquaculture-dependent communities, updating their National Adaptation Plans, and increasing the ambition of their Nationally Determined Contributions (NDC) to the implementation of the Paris Agreement;
- note progress on interagency collaboration to achieve SDG target 14.1 (By 2025, prevent and significantly reduce marine pollution of all kinds) through the GloLitter Partnerships Programme (COFI/2020/SBD.13) and advise on which other UN agencies or international organizations should be involved in this Programme; and

Documents can be consulted at www.fao.org

- provide recommendations on the appropriate role and functions FAO should take to address other environment-related matters, in particular underwater noise, harmful algal blooms, marine litter and the implementation of the recommendations issued from the four regional workshops on best practices to prevent and reduce abandoned, lost or otherwise discarded fishing gear (ALDFG) (COFI/2020/SBD.6).

Queries on the substantive content of this document may be addressed to:

Ms Tarub Bahri
Fishery Resources Officer
Email: tarub.bahri@fao.org

I. INTRODUCTION

1. There is a growing interest in environment-related matters particularly those linked to aquatic ecosystems and the food production systems they sustain. Increasing evidence shows that climate change and other anthropogenic impacts on aquatic environments, such as temperature increase and marine litter, have a considerable impact on the wellbeing of aquatic ecosystems, hence with implications on food security and the livelihoods of fishery and aquaculture communities. There are a number of options available to address these growing concerns, which have been learned from real on-the-ground examples. In most instances, solutions have been identified, tested on the ground and can be scaled-up or replicated.

2. During the intersessional period, FAO pursued efforts initiated in previous years to help countries and communities to (i) understand, respond and cope with adverse environmental impacts (including climate change); (ii) benefit from opportunities associated with climate change, and (iii) reduce the contributions of this economic sector to climate change and ecosystem disturbances by improving fishing and farming practices, increasing knowledge on emerging issues such as abandoned, lost or otherwise discarded fishing gear (ALDFG), marine litter, underwater noise, and harmful algal blooms. All activities were implemented within the overall framework of the Sustainable Development Goals (SDGs) 2, 13, 14 and 17, funded through the FAO Regular Programme and with the support of extra-budgetary funds from institutional and bilateral donors, and through the strengthening of existing and new partnerships.

II. UNDERSTANDING AND COPING WITH CLIMATE CHANGE IMPACTS

3. The 2019 Special Report on the Ocean and Cryosphere¹ (SROCC) of the Intergovernmental Panel on Climate Change (IPCC) echoed the most relevant messages of the FAO Technical Paper 627² and singled out the fisheries and aquaculture sector as most vulnerable to climate drivers. Moreover, there is an increased awareness of the importance of oceans and their contribution to food systems within the discussions led by the United Nations Framework Convention on Climate Change (UNFCCC). The most recent analysis indicated that out of the 163 Nationally Determined Contributions (NDCs) and 6 Intended NDCs (INDCs),³ submitted by countries as part of their commitment to the Paris Agreement, 147 referred to adaptation in the agriculture sector, of which 112 referred to fisheries and aquaculture, including oceans and coastal zone management.

4. Although knowledge gaps are gradually being dealt with, the level of uncertainty on climate change impacts on the fisheries sector remains high. This is not only because climate change predictions are subject to a number of socio-economic considerations, but because of the complexity of the ecosystem processes underpinning the fisheries sector. However, FAO pursued its efforts in drawing up efficient climate change adaptation and mitigation strategies for the sector including guidance on responses, as well as increasing its leadership in United Nations (UN) fora and global processes especially those addressing climate change and oceans wellbeing. Based on the Committee on Fisheries (COFI)'s requests, FAO implemented a range of activities aimed at supporting Member Nations and partners to effectively mitigate and adapt to the impacts of climate change on fisheries, aquaculture and aquatic ecosystems, through knowledge development and exchange, policy

¹ IPCC. 2019. *Special Report on the Ocean and Cryosphere in a Changing Climate*. (also available at https://report.ipcc.ch/srocc/pdf/SROCC_FinalDraft_FullReport.pdf)

² Barange, M., Bahri, T., Beveridge, M.C.M., Cochrane, K.L., Funge-Smith, S. & Poulain, F., eds. 2018. Impacts of climate change on fisheries and aquaculture. FAO Fisheries and Aquaculture Technical Paper 627. Rome, FAO. 628 pp. (also available at www.fao.org/3/i9705en/i9705en.pdf)

³ These NDCs and INDCs represent 196 countries, as at the time of submission the EU's NDC comprised 28 countries including the United Kingdom

development, practical demonstration and capacity building. The work carried out is in line with the corporate Strategy on Climate Change endorsed by the 156th Session of the FAO Council.

A. Strengthening the knowledge base and guidance for policy development

5. During the intersessional period, FAO and its partners have been working to increase the knowledge base on climate change impacts and vulnerability and provide policy development guidance for mitigation and adaptation options including disaster risk management. National, regional and sub-sectoral reviews and analysis were carried out. These included a synthesis of current knowledge on climate-related impacts on fisheries and aquaculture at both global and regional scales,⁴ quantifying and mitigating greenhouse gas (GHG) emissions from global aquaculture,⁵ several regional reviews on disaster risk management in the fisheries and aquaculture sector,⁶ innovative integrated agro-aquaculture for Blue Growth in Asia-Pacific,⁷ experiences relating to marine protected areas in North and West Africa,⁸ a review of ecosystem-based adaptation (EbA) in aquatic food production systems,⁹ and a vulnerability study of fishing communities in Myanmar.¹⁰ FAO contributed to an exchange of experience and good practices for climate change adaptation at the Expert Seminar on Traditional Knowledge and Indigenous Peoples' Fisheries in the Arctic Region (23-24 September 2019, Rome, Italy).¹¹ The seminar brought together over 40 indigenous experts, fishers, researchers

