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Partnership dialogues

Increasing scientific knowledge, and developing research capacity and transfer of marine technology

Concept paper prepared by the secretariat

I. Introduction

1. The present concept paper for the partnership dialogue on the theme "Increasing scientific knowledge, and developing research capacity and transfer of marine technology", prepared pursuant to General Assembly resolution 70/303, relates to target 14.a of the Sustainable Development Goals. The paper is based on input received from Member States, United Nations system entities and other stakeholders.[1]

2. Marine science plays an important role in the fisheries management process, including for the adoption of conservation and management measures. Science also has an important role to play in managing other human pressures on the marine environment, including from local pressures such as pollution, coastal development and resources extraction, that act together with the global impact of climate change. Technology can play a role in the achievement of many of the targets of Sustainable Development Goal 14, for example, by helping to deliver more efficient and sustainable fishing methods, enhancing the monitoring of fishing activities, facilitating pollution prevention and clean-up and enhancing marine spatial planning. It can also allow for better research into and protection of the natural and cultural heritage of the oceans.

* A/CONF.230/1.

[1] Given the word limit, not all inputs have been included in their entirety, but they can be accessed at https://oceanconference.un.org/documents.

3. Scientific understanding of the ocean is fundamental in order to carry out effective management of the human activities that affect the marine environment and the biota that it contains. Scientific understanding is also fundamental in order to predict, forecast and mitigate changes to the ocean that may affect human lives and infrastructure over different spatial and temporal scales, and to help societies to adapt to those changes.

4. Ocean research and observation activities cover a wide range of interests, sectors, users and uses, and disciplines. All of these activities are of great importance in reaching the goal embedded in the United Nations Convention on the Law of the Sea to promote the equitable and efficient utilization of ocean resources, the conservation of their living resources and the study, protection and preservation of the marine environment.

5. The basis for various maritime industries is strong marine science and technology capability, and the development of human resources is essential to ensuring a better understanding of marine science and technology and their potential. States need to have not only full-time researchers but also technical support staff who service the equipment, computers and ships. Enhancing the skills and the knowledge base of academics, scientists, managers, field practitioners and local communities is critical.

6. The General Assembly has consistently called upon States and international financial institutions to continue to strengthen capacity-building activities in the field of marine scientific research by, inter alia, training personnel to develop and enhance relevant expertise, providing the necessary equipment, facilities and vessels and transferring environmentally sound technologies.[2]

7. Part XIII of the United Nations Convention on the Law of the Sea provides the legal framework for the conduct of marine scientific research. Under the Convention, States and competent international organizations are required to promote and facilitate the development and conduct of marine scientific research, as well as to promote international cooperation in such research. The Convention also provides for the obligation to make available by publication and dissemination information on proposed major programmes and their objectives as well as knowledge resulting from marine scientific research.

8. Transfer of marine technology is often considered as a tool to support capacity-building. Under part XIV of the Convention, States are required to cooperate in accordance with their capabilities to promote actively the development and transfer of marine science and marine technology on fair and reasonable terms and conditions. In addition to the 2030 Agenda for Sustainable Development, the need to facilitate the transfer of marine technology in order for countries to achieve sustainable use of the oceans and seas and their resources is also recognized in a number of international instruments related to sustainable development.[3]

[2] See, for example, General Assembly resolutions 61/222, 62/215, 63/111 and 64/71.

[3] These include the outcome document of the United Nations Conference on Sustainable Development, held in Rio de Janeiro, Brazil, from 20 to 22 June 2012, entitled “The future we want” (para. 160); the SIDS Accelerated Modalities of Action (SAMOA) Pathway (para. 58 (f)); and the annual General Assembly resolutions on oceans and the law of the sea. The transfer of marine technology is also part of the package of issues currently being discussed by the preparatory committee established pursuant to General Assembly resolution 69/292, on the development of an international legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction.

II. Status and trends

9. For the purpose of the dialogue, activities in relation to target 14.a of the Sustainable Development Goals can be classified into the following three clusters: (a) observation systems and knowledge base; (b) capacity-building; and (c) transfer of marine technology.

