United Nations

Framework Convention on Climate Change

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Capacity building and the transfer of marine technology: New developments, approaches and challenges

Contribution from the United Nations Framework Convention on Climate Change

I. Introduction

1. The United Nations Framework Convention on Climate Change (UNFCCC) secretariat ("the secretariat") seeks to contribute to the United Nations General Assembly resolution 79/144 of 12 December 2024, entitled "Oceans and the law of the sea". More specifically, in accordance with paragraph 347 of the said resolution, this written input will contribute to the theme "Capacity building and the transfer of marine technology: New developments, approaches and challenges", which is the focus of the twenty-fifth meeting of the United Nations Open-ended Informal Consultative Process on Oceans and the law of the sea.

2. Parties to the UNFCCC have recognized the importance of protecting the ocean and its ecosystems in the Convention and Paris Agreement:

(a) In the Convention Parties agreed to protect the climate system (Article 2), defined as the totality of the atmosphere, hydrosphere, biosphere and geosphere and their interactions (Article 1.3);

(b) In the Paris Agreement, Parties noted the importance of ensuring the integrity of all ecosystems, including oceans, and the protection of biodiversity, recognized by some cultures as Mother Earth.

II. UNFCCC mandates on ocean-based climate action

3. The recognition of the ocean's critical role in climate action under the UNFCCC has evolved significantly. At COP 25, the Chile Madrid Time for Action 2019, governments recognized the need to strengthen the understanding of, and action on, ocean and climate change under the UNFCCC.

4. At COP 26, in the Glasgow Climate Pact 2021(Decision 1/CP.26 Paras. 60-61), Parties invited the relevant work programmes and constituted bodies under the UNFCCC to consider how to integrate and strengthen ocean-based action in their existing mandates and workplans and to report on these activities within the existing reporting processes.

5. At COP 27/CMA 4, in 2022, the COP Sharm el-Sheikh Implementation Plan (Decision 1/CP.27 para. 50) and CMA Sharm el-Sheikh Implementation Plan (Decision 1/CMA.4 para. 79), Parties were encouraged to integrate ocean-based actions into their national climate goals, including the nationally determined contributions (NDCs). A key outcome was the establishment of facilitated annual ocean and climate change dialogues. The COP27 Sharm el-Sheikh Implementation Plan mandates that these dialogues be led by two

co-facilitators, biennially selected by the Parties who decide on the two topics based on consultations with Parties and observers, conduct the dialogue, and prepare an informal summary report to present at COP.

6. The ocean dialogue has become a vital forum under the UNFCCC process for Parties and observers to a) enhance collaboration, understand and strengthen ocean-based climate action; b), exchange of good practices on ocean-based mitigation and adaptation solutions; and, c) through the informal summary reports,[1] highlight key messages, inter-alia on marine technology transfer and capacity building, opportunities and challenges.

7. The first facilitated 2023 ocean dialogue was held during SBSTA 58. The two topics addressed were: first, coastal ecosystem restoration, including blue carbon and second, fisheries and food security.

8. The outcome of the first global stocktake (Decision 1/CMA.5, para. 180), welcomed the outcomes of and the informal summary report on the 2023 ocean dialogue and encouraged further strengthening of ocean-based action, as appropriate.

9. The 2024 ocean dialogue, held during SBSTA 60, focused on the topics of marine biodiversity conservation and coastal resilience, and technology needs for ocean climate action, including finance links.

III. The 2024 dialogue key messages on Topic 2: Technology needs for ocean climate action, including finance links

10. At the 2024 ocean dialogue, on Topic 2, "Technology needs for the ocean climate action, including finance links", participants discussed a range of renewable ocean energies, green shipping technologies, satellite-based remote sensing technologies and automated ocean-based technologies. Financing of technologies and capacity building were considered critical enablers, especially for developing countries, to accelerate ocean-based climate action.

11. The key messages and discussions from the 2024 ocean dialogue and as relevant to the General Assembly resolution theme on "Capacity building and the transfer of marine technology: New developments, approaches and challenges marine technology", are provided below. Further information on these highlighted messages and discussions are available in the 2024 informal summary report. More than 300 case studies and good practices exemplifying these discussions and key messages are available here.

12. More specifically, the relevant key messages and discussions included:

(a) Enhancing the adoption of ocean-based technologies, including renewable ocean energies, green shipping technologies, marine Carbon Dioxide Removal (mCDR), internet of things (IoT) and satellite imagery has the potential to support mitigation and adaptation objectives of the Paris Agreement.