⁴ See e.g., Bertrand, A., Lengaigne, M., Takahashi, K., Avadí, A., Poulain, F. & Harrod, C. 2020. *El Niño Southern Oscillation (ENSO) effects on fisheries and aquaculture*. FAO Fisheries and Aquaculture Technical Paper No. 660. Rome, FAO. (also available at <http://www.fao.org/3/ca8348en/CA8348EN.pdf>); FAO. 2018. *Deep-ocean climate change impacts on habitat, fish and fisheries*, by Lisa Levin, Maria Baker, and Anthony Thompson (eds) FAO Fisheries and Aquaculture Technical Paper No. 638. Rome, FAO. 186 pp. (also available at www.fao.org/3/ca2528en/CA2528EN.pdf); Barbieri, M.A., Aguilar-Manjarrez, J. y Lovatelli, A. 2020. *Guía básica - Cambio climático pesca y acuicultura. Fortalecimiento de la capacidad de adaptación en el sector pesquero y acuicola chileno al cambio climático*. Santiago de Chile, FAO. (also available at www.fao.org/3/cb1598es/cb1598es.pdf); FAO and CERMES. 2020. *Climate change and fisheries*, by Shelly-Ann Cox, Hazel A. Oxenford, and Iris Monnereau. Rome, FAO. (also available at www.fao.org/3/cb1471en/CB1471EN.pdf)

⁵ MacLeod, M., Hasan, M.R., Robb, D.H.F. & Mamun-Ur-Rashid, M. 2019. *Quantifying and mitigating greenhouse gas emissions from global aquaculture*. FAO Fisheries and Aquaculture Technical Paper No. 626. Rome, FAO. (also available at www.fao.org/3/ca7130en/CA7130EN.pdf)

⁶ See e.g., FAO and ICSF. 2019. *Cyclone Ockhi – Disaster risk management and sea safety in the Indian marine fisheries sector*. Rome. 72 pp. (also available at <http://www.fao.org/3/CA2904EN/ca2904en.pdf>); Molnár, K., Székely, C. and Láng, M. 2019. *Field guide to the control of warmwater fish diseases in Central and Eastern Europe, the Caucasus and Central Asia*. FAO Fisheries and Aquaculture Circular No.1182. Ankara, FAO. 124 pp. (also available at www.fao.org/3/ca4730en/ca4730en.pdf); FAO. 2019. *Development of a Sustainable Fisheries Fund for the Western Central Atlantic: Wilderness Markets and Conservation International*. Rome. 30 pp. (also available at www.fao.org/3/CA3176EN/ca3176en.pdf)

⁷ FAO. 2019. *Report of FAO Regional Training Workshop on Innovative Integrated Agro-Aquaculture for Blue Growth in Asia-Pacific, Kunming, China, 12-17 June 2017*. FAO Fisheries and Aquaculture Report. No. 1292. Rome. (also available at www.fao.org/3/ca7038en/CA7038EN.pdf)

⁸ FAO. 2019. *Participatory monitoring and evaluation in marine protected areas: experiences from North and West Africa/Suivi et évaluation participatifs dans les aires marines protégées: expériences en Afrique du Nord et de l'Ouest*. FAO Fisheries and Aquaculture Circular/Circulaire sur les pêches et l'aquaculture no.1173. FAO. Rome. 96 pp. (also available at www.fao.org/3/CA2898B/ca2898b.pdf)

⁹ Abdelmagied, M. and Mpheshea, M. 2020. *Ecosystem-based adaptation in the agriculture sector – A nature-based solution (NbS) for building the resilience of the food and agriculture sector to climate change*. Rome, FAO. (also available at www.fao.org/3/cb0651en/CB0651EN.pdf) [This publication includes a chapter on aquatic ecosystems contributed by NFI]

¹⁰ Thein, A. K., Gregory, R., Akester, M., Poulain, F. and Langeard, R. 2019. *Participatory rural appraisal-Vulnerability study of Ayeyarwady Delta fishing communities in Myanmar and social protection opportunities*. FAO Fisheries and Aquaculture Circular no.1177. FAO. Rome. 56 pp. (also available at www.fao.org/3/CA2893EN/ca2893en.pdf)

¹¹ www.fao.org/indigenous-peoples/arctic/en/ organized by the FAO Fisheries Division, the FAO Indigenous Peoples Team, the Ministry of Agriculture and Forestry of Finland, the Government of Canada and the United Nations Permanent Forum on Indigenous Issues

and other stakeholders from the region to share perspectives on elements that could guide and support indigenous peoples' fisheries policy.

6. Building on the FAO Technical Paper 627, FAO's Technical Paper 650 reviews and provides guidance on available approaches and methods to appraise adaptation options in the fisheries and aquaculture sector including emerging frameworks (e.g. low-regret actions, addressing potential lock-in, and early planning for long-term adaptation) and economic tools, with the overall aim to help adaptation planners and practitioners identify the most appropriate interventions.¹² Specific NAP-guidelines¹³ have also been developed to provide technical guidance on the integration of fisheries and aquaculture in the formulation and implementation of National Adaptation Plans (NAPs) and to complement FAO's publication "Addressing agriculture, forestry and fisheries in national adaptation plans – Supplementary guidelines."¹⁴ FAO also conducted a preliminary study for identifying the most-at-risk states to changes in capture fisheries due to climate change based on a climate change risk score resulting from the combination of impact on the sector, estimates of nutritional and economic dependency, as well as national developmental indices. This helped with the selection of the top twenty countries most at risk from the impacts of climate change on fisheries, to fast track resource mobilization exercises from FAO, and policy interventions (mainly in tropical coastal regions of Sub-Saharan Africa, in addition to several small island states in the Pacific). Moreover, two E-learning courses were developed on Climate Smart Agriculture approaches for fisheries and aquaculture¹⁵ and on adaptation and mitigation in the fisheries and aquaculture sector.¹⁶

7. Furthermore, research activities under the EAF Nansen Programme (GCP/GLO/690/NOR), using the Research Vessel (R/V) Dr. Fridtjof Nansen have been carried out in different sub-regions bordering the African continent.¹⁷ The data, information and knowledge collected will improve the understanding of climate change impacts at the regional and local scales. Also, with the support of a number of FAO regional projects in the Mediterranean and the General Fisheries Commission for the Mediterranean (GFCM), research on the vulnerability of fisheries to climate change has been carried out in Western, Central and Eastern Mediterranean Sea¹⁸, including the Adriatic and Black Seas. This research is expected to identify a set of cost-effective and robust adaptation options for long-term fisheries management.