Observation systems and knowledge base

10. Key global activities in marine scientific research include the development of a permanent infrastructure to observe the ocean under the Global Ocean Observing System, the mandate of which has been expanded to include observation requirements for ocean health; the technical coordination of the established elements of the Global Ocean Observing System provided by the Joint Technical Commission for Oceanography and Marine Meteorology of the World Meteorological Organization (WMO) and the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO);[4] the integration of observations from multiple platforms through the WMO Integrated Global Observing System and the development of its 2040 vision for space- and surface-based observing systems; the development of ocean biological data repositories under the Ocean Biogeographic Information System; the global Earth system science approach under the World Climate Research Programme; projects of Future Earth (including the Integrated Marine Biosphere Research project); and global efforts to synthesize ocean research results into assessments of the state of the oceans under the Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects, the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection and the special report of the Intergovernmental Panel on Climate Change on the ocean and cryosphere, the outline for which was recently approved. A long-term research effort in support of decision-making was represented by the decade-long Census of Marine Life, a partnership of 2,700 scientists from more than 80 States, the results of which were published in October 2010.

11. Several States have developed marine policies that encompass marine science and technology plans and strategies for building human and technical capacity in the area of ocean affairs and the law of the sea. A number of developing countries have also established specific infrastructure regarding marine science and technology, although they are at different levels of development.

12. Most States and relevant organizations have established institutional infrastructure to carry out specific activities or programmes related to marine science, such as oceanographic institutes. They may be national, regional or international in scope and influence. The Intergovernmental Oceanographic Commission is an intergovernmental cooperation mechanism on ocean sciences. Established in 1960, as at 11 February 2016 the Commission had 148 member States, representing 75 per cent of all independent States, but not all the parties to the United Nations Convention on the Law of the Sea.

13. United Nations entities are carrying out activities in relation to target 14.a of the Sustainable Development Goals, including strengthening the knowledge base on and implementing ecosystem approaches and maintaining information systems covering

[4] The Joint Technical Commission for Oceanography and Marine Meteorology is an intergovernmental body of technical experts that provides a mechanism for the international coordination of oceanographical and marine meteorological observation, data management and services through combining the expertise, technologies and capacity-building capabilities of the meteorological and oceanographical communities.

relevant scientific fields. One mechanism for tracking scientific knowledge and technology transfer is the Global Ocean Science Report of the Intergovernmental Oceanographic Commission, which will be issued in time for the Ocean Conference.

14. The Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects, is the global mechanism for reviewing the state of the marine environment on a continual and systematic basis by providing regular assessments at the global and supraregional levels and an integrated view of environmental, economic and social aspects. The first global integrated marine assessment, which was the outcome of the first cycle of the Regular Process, is the first comprehensive report on the state of the world's oceans and knowledge about them, and supports the implementation of the 2030 Agenda. That and future assessments will play a decisive supporting role in ocean-related intergovernmental processes.

15. Another important role carried out by United Nations entities is to assure and promote the sustainability of observing systems, as most observing efforts are funded by research activities and programmes that are limited in time. Long-term, sustained and consistent ocean data series are required to address research needs and operational applications.

16. Efforts are also being made to extend observations to the deep ocean, allowing for the long-term (decadal and beyond) changes affecting the oceans and climate to be addressed, and thereby contributing to assessment reports of the Intergovernmental Panel on Climate Change.

17. Efforts are also ongoing at the regional level to strengthen the science-policy interface. In the Mediterranean region, the Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and the General Fisheries Commission for the Mediterranean of the Food and Agriculture Organization of the United Nations (FAO) have both adopted their own strategies to accelerate progress towards the implementation of Sustainable Development Goal 14. Their midterm strategies include goals to strengthen the science-policy interface and citizens' understanding of marine and coastal issues.

18. Furthermore, with the support of the European Union, a specific science-policy interface and related process was established under the auspices of the Barcelona Convention to address science-policy interface needs for the regional implementation of the ecosystem approach.

Capacity-building

19. Several States provide training to developing countries in relation to a range of issues, including fisheries research; stock assessment; fisheries statistics; implementation of an ecosystem approach to management; data collection, handling and analysis; monitoring, control and surveillance; and underwater cultural heritage research and protection. Such assistance also involves institutional strengthening and technology transfer of mitigation devices for the protection of marine biodiversity.