(b) A range of renewable ocean energies, including offshore wind, wave, and tidal technologies, and green shipping technologies seem to have the potential to deliver long-term carbon emissions reductions and appear to have low environmental impacts.[2]

(c) Satellite mapping, and satellite-based remote sensing technologies are an important tool for monitoring the state of the ocean and advancing the efforts of Parties to adapt to climate change impacts. The use and scaling of advanced and automated ocean-based technologies like IoT and artificial intelligence, has the potential to contribute to real-time data collection, and protect, restore and manage marine ecosystems.

(d) As technology needs assessments TNAs follow a comprehensive, country-driven, participatory and action-oriented approach, involving all stakeholders, they could assist Parties in identifying technologies with the highest potential to mitigate climate change

[1] The dialogue aims to be a multi-year exercise, that builds knowledge in relevant topics on the ocean and climate change, and on previous years' experience, inputs and the 2024, 2023, 2022, 2020 informal summary reports.

[2] See IPCC Sixth Assessment Report for more details.

and adapt to its impacts, whilst identifying barriers to the development, transfer and uptake of these technologies. Parties may wish to utilize the UNFCCC TNAs for the identification, development and deployment of ocean-based technologies, and for informing the development and implementation of their NDCs.

(e) We take note of the IPCC Sixth Assessment Report on a potential use of CDR to compensate for greenhouse gas emissions from sectors that cannot completely decarbonize, or which may take a long time to do so. We recognize that mCDR methods differ in terms of removal process, timescale of carbon storage, technological maturity, mitigation potential, cost, co-benefits, adverse side-effects, and governance requirements. Parties' implementation strategies may wish to take into account these differences and potential trade-offs, including the implementation of IMO's amendments to regulate marine geoengineering.

(f) Finance and capacity building are critical enablers to accelerate technology related ocean climate action. Developing countries, especially least developed countries (LDCs) and small island developing states (SIDS), lack access to finance and have significant capacity building needs for the uptake of these technologies. Scaling financial flows would need clear government signalling to align public finance, and the development of innovative financial instruments to lower market barriers and costs, and related risks. In this regard, Parties and private investors may consider collaborating to develop innovative financial instruments, such as blue bonds and blended finance facilities including public private partnerships, which could assist with risk sharing and access to capital markets. We further note the significant role of international financial institutions and climate funds such as the GCF and GEF, in funding guarantees, grants and concessional finance, that help to mitigate investment risks and attract private capital for ocean-based projects.

IV. Ocean-based technologies and capacity building in the nationally determined contributions

13. In the 2024 NDC synthesis report of the secretariat, Parties continued to report ocean-based measures to demonstrate climate action. Parties communicated measures for achieving conditional mitigation targets in their NDCs, that included wind energy (32 per cent), with 36 per cent of Parties (compared with 35 per cent in the 2022 report), accounting for 55 per cent of total global electricity generation from fossil fuels in 2022, indicating corresponding measures, including developing offshore wind power capacity.[3]

14. Further, the NDC synthesis report reported that the share of Parties that identified in their adaptation component synergies between adaptation and mitigation, particularly in the terrestrial and marine ecosystem and biodiversity, agriculture, energy, water resources and human health sectors, increased to 29 per cent in the new or updated NDCs from 27 per cent in their previous NDCs. Examples of these synergies included using renewable energy and improving energy efficiency to enhance energy security.[4]

15. At the 2024 dialogue, Parties widely discussed offshore wind programs as the only marine energy technology that was ready for efficient large-scale deployment. Participants highlighted that whilst funding and technology advancement are critical for deploying tidal and wave energy technologies, which, while included in some NDCs, are currently underdeveloped. Although some Parties already include offshore wind in their NDCs, these technologies require further advancement and funding for large-scale deployment, particularly for SIDS. For example, Vanuatu is actively pursuing wave and tidal energy as part of its NDC, despite current technological limitations. Participants stressed the importance of prioritizing offshore renewable energy in NDCs, as exemplified by the EU's focus on offshore wind energy.

16. In the NDC synthesis report, a total of 76 per cent of Parties identified capacity-building as a prerequisite for NDC implementation, while 50 per cent recognized capacity-building as a cross-cutting means of NDC implementation.[5] In the new or updated NDCs,

[3] See paragraph 172 (b) of the 2024 NDC synthesis report.
[4] See paragraph 164 of the 2024 NDC synthesis report.
[5] See paragraph 195 of the NDC synthesis report.