8. Adaptive and effective fisheries and aquaculture management plays a crucial role in addressing the anticipated impacts of climate change on aquatic systems and their dependent communities and livelihoods. However, one of the key conclusions of the FAO Technical Paper 627 was that evaluations of success of management practices were often lacking in adaptation studies. The Expert Workshop on Fisheries Management Adaptation to Climate Change (12-14 November 2019,

¹² Watkiss, P., Ventura, A. and Poulain, F. 2019. *Decision-making and economics of adaptation to climate change in the fisheries and aquaculture sector*. FAO Fisheries and Aquaculture Technical Paper 650. Rome, FAO. (also available at www.fao.org/3/ca7229en/ca7229en.pdf)

¹³ Brugere, C. and De Young, C. 2020. *Addressing fisheries and aquaculture in national adaptation plans - Supplement to the UNFCCC NAP Technical Guidelines*. Rome, FAO. (also available at www.fao.org/3/ca2215en/ca2215en.pdf)

¹⁴ FAO. 2017. *Addressing agriculture, forestry and fisheries in national adaptation plans*. Rome. 101 pp. (also available at www.fao.org/3/a-i6714e.pdf)

¹⁵ FAO. 2020. *Climate-smart fisheries and aquaculture*. (also available at <https://elearning.fao.org/course/view.php?id=579>)

¹⁶ FAO. 2020. *Climate change adaptation and mitigation in fisheries and aquaculture*. (also available at <https://elearning.fao.org/course/view.php?id=544>)

¹⁷ FAO. 2019. *EAF-Nansen Programme Yearly Summary 2018*. Rome. 9 pp. (also available at www.fao.org/3/ca7044en/CA7044EN.pdf)

¹⁸ FAO. 2019. General Fisheries Commission for the Mediterranean. Report of the twenty-first session of the Scientific Advisory Committee on Fisheries, Cairo, Egypt, 24–27 June 2019 / Commission générale des pêches pour la Méditerranée. Rapport de la vingt-et-unième session du Comité scientifique consultative des pêches. Le Caire, Égypte, 24-27 juin 2019. FAO Fisheries and Aquaculture Report/FAO Rapport sur les pêches et l'aquaculture No. 1290. Rome. (also available at www.fao.org/3/ca6704b/ca6704b.pdf)

Rome, Italy), organized by FAO and Fisheries and Oceans Canada, intended to fill this knowledge gap by analysing practical experiences of adaptive management of fisheries in response to climate change and identifying examples of good practices to increase fisheries resilience.¹⁹

9. The importance of improving fisheries management practices to build sustainability of the fisheries and aquaculture sector as an adequate response to climate change was reiterated during the Fisheries Sustainability Symposium (18-21 November 2019, Rome, Italy).²⁰ Discussions held during Session 6 of the symposium on “Fisheries Management in the face of a changing climate”²¹ were concluded by highlighting seven messages that emphasize the current trend in observations and practices considered essential to foster sustainability in response to climate change. One of the baseline statements was that there is a need for local solutions and that industry is adapting faster than institutions that are lagging behind. Discussions reiterated the value of implementing cross-sectoral, holistic and precautionary approaches, including effective communication between stakeholders and use of spatial management to account for shifts in species distribution and changes in ecological processes. Drawing on equity and climate justice consideration emerged as a fundamental principle to address allocation and access to fisheries resources. Effective responses to build resilience include the diversification of supply chains, adding value to new or undervalued resources, with due consideration of gender differences, specific skills and the positive role women and youth can play. Finally, innovation and new ways of collecting, sharing and communicating data was highlighted, including in relation to modern insurance alternatives and early warning systems.

10. As recalled in the FAO Technical Paper 627, climate change and poverty both tend to hit hardest the most vulnerable, and climate change is expected to worsen poverty and disproportionately affect vulnerable fishing communities and those facing inequality, particularly women and indigenous peoples. Coastal areas and Small Island Developing States (SIDS) are prone to climate risks, and people who live and work in coastal communities often experience high levels of climate-related vulnerability associated with the combined effect of high levels of exposure and sensitivity to climate variability, sparse support infrastructure, and lack of adaptation options. With only ten years left to achieve the 2030 Sustainable Development Agenda and the fact that 2020 was crucial for countries’ commitments to the Paris Agreement, FAO proposes a climate-poverty approach to improve the ways in which the interrelated challenges of poverty and climate change are addressed in fisheries and coastal areas and to ensure that responses to both are more coherent, effective and sustainable. The FAO report, “Addressing the climate change and poverty nexus: A coordinated approach in the context of the 2030 Agenda and the Paris Agreement”²², presents tools and an integrated approach to support the development of coherent policies, actions and linkages between climate responses and poverty reduction and food security initiatives.