20. The work of the Global Environment Facility on large marine ecosystems contributes to building technical and institutional capacity for the assessment and transboundary management of shared resources. The capacity-building strategy and programme of the Intergovernmental Oceanographic Commission is aimed at assisting States in developing and sustaining capacity in ocean sciences, observation and services. This includes the establishment of regional training centres through the Ocean Teacher Global Academy and other subregional bodies of the Commission. The International Seabed Authority has three active training streams, namely the Endowment Fund, through which it supports the participation of qualified researchers

from developing countries in cooperative research on the international seabed area; the Contractors training programme, through which personnel from developing States are provided with appropriate operational expertise, including at-sea training; and the internship programme. In addition, several ocean literacy networks are aimed at raising the awareness of citizens on how the ocean influences people and how people influence the ocean. These include the European Marine Science Educators Association and the Consortium for Ocean Science Exploration and Engagement. Moreover, under the Convention on the Protection of the Underwater Cultural Heritage, UNESCO organizes training in underwater archaeology and is supported by a university network comprising some 20 institutions. The Intergovernmental Oceanographic Commission and the Division for Ocean Affairs and the Law of the Sea of the Office of Legal Affairs of the Secretariat, in partnership with the Korea Maritime Institute, have developed a training course on marine scientific research under the United Nations Convention on the Law of the Sea, which is aimed at providing government officials with the knowledge required to conduct marine scientific research in accordance with the Convention.

Transfer of marine technology

21. The transfer of marine technology occurs on a regular basis through bilateral cooperation among States and through United Nations entities and international organizations such as the Intergovernmental Oceanographic Commission, the International Maritime Organization, FAO and the International Seabed Authority. Universities and research institutions also regularly undertake both capacity-building and technology transfer as part of their research activities in developing countries. The Criteria and Guidelines on the Transfer of Marine Technology of the Commission, which are mentioned specifically in target 14.a of the Sustainable Development Goals, constitute a reference document on the matter.

III. Challenges and opportunities

22. The ocean is still one of the least known areas of the world. Understanding of the processes that are taking place is currently not keeping pace with changes in the oceans. There is a need to better understand ecosystem processes and functions and their implications for ecosystem conservation and restoration, ecological limits, tipping points, socioecological resilience and ecosystem services. In particular, the effects of cumulative and socioeconomic impacts on biodiversity and ocean productivity are often not understood well enough for suitable political and business decisions to be made.

23. There are major knowledge gaps relating to many aspects of integrated coastal zone management. Many coastal areas are experiencing rising sea levels and extreme weather events that are causing widespread loss of life and the extensive destruction of infrastructure, settlements and facilities that support human livelihoods and existence. Therefore, there is a need to improve observation, coastal bathymetric data, the modelling and forecasting of extreme weather events and the development of multi-hazard early warning systems and risk management strategies that are embedded in integrated coastal management approaches. There is also a gap in terms of understanding species and the diversity of marine resources. Data and knowledge gaps exist with respect to pollution, including all aspects of the life cycle of marine debris, plastics and microplastics, heavy metals and other hazardous substances. The precise scope of the impact of acidification on the marine environment remains unclear, particularly in the polar regions. Further research is needed on ocean acidification, in particular in terms of observation and measurement, and increased scientific activity is required to better understand the

effects of climate change on the marine environment and marine biodiversity. There is still limited scientific understanding of the effectiveness and impact of conservation measures, including with regard to their socioeconomic benefits and how marine- and land-based human activities impact their effectiveness. The majority of underwater cultural heritage sites remain uncatalogued and unresearched, and therefore unprotected. The limited amount of scientific knowledge about areas beyond national jurisdiction means that the extent of impact and the productivity limits and recovery time of ecosystems and biodiversity in those areas cannot be easily predicted.