20 per cent of Parties referred to capacity-building as being important for transfer of low-carbon and green technologies.[6] In addition, 66 per cent of Parties identified capacity-building needs relating to specific sectors, including energy and ecosystems (marine, coastal and terrestrial).[7]

V. Technology executive committee and marine technologies

17. Under the "Rolling workplan of the Technology Executive Committee for 2023–2027", the Technology Executive Committee (TEC) has dedicated activities focused on innovative ocean climate solutions. These activities aim to analyse the role of technological innovations in ocean-based actions, including how technology can address issues related to marine protected areas and support the achievement of SDG 14. The TEC is also working on other activities related to ocean technologies, such as early warning systems, disaster risk management, water-energy-food systems, and digital technologies, particularly AI.

18. In the 2024 TEC policy brief on "Emerging Climate Technologies in the Energy Supply Sector", a review of the emerging climate technologies highlights that some are very likely to provide global-scale climate and broader SDGs benefits (floating wind, floating solar PV, green hydrogen, advanced batteries, thermal energy storage, and heat pumps). However, some of the technologies that have been reviewed are unlikely to provide a large, globally significant contribution to meeting climate change goals in the near to medium term (airborne wind energy, wave energy, tidal energy, ocean thermal energy conversion), but they may be critical to some countries' or subregions' efforts. For this latter group, the policy brief recommended overcoming engineering and business case challenges.

19. In 2022, the TEC published two Policy Briefs "Innovative Approaches for Strengthening Coastal and Ocean Adaptation: Integrating Technology and Nature-based Solution" and "Technologies for Averting, Minimizing and Addressing Loss and Damage in Coastal Zones". These policy briefs provided information on an array of technologies – hardware, software, and orgware – currently available to assess risks, reduce risks, recover and rehabilitate from the impacts of climate change in coastal zones. It also highlighted the challenges and opportunities of these technologies where improvements can be made to help countries prepare better to deal with adverse impacts of climate change in coastal zones.

VI. Marine technology transfer and capacity building in the national adaptation plans

20. Parties under the UNFCCC established the global goal on adaptation, of which one of the seven thematic indicators is about "reducing climate impacts on ecosystems and biodiversity, and accelerating the use of ecosystem-based adaptation and nature-based solutions, including through their management, enhancement, restoration and conservation and the protection of terrestrial, inland water, mountain, marine and coastal ecosystems".

21. Increasingly, Parties are including adaptation strategies and approaches in relation to capacity building and marine technology transfer in their national adaptation plans (NAPs), including SIDS, as well as other developing countries with significant exposure to climate risks in coastal areas. Analysis of NAPs submissions[8] reveals several key approaches, including the development of advanced digital tools and technology transfer platforms that enhance data sharing and climate monitoring.

22. For instance, Fiji's NAP advocates for the exchange and monetization of technological expertise in marine-related services, proposing the establishment of a payment system for tailor-made meteorological, hydrological, and earthquake services. To improve the sustainable use of marine resources, Fiji plans to strengthen climate information systems, enabling better monitoring and proactive measures. Additionally, the plan seeks to upgrade

[6] See paragraph 198 of the NDC synthesis report.
[7] See paragraph 196 of the NDC synthesis report.
[8] The submitted NAPs are available at https://napcentral.org/submitted-NAPs.

existing infrastructure and resources for climate data collection, dissemination, and early warning systems.

23. In Kiribati, the 2020 Joint Implementation Plan (KJIP) prioritizes technological development within its NAP. The plan stresses the modernization of data logging systems for various environmental parameters such as wind, solar, tidal, and sea surface temperature. Kiribati also plans to establish geodetic benchmarks across selected islands to monitor coastal movement, land erosion, and accretion.

24. Bangladesh's NAP focuses on enhancing climate resilience through advanced information management systems. The plan includes the development of climate products and services, such as early warning systems for climate hazards, leveraging AI, space technology, and big data to support decision-making and emergency responses. It also emphasizes research on low-cost desalinization tools for coastal households and pollution control technologies for agriculture, industry, and urban areas.

25. Access to adaptation technologies and technology transfer remains one of the key challenges, gaps, and needs of developing countries. Parties in their NAPs have identified technical barriers, knowledge gaps, and coordination as key capacity building challenges. Additionally, limited participation from vulnerable communities, cultural and religious barriers to awareness and action, have also been identified as capacity building challenges in some Parties NAPs.

26. Financial constraints for research and technological innovation are identified as major barriers in Parties' NAPs. Challenges to technology transfer include limited access to affordable, low-maintenance technology, insufficient research facilities, lack of country-driven initiatives, and limited knowledge of local circumstances. Additionally, limited coordination and collaboration across ministries and sectors, outdated legal frameworks to attract the private sector, and limited emergency response capacities further hinder marine technology transfer.