11. The above was the main topic of a Regional NDC-SDG Dialogue workshop on Integrating climate-resilient fisheries and coastal community priorities into post-2020 climate action and leveraging SDG co-benefits for the rural poor and vulnerable (26-28 November 2019, Barbados) attended by government representatives from 11 Caribbean countries that identified best practices, approaches and next steps in climate change and development planning in the fisheries sector of the region. The dialogue provided a multi-stakeholder and cross-sectoral forum to discuss the implementation of the “Climate-Poverty Approach” within the context of small-scale fishing and

¹⁹ Bahri, T., Vasconcellos, M., Welch, D., Johnson, J., Perry, R.I., Ma, X., & Sharma, R., eds. 2021. Adaptive management of fisheries in response to climate change. FAO Fisheries and Aquaculture Technical Paper 667. Rome. (in press)

²⁰ FAO. 2020. *Proceedings of the International Symposium on Fisheries Sustainability: strengthening the science-policy nexus. FAO headquarters, 18–21 November 2019, Rome, Italy*. Fisheries and Aquaculture Proceedings No. 65. Rome. 116 pp. (also available at www.fao.org/3/ca9165en/ca9165en.pdf)

²¹ www.fao.org/about/meetings/sustainable-fisheries-symposium/programme/day-2/session6/en/

²² Charles, A., Kalikoski, D. & Macnaughton, A. 2019. Addressing the climate change and poverty nexus: a coordinated approach in the context of the 2030 agenda and the Paris agreement. Rome. FAO. www.fao.org/3/ca6968en/CA6968EN.pdf

coastal communities. The workshop participants completed a series of country-level, system-specific assessments, including i) poverty-climate vulnerability assessments; ii) social protection coverage gaps and need assessments; iii) NDC-SDG Progress Reports, including capacity development needs; and iv) NDC-SDG Sectoral Roadmaps for small-scale fisheries and coastal communities. Linked to this activity a webinar was organized to discuss the results of Piloting a Multidimensional Poverty Index for the Caribbean Fisheries Sector in the context of climate change as an important tool to address the poverty and climate change nexus in fisheries. Future support activities will be implemented in close collaboration with national government, local universities, civil society organizations and fisherfolk organizations.

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

12. Extreme weather events are projected with very high confidence to significantly increase throughout this century under all GHGs emissions scenarios, with potentially devastating humanitarian, socioeconomic and environmental impacts.²³ A diversity of adaptation measures including disaster risk reduction and management responses have been implemented worldwide to prepare for and reduce the impact of extreme events on the fisheries and aquaculture sector. These include:

- Climate risk informed policies, management plans and regulatory frameworks;
- Monitoring and early warning systems;
- Risk pooling or risk transfer through innovative financial services;
- Vulnerability and risk reduction measures such as safety at sea or climate resilient infrastructures; and
- Preparedness and responses to climate related emergencies through training and capacity development in post-disaster assessment and response, development of rapid assessment tools, data standardization and the use of new technologies.

13. With the support from the Global Environmental Facility (GEF), work is undergoing in Myanmar and Malawi to pilot monitoring, early warning and dissemination tools for fisheries and aquaculture communities with the aim of increasing resilience to climate related disasters (GCP/MLW/053/LDF and GCP/MYA/020/LDF).

14. In 2019, finance and fisheries experts from Bangladesh, China, India, Indonesia, Japan, Philippines, Thailand, United Kingdom, Canada and the United States of America, met at a regional expert workshop to discuss ways to improve access to financial services for small-scale fishers in Asia to build their resilience to disasters and climate change.²⁴ The event was organized by the Asia-Pacific Rural and Agricultural Credit Association (APRACA) in close collaboration with FAO. It contributed to producing practical guidelines²⁵ in support of better access to financial services and to the design of a capacity building programme for financial services for small-scale fisheries communities.

²³ The Special Report on the Ocean and Cryosphere in a Changing Climate of the IPCC (SROCC) and Poulain, F., and Wabbes, S. 2018. Impacts of climate-driven extreme events and disasters. In: Barange, M., Bahri, T., Beveridge, M.C.M., Cochrane, K.L., Funge-Smith, S. & Poulain, F., eds. 2018. *Impacts of climate change on fisheries and aquaculture*. FAO Fisheries and Aquaculture Technical Paper 627. Chapter 23. Rome, FAO. 628 pp. (also available at www.fao.org/3/i9705en/i9705en.pdf)

²⁴ FAO. 2019. *Report of the Expert workshop on Guidelines for micro-finance, credit and insurance for small-scale fisheries in Asia, Bangkok, Thailand, 7-9 May 2019*. FAO Fisheries and Aquaculture Report No. 1280, Rome. (also available at www.fao.org/3/ca6482en/CA6482EN.pdf)

²⁵ Tietze U., van Anrooy, R. 2019. *Guidelines for increasing access of small-scale fisheries to insurance services in Asia. A handbook for insurance and fisheries stakeholders. In support of the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication*. Rome, FAO. (also available at www.fao.org/3/ca5129en/ca5129en.pdf)

15. Practical adaptation work on safety at sea continues worldwide. FAO and the Bay of Bengal Programme (BOBP) have developed a manual for safety at sea for small-scale fishers.²⁶ Accident and fatality reporting and capacity building package for small-scale fishers on safety at sea are being developed and implemented in the Eastern Caribbean with the support from Norad (GCP/GLO/959/NOR), the GEF-funded CC4Fish project and FAO.

16. Building on existing FAO guidance material²⁷, the Centre for Resource Management and Environmental Studies of the University of the West Indies (CERMES) and the Grenada Red Cross Society ran an FAO Fisheries and Aquaculture Response to Emergency (FARE) training, along with a Training of Trainers course, in Grenada on September 2018 with the participation of seven countries (Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago) and funding from CC4Fish. FAO is also developing a short E-learning course on FARE. All three training courses aim to enhance the quality and accountability of preparedness and response to emergencies affecting the fisheries and aquaculture sector.

17. For calculating post disaster damage and losses, standardization of the data is important so it can be shared and collated to develop aggregated and disaggregated global damage and loss assessments in capture fisheries and aquaculture. FAO has developed a corporate methodology for the calculation of damage and loss in the agricultural sectors, including fisheries and aquaculture, using a data collation questionnaire.