24. Ocean science needs to apply a holistic approach to understanding and addressing the cumulative impacts of threats such as climate change, acidification, pollution, coastal erosion and overfishing. There are opportunities for enhanced multidisciplinary and transdisciplinary research on oceans, with natural and social scientists working together with holders of relevant traditional knowledge to better understand the nature of the complex interactions between humans and marine and coastal ecosystems. Comprehensive databases, at the country and the regional levels, are required. Leading research institutions within each region should seek to work collaboratively and to ensure that research efforts are not duplicated and that limited resources are efficiently utilized.

Observation systems and knowledge base

25. The sustained ocean observing system of today has been developed over the last 20 to 30 years and represents an impressive achievement. However, it is largely funded through short-term research budgets. There is a need to strengthen and diversify support for sustained observations by, inter alia, ensuring that users clearly express and advocate for the need for sustained observations as the foundation of the required information.

26. Technology development in autonomous platforms, communications and sensors provides a tremendous opportunity, increasing the ability to measure more of the oceans (such as deep ocean and under the ice), measure more variables (chemistry and biology) more cost-effectively and deliver data more quickly. The Joint Technical Commission for Oceanography and Marine Meteorology is developing a strategy for the roll-out of new technologies across the observing networks.

27. The reliability of long-term climate change predictions in the Arctic and Antarctic is severely limited by the lack of systematic in-situ observations of and beneath the sea ice. For example, changes in the cryosphere in the oceans, and sea ice in particular, have a substantial impact on climate. It is critical to be able to understand and predict such changes on various timescales in order to support human activities in polar regions (e.g. maritime safety, navigation aids). Various United Nations entities, international organizations and actors are playing a role with regard to observations in polar regions, and there is a need to strengthen collaboration between them, establish partnerships and better integrate and sustain such activities in order to better address research and operational requirements.

28. Although the monitoring of the oceans is carried out under various programmes, the protocols used tend to be different, preventing comparisons and the harmonization of data. Efforts under the Joint Technical Commission for Oceanography and Marine Meteorology are aimed at evaluating the standards and best practices (from sensor calibration to data delivery) used across the observing networks, in order to ensure that data can be delivered using a variable of known quality. The existing monitoring and assessment practices of regional sea conventions already provide a key knowledge base on the status of the marine (and

coastal) environment, which could be further built on and should be the basis of further harmonization at the national, regional and international levels.

29. Ocean research or related services and the acquisition of sufficient credible scientific data and information are still weak in many countries because of their high cost. National ocean research policies to support sustainable development plans are rare. The establishment of the Regular Process has improved the science-policy interface at the global level and it is hoped that it will also contribute to enhancing it at the regional and national levels. However, gaps remain in the ability to integrate the results of scientific research into policy development.

30. In many countries, higher education is heavily dependent on the type and expertise of guest researchers. Technical education in marine-related fields is often non-existent or inadequate. Infrastructure for marine research is often weak, inadequate or in need of upgrading. There is often an overdependence on project-oriented, short-term international support.

31. Developing countries have expressed the need for the availability of data and information that are reliable and accessible through appropriate data centres, such as those of the International Oceanographic Data and Information Exchange of the Intergovernmental Oceanographic Commission. The international exchange of climate-relevant data, such as coastal interface data, in particular on sea levels, waves and storm surges, is also critical for the delivery of climate services and management.

32. It has been noted that inadequate scientific support systems prevent the full participation of small island developing States in global ocean science programmes.

33. There is a need to undertake marine scientific research and develop the associated technological capacity of small island developing States, including through the establishment of dedicated national and regional marine scientific and technological centres, in accordance with part XIV of the United Nations Convention on the Law of the Sea and the provision of technical assistance.

34. Finally, there is a gap in the collective capacity to effectively measure progress in many areas of Sustainable Development Goal 14. Although indicators have been developed for all targets under the Goal, gathering data on many of those indicators is a challenge. Currently, the Global Sustainable Development Goal Indicators Database[5] contains information on only two indicators for targets under Goal 14, namely indicators 14.4.1 and 14.5.1.[6] To date, no global database containing information related to indicator 14.a.1 exists. While general information on investments toward research and development is available, the multidisciplinary character of ocean science and marine technology transfer makes it difficult to classify.