18. Satellite remote sensing has had an enormous impact on disaster management. Over the past decade, this technology has been used extensively to assess the extent of impacts caused by earthquakes, tsunamis, hurricanes, floods and wildfires. Satellite remote sensing is widely considered to be a key support tool for disaster management, primarily because it provides information over large areas, and at short time intervals. To fully benefit from its use, it can be used in combination with other data and innovative technologies in order to have complete assessments. Available FAO guidance is a useful framework in this context.²⁸

19. Depending on the type and impact of the event, fishery resources can provide a means to address the food deficit problems in the aftermath of a disaster. However, there is a danger that additional fishing capacity may lead to overexploitation of fishery resources, especially in regions where fish stocks are poorly managed or are already being fished beyond their biological limits prior to the emergency. To address this FAO developed the Fisheries Emergency Rapid Assessment Tool (FERAT), initially used in inland fisheries, tested in Somalia and South Sudan in 2018 under complex emergency conditions.

C. Developing and implementing projects

20. FAO has developed and is implementing a number of projects to support adaptation, risk management and resilience building in the fisheries and aquaculture sector. GEF-funded projects through the Special Climate Change Fund (SCCF) and/or the Least Developed Countries Fund (LDCF) are underway in Bangladesh, Benguela Current, Cambodia, Chile, Eastern Caribbean, several

²⁶ www.fao.org/voluntary-guidelines-small-scale-fisheries/resources/detail/en/c/1207200/

²⁷ Cattermoul, B.; Brown, D. & Poulain, F. (eds). 2014. *Fisheries and aquaculture emergency response guidance*. Rome, FAO. 167 pp. (also available at www.fao.org/3/a-i3432e.pdf); and Brown, D. & Poulain, F. (eds). 2013. *Guidelines for the fisheries and aquaculture sector on damage and needs assessments in emergencies*. Rome, FAO. 114 pp. (also available at www.fao.org/3/a-i3433e.pdf)

²⁸ Aguilar-Manjarrez, J., Wickliffe, L.C. & Dean, A., eds. 2018. *Guidance on spatial technologies for disaster risk management in aquaculture*. Summary version. Rome, FAO. 34 pp. Licence: CC BY-NC-SA 3.0 IGO. (www.fao.org/3/CA2659EN/ca2659en.pdf) and Aguilar-Manjarrez, J., Wickliffe, L.C. & Dean, A., eds. 2018. *Guidance on spatial technologies for disaster risk management in aquaculture*. Full document. Rome, FAO. 312 pp. Licence: CC BY-NC-SA 3.0 IGO. (www.fao.org/3/CA2240EN/ca2240en.pdf)

of the Pacific Small Island Developing States (SIDS), Malawi, Myanmar and Timor Leste.²⁹ Work is also ongoing in projects implemented by FAO with funds from Japan, Norway, and Belgium (Region of Flanders), supporting Members' fisheries and aquaculture management in the face of climate change. Interventions include Technical Cooperation Programme (TCP) and Regular Programme (RP) funded projects that provide direct assistance to Members. For example, the TCP project on Climate Resilient Fishery Initiative for Livelihood Improvement in The Gambia and the RP project on the provision of technical support to the Pre-COP in Costa Rica and COP25 hosted by Chile. Furthermore, FAO was also part of the consortium implementing the European Union funded ClimeFish project along with 20 other partners, to support adaptation in fisheries and aquaculture through effective forecasting and development of management tools for adapting to climate change (GCP/INT/262/EC).

21. The current phase of EAF-Nansen Programme addresses climate change as one of the main stressors together with overfishing and pollution, with a particular aim at monitoring ocean variables to improve knowledge on the impacts of climate change at regional and national scales. Ongoing research activities concern the Angolan and Ivory/Western Gulf of Guinea coastal upwelling ecosystems, the Canary and Benguela currents eastern boundary upwelling ecosystems, shelf and inner-shelf circulation off the South-Eastern coasts of Africa (South Africa, Mozambique and Tanzania) and the Bay of Bengal.

22. In the past biennium, 8 new climate change project proposals developed with the support of FAO have been approved. A global project with specific country-level activities (GCP/GLO/959/NOR) is underway in Saint Lucia, South Africa, and The Philippines, with the aim of improving these countries' capacity to develop and implement adaptation strategies, by using and further developing the FAO adaptation toolbox for fisheries and aquaculture. Three projects concern climate-related processes in Cambodia, of which two projects (known as "CAPFISH-Capture", including TCP/CMB/3701/C1 (18/III/CMB/236) & GCP/CMB/043/EC) aim at promoting more sustainable, climate-resilient and inclusive growth of Cambodia freshwater and marine capture fisheries, and one project (GCP/CMB/038/LDF) focused on increasing the resilience of Cambodia's coastal fishery dependent communities in adapting to climate change. Two projects (known as "IkanAdapt", including GCP/TIM/011/LDF & GCP/TIM/009/GFF) are in progress to support Timor-Leste in strengthening the adaptive capacity, resilience and biodiversity conservation ability of its fisheries and aquaculture-dependent livelihoods. Moreover, through the My-Coast Project (GCP/MYA/026/GFF), FAO seeks to promote ecosystem-based conservation of Myanmar's southern coastal zone to derive sustainable benefits for marine biodiversity, climate change mitigation and food security. FAO is also implementing a TCP project (TCP/GAM/3702/C2) to promote climate change adaptation best practices in The Gambia.

23. The implementation of the mid-term strategy (2017-2020) towards the sustainability of Mediterranean and Black Sea fisheries is also in progress within the General Fisheries Commission for the Mediterranean (GFCM). One of the outputs expected from this mid-term strategy, to be based on the outcomes of dedicated research on the topic, is the creation of an adaptation strategy to cope with potential effects of invasive species and climate change on fisheries.

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

24. Measuring, understanding and reducing the GHG emissions, or carbon footprint, of fishery and aquaculture activities is important in terms of long-term environmental and economic sustainability. Fuel consumption during fishing makes up the largest single contributor to GHG emissions, although, emissions vary according to fishing method and species as well as distance to fishing grounds. Feed production and on-farm electricity are commonly found to be the major drivers of GHGs in aquaculture. Post-harvest and processing activities, whether on-board fishing vessels or

²⁹ For detailed information on these projects, see FAO. 2019. *FAO's work on climate change – Fisheries & aquaculture 2019*. 64 pp. Rome. (also available at www.fao.org/3/ca7166en/ca7166en.pdf)

ashore, are heavily dependent on fuel (or energy). The increase in fish trade and more geographically dispersed supply chains and more sophisticated value-added products also contribute to increased energy demands and emissions.

25. However, there is lack of data particularly on the contribution to GHG emissions by fish processing and utilization. More studies have focussed on production. The impact of domestic and food service food waste, particularly for fishery products, is relatively little measured.

26. Key policy guidance can be found in the FAO Code of Conduct for Responsible Fisheries (CCRF) and is related to more efficient use of energy in harvesting and post-harvest activities, reduction in emissions and the development and transfer of appropriate technologies, to ensure that processing, transportation and storage methods are environmentally sound. The Voluntary Guidelines for Securing Small-Scale Fisheries (SSF guidelines) also promote the objectives, principles and provisions of the UNFCCC and strategies for adaptation and mitigation, energy efficiency in the whole value chain. According to the FAO Technical Paper 627, mitigation includes improving value chain efficiency and enhancing local added-value by scaling up cold chains and sanitary practices; reducing losses and waste; promoting climate-smart fishing, aquaculture and processing technologies.

27. GHG emissions can be reduced by introducing energy-saving, more efficient fishing and farming techniques and technologies. Improvements can also be gained through better product utilization and reduced loss and waste in value chains. Market-led standards and certification schemes are also important. As is a shift away from non-renewable to renewable energy sources. Sustainable seafood consumption that pairs nutritional benefits against environmental costs could also be considered.

28. In terms of mitigation efforts there is little documented information available on the consequences of actions taken, nor on lessons learnt across the sector. However, several initiatives are ongoing to quantify and reduce the carbon footprint of the fisheries and aquaculture sector. FAO, WorldFish and Duke University are working in partnership with experts globally in the Illuminating Hidden Harvests study that investigates the contribution of small-scale fisheries to sustainable development and looking at GHG emissions from small-scale fisheries and energy use. The EU-funded FISH4ACP (GCP/GLO/028/EC)³⁰ project which began in early 2020 is a 5-year programme led by the African, Caribbean and Pacific Group of States (ACP) and implemented by FAO, is expected to work in 10 value chains with small- and medium-sized businesses. The programme has the mandate to implement interventions which will contribute to reducing GHG emissions. Finally, FAO continues to promote the FAO-Thiaroye Processing Technique (FTT-Thiaroye) which is an improved technology for drying and smoking fish that helps processors meet food safety standards, as well as, in reducing fuel wood consumption. This improved technology was developed in Senegal and is now adopted in several countries in Africa, Asia and the Pacific.

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

29. During the intersession period, the momentum on oceans within the UNFCCC continued and was reaffirmed. FAO, in collaboration with Country Representatives, participated in a series of events intended for climate negotiators, mainly to disseminate information on the role fisheries and aquaculture can play in climate adaptation and mitigation and showcase concrete examples of field work. As for previous years, FAO participated in the Climate Action Day on Ocean organized during the UNFCCC-COPs, both in 2018 (Katowice, Poland) and in 2019 (Madrid, Spain, hosted by the Government of Chile). In addition, FAO contributes to the UNFCCC Working Group on Coastal Adaptation, ensuring an adequate representation of fisheries and aquaculture. FAO submitted a

³⁰ www.fao.org/in-action/fish-4-ACP/en/

proposal³¹ to and participated in the UNFCCC Dialogue on Ocean and Climate Change held during the Subsidiary Body for Scientific and Technological Advice (SBSTA) on 2-3 December 2020.³² Contributions were also given to the New York Climate Summit (September 2019, New York, United States of America) in particular to the Nature's Climate Hub with an event focussed on nature-based solutions, the 2020 Virtual Ocean Action Day (20 November 2020, in memory of Dr. Biliiana Cicin-Sain),³³ and the 5th International EbA Community of Practice Workshop (24-25 November 2020) to present FAO's ongoing work EbA of aquatic food production systems.³⁴

30. FAO is contributing to the initiative on "Turning the tide on deforestation" launched at the Climate Action Summit in September 2019 by the UN Secretary General (UNSG). Under the leadership of the United Nations Environment Programme (UNEP) and FAO and with the involvement of the UN System as a whole, it is expected to step up actions against deforestation and forest degradation across the agriculture and forestry sectors. Contributing to the UN-wide efforts, FAO will enhance related cross-sectoral work internally, including through an initiative on "Transforming food systems to feed the planet without deforestation". NFI will contribute by focussing mainly on mangroves, coastal areas and inland ecosystems that currently contribute to or are impacted by deforestation.

III. MINIMISING SELECTED ENVIRONMENTAL IMPACTS OF FISHING AND AQUACULTURE

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

31. In 2018, the thirty-third Session of FAO's Committee on Fisheries (COFI33) endorsed the Voluntary Guidelines for the Marking of Fishing Gear (VGMFG). The Voluntary Guidelines complement FAO's Code of Conduct for Responsible Fisheries and are an important tool to guide Members in preventing and reducing Abandoned, Lost and otherwise Discarded Fishing Gear (ALDFG) and its impact such as ghost fishing, and in combatting Illegal, Unreported and Unregulated (IUU) fishing.

32. In 2019, FAO in collaboration with the Global Ghost Gear Initiative (GGGI) convened four regional workshops around the globe on best practices to prevent and reduce ALDFG. The aim of these workshops was to raise awareness and understanding of the VGMFG and GGGI's Best Practice Framework for the Management of Fishing Gears (BPF). Each workshop produced a set of recommendations on actions that need to be taken up in the respective regions. The report of the four regional workshops is available as a Session Background Document (COFI/2020/SBD.6).

33. The GGGI is a civil society organisation that has supported FAO in the delivery of its aims and objectives to implement the VGMFG through workshops and pilot projects. Since 2015, FAO has held a seat on the former GGGI Steering Group (now Expert Advisory Council, EAC) as an independent expert organisation. The EAC exists to provide technical, commercial and governance judgment to the GGGI Leadership, which itself provides leadership and support to the GGGI, its participants and its Working Groups.

34. COFI 33 mandated FAO to develop a comprehensive global strategy to tackle issues relating to ALDFG and to support implementation of the VGMFG involving relevant international bodies and

³¹ https://www4.unfccc.int/sites/SubmissionsStaging/Documents/202003311247---FAO_Submission_Dialogue_on_Ocean_and_Climate_Change_final.pdf

³² <https://unfccc.int/event/ocean-and-climate-change-dialogue-to-consider-how-to-strengthen-adaptation-and-mitigation-action>

³³ <https://roca-initiative.com/virtual-oceans-action-day-2020/>

³⁴ https://images.agri-profocus.nl/upload/event/Invitation_EbA_CoP_51604568071.pdf

other stakeholders. In response, FAO has developed a programme of work on responsible fishing operations including action on ALDFG, bycatch, marine litter and discards (see COFI/2020/inf. 15.4 for more details); and has also signed a UN to UN Agreement with the International Maritime Organization (IMO) to assist, also with the assistance of Norway, developing countries to address the issue of marine plastic litter from sea-based sources (GloLitter Partnerships Programme). Further details on the GloLitter Partnerships Programme are available in document COFI/2020/SBD.13.

B. Understanding the impacts of marine litter

35. The 45th Session of the Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) (17-20 September 2018, Rome, Italy) supported the establishment of a working group on sea based sources of marine litter including fishing gear and other shipping related litter (GESAMP Working Group 43), sponsored by FAO and IMO and in partnership with UNEP.

36. The Working Group 43 (WG43) was established in April 2019 and held its first virtual meeting to develop a work plan and timeline of deliverables as set forth in its Terms of Reference. In October 2019, the WG43 had its first face-to-face meeting in Rome hosted by FAO to report and discuss findings on the sources, level and impact of marine litter, their relative contributions, the impacts of different sea-based sources of marine litter and data gaps. The second interim report of WG43 is available as COFI/2020/SBD.8.

37. Following the recommendations contained in the Manila Declaration³⁵, the Global Partnership on Marine Litter (GPML) was launched in June 2012 at Rio + 20 in Brazil and seeks to protect human health and the global environment by the reduction and management of marine litter. The GPML is a global partnership gathering international agencies, governments, NGOs, academia, private sector, civil society and individuals. FAO was elected as the co-chair of the Steering Group of the GPML in March 2018 at the 6th International Marine Debris Conference (6IMDC) for a 2-year term alongside the Government of the Seychelles.

38. At the fourth session of the UN Environment Assembly, the UN Environment Management Group (EMG) was invited to engage in and contribute to the Ad Hoc Open-ended Expert Group on Marine Litter and Microplastics by providing inter alia a mapping of all relevant United Nations agencies, programmes, initiatives and expertise with relevance to marine litter including plastic litter and microplastics. In response to this call, in May 2019, the EMG Senior Officials decided to establish an Interagency Task Team to prepare the requested system-wide contribution. Two FAO representatives from the Climate and Environment Division and from the Fisheries Division are operating as FAO focal points for the EMG Task Team on Marine Litter and Microplastics. The group has held a number of coordination meetings and collated all relevant information and work that FAO has carried out on this subject matter.

39. The EAF Nansen Programme has a comprehensive Science Programme comprising 11 themes. Theme-6 covers the occurrence and impacts of marine litter and microplastics on marine ecosystems, and theme-8 includes the potential impact of microplastics on seafood safety. The distribution of seafloor marine litter (recovered in demersal trawls), floating microplastics and microplastics in fish has been studied off the West and East coasts of Africa and in the Bay of Bengal, off Myanmar. These studies include the determination of the polymer composition using advanced analytical techniques at IMR. Based on results of these studies one aspect will be to identify and quantify the proportion of litter generated by the fishing sector. It is certain that marine litter has a significant social and economic impact on a number of fisheries, being most clearly demonstrated for the artisanal beach seine fishery in the Gulf of Guinea. In addition, large quantities of seafloor litter

35

<http://wedocs.unep.org/bitstream/handle/20.500.11822/12347/ManillaDeclarationREV.pdf?sequence=1&isAllowed=y>

have been observed offshore in this region. Currently there is no evidence that microplastics pose a threat to seafood safety.

40. FAO was invited to join the Plastic Waste Partnership (PWP) launched in November 2019 and operated by the Secretariat of the Basel, Rotterdam and Stockholm Conventions³⁶. The goal of the Partnership is to foster sound management of plastic waste at the global, regional and national levels and prevent and minimize their generation, including in the marine environment. Whenever relevant, FAO will contribute with information and provision of technical advice, as well as the sharing of lessons learned from its ongoing activities within the EAF-Nansen programme (data collection and processing) and the GloLitter Partnerships Programme.

C. Understanding the impacts of underwater noise on fish resources

41. As of 2010, the United Nations General Assembly (UNGA), through its annual resolution on Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea (UNCLOS) of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments³⁷, has been encouraging FAO to develop studies on the impacts of underwater noise on fish resources and fishing catch rates, as well as associated socio-economic effects. The request by the UNGA was reiterated by the 33rd session of COFI who noted with concern the issue of underwater noise.

42. Having regard to the relevance of such calls to the work of regional fishery bodies, and the role these bodies can also play in developing such studies, FAO-GFCM has organized, jointly with OceanCare, a workshop on “Anthropogenic Underwater Noise and Impacts on Fish, Invertebrates and Fish Resources” on 21-22 February 2019 at the FAO HQ.³⁸

43. The main objective of this workshop was to facilitate the understanding of the impacts of underwater noise on fish resources by, among others: i) reviewing reported underwater noise effects on fish and invertebrates; ii) identifying areas in the Mediterranean Sea where fishing is restricted but other anthropogenic activities, in particular underwater noise, could impact fish resources; iii) considering how the prevention of these impacts, particularly socio-economic impacts, on fish resources could be addressed; and iv) discussing recent developments within UNCLOS in connection with transboundary pollution in the high seas.

44. During the workshop, several studies were presented, as well as regional experiences relating to underwater noise, which facilitated in turn the understanding of its potential impacts on fish resources³⁹. Having regard to the mandate of the FAO-GFCM, and particularly its regulatory powers

³⁶ www.basel.int/Implementation/Plasticwaste/PlasticWastePartnership/tabid/8096/Default.aspx

³⁷ Resolution 65/38 - https://www.un.org/Depts/los/general_assembly/general_assembly_resolutions.htm

³⁸ Report of Joint GFCM/OceanCare Workshop on anthropogenic underwater noise and impacts on fish, invertebrates and fish resources, FAO headquarters, Rome, Italy, 21-22 February 2019. (also available at <http://www.fao.org/gfcm/technical-meetings/detail/en/c/1194253/>)

³⁹ In paragraph 13 of the *Report on the work of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea at its nineteenth meeting*, which was held in 2018 at the UNGA and focused its discussions on the topic “*Anthropogenic underwater noise*”, the following information is available on the impacts of underwater noise: “The impacts of anthropogenic ocean noise on specific marine species and ecosystems were highlighted by several delegations, including impacts on marine mammals, fish in general and migratory species. Several delegations noted that higher levels of anthropogenic underwater noise were affecting the abilities of marine species to rely on sound for critical life functions. The negative impacts of anthropogenic noise upon marine life referred to by delegations included inducing changes in the behaviour and migratory routes of species, disrupting communication, displacing animals from feeding and breeding grounds and causing stress, injury and death”. Document A/73/124 – <https://undocs.org/A/73/124>.

in connection with the establishment and monitoring of Fisheries Restricted Areas (FRAs), the workshop recommended that it would be appropriate to broaden knowledge as to if and how underwater noise could undermine such spatial measures and negatively affect efforts towards the conservation of fish resources found therein.

45. The workshop recommended the development of a study that would deepen the understanding of any socio-economic impact of underwater noise on fish resources in connection with FAO-GFCM FRAs. This study is currently ongoing and will be submitted to the consideration of the FAO-GFCM Scientific Advisory Body on Fisheries in due course.

46. The study, when available, could be submitted by FAO to the UNGA and circulated among other regional fishery bodies which might carry out similar studies.

D. Preventing and understanding the impacts of harmful algal blooms on fish resources and food safety

47. Phytoplankton blooms, micro-algal blooms, toxic algae, red tides, or harmful algae blooms, are all terms for naturally occurring phenomena that have occurred throughout recorded history. About 300 hundred species of microalgae are reported at times to form mass occurrence, so called blooms. Nearly one fourth of these species are known to produce biotoxins. Even non-toxic algal blooms can have devastating impacts when they lead to kills of fish and invertebrates by generating anoxic conditions and clogging respiratory apparatuses. Some algal species, although non-toxic to humans, can produce exudates that can cause damage to the delicate gill tissues of fish (raphidophytes *Chattonella*, *Heterosigma*, and dinoflagellates *Karenia*, *Karlodinium*)⁴⁰. Aquatic animals can suffer devastating mortalities, which could lead to economical and food losses, and eventually become a food security and livelihood problem.

48. Of greatest concern to humans are algal species that produce potent neurotoxins that can find their way through shellfish and fish to human consumers where they evoke a variety of gastrointestinal and neurological illnesses (such as paralytic shellfish poisoning (PSP), amnesic shellfish poisoning (ASP), diarrhoeic shellfish poisoning (DSP), neurotoxic shellfish poisoning (NSP), azaspiracid⁴¹ shellfish poisoning (AZP) and ciguatera fish poisoning (CFP)). Worldwide, ciguatoxins are estimated to cause around 50 000 cases of ciguatera fish poisoning annually; neurological effects may last for weeks or even years and one percent of these cases are fatal⁴².

49. Climate change and coastal water over-enrichment create an enabling environment for harmful algal blooms, which seem to have become more frequent, more intense and more widespread in the past decades. In response to this, important progress limiting adverse impacts of planktonic harmful algal blooms (HABs) has been achieved by implementing rigorous monitoring programs addressing HABs species in the environment, marine toxins in seafood, and associated human diseases. However, the situation is very different for benthic HABs (BHABs) happening at the bottom of coastal waters, especially for Gambierdiscus species responsible for ciguatera poisoning, the most common non-bacterial seafood poisoning globally. Small island states in tropical regions are particularly vulnerable to the consequences of ciguatera poisoning, and global changes in climate may exacerbate the incidence rates, and impacts on natural and economic resources of endemic populations. For this reason, Ciguatera Poisoning (CP) was raised at the Codex Committee on Contaminants in Food at its 11th Session (CCCF11) (3-7 April 2017, Rio de Janeiro, Brazil). The Committee requested scientific advice from FAO/WHO to allow the development of appropriate risk management options. In particular, CCCF11 requested scientific advice to FAO/WHO for full evaluation of known ciguatoxins (toxicological assessment and exposure assessment), including geographic distribution and rate of

⁴⁰ http://hab.ioc-unesco.org/index.php?option=com_content&view=article&id=5&Itemid=16

⁴¹ Azaspiracids are polyether marine toxins that accumulate in various shellfish species and have been associated with severe gastrointestinal human intoxications

⁴² www.fao.org/3/a-i3215e.pdf

illness, congeners and methods of detection; and based on this, guidance for the development of risk management options. The expert meeting took place in November 2018 and the resulting FAO/WHO Joint Report of the Expert Meeting on Ciguatera Poisoning provides the basis for guiding the elaboration of appropriate Codex texts and to advise Members.⁴³

⁴³ FAO and WHO. 2020. *Report of the Expert Meeting on Ciguatera Poisoning. Rome, 19–23 November 2018.* Food Safety and Quality No. 9. Rome. (also available at www.fao.org/3/ca8817en/CA8817EN.pdf)