35. Opportunities in relation to ocean research and education include the following: (a) strengthening the human resources and infrastructure of universities and technical institutions; (b) continuing the education of locally available capacity through involvement in capacity-building activities; (c) supporting measures to retain existing capacity in marine sectors; (d) promoting the establishment of consortiums of higher education on the appropriate geographical scale; (e) establishing and maintaining a register of infrastructure open to international cooperation to facilitate access for developing countries; (f) promoting further scientific research in the area beyond

[5] The report will contain a summary of information about the status of ocean research, investment in research infrastructure and human capacity, as well as potential gaps in marine sciences programmes in need of further investment. The Inter-Agency and Expert Group on Sustainable Development Goal Indicators agreed that parts of the report would be used to monitor the indicator for target 14.a of the Goals.

[6] http://unstats.un.org/sdgs/indicators/database.

national jurisdiction to fill data gaps and enhance understanding; (g) promoting the development of public information (communications) departments in ocean research institutions; (h) fostering the development of ocean literacy programmes as communities of practice to share experience within and across regions; and (i) promoting and assisting with the development of alumni scientific networks. In addition, countries could consider establishing ocean science advisory bodies at the national level in order to strengthen the science-policy interface.

Capacity-building

36. Gaps in capacity-building hamper the efforts of less developed countries to take advantage of what the ocean can offer them and reduce their capability to address the factors that degrade the ocean. Although many international training initiatives on marine sciences exist, no comprehensive global catalogue of such efforts exists to date.

37. In the follow-up to the United Nations Conference on Sustainable Development, the Intergovernmental Oceanographic Commission conducted a baseline study to assess national capacities and needs in marine research, observation and data and information management.[7] The assessment showed that requirements and priorities for capacity-building varied from region to region, and that capacity-building interventions needed to adapt to regional priorities. The first global integrated marine assessment identified the following common capacity-building needs in relation to marine research across regions: (a) data accessibility and data-sharing; (b) mentoring and training opportunities for less experienced scientists and practitioners; (c) data collection and marine habitat mapping to inform the management of ecosystems, biodiversity and fisheries; (d) improving professional capacities to assess socioeconomic issues; and (e) countering the lack of capacity to conduct integrated and ecosystem services assessments.

38. Training and retaining staff in small Pacific countries is a critical need. Brain drain is a concern in many developing countries, with trained staff often leaving to take international positions. This challenge can be addressed by making changes to the support provided to staff, the working culture and the quality of staff positions available, in order to attract and maintain national staff.

39. Efforts to build capacity in developing countries must be intensified, in particular in the least developed countries and small island developing States, as well as coastal African countries.

40. Opportunities include the following: (a) establishing a global mechanism for reporting on training and capacity-building activities in ocean science, hence facilitating access to scientists; (b) providing technical support for the development of national ocean research plans in accordance with national development plans and ocean policy processes; (c) exploring the possibility of creating regional training centres in new regions, especially to address the issues faced by small island developing States; and (d) seeking support from Member States with ship capabilities for ship time and exploring ship-sharing mechanisms. Capacity-building efforts in marine sciences, including training programmes, need to take a long-term perspective. In addition to providing traditional capacity-building assistance through North-South cooperation, South-South cooperation can be used to foster capacity-building partnerships and to develop initiatives to systematically take advantage of the pool of expatriated national experts for capacity-building activities.

41. In its resolution 71/251, the General Assembly decided to establish the Technology Bank for the Least Developed Countries, to strengthen those countries'

[7] Document IOC/INF-1313.

science, technology and innovation capacities, foster the development of national and regional innovation ecosystems and generate home-grown research.

Transfer of marine technology

42. In spite of its importance, as reflected in the United Nations Convention on the Law of the Sea and many international documents, the transfer of marine technology seems to be insufficiently monitored. Most developing States are inadequately equipped to be able to fully benefit from ocean activities and resources and to deal with impacts on the marine environment. They continue to express the need for the development of technology, its transfer and technical assistance. Furthermore, most developing States are inadequately equipped to deal with the environmental impacts of ocean use.

43. For a number of countries, in particular small island developing States, oceans represent a potential for building strong, innovative and resilient economies. Identifying context-specific options for ocean-based economic activities and incorporating them into coherent science and technology roadmaps that support national development strategies will be critical to those efforts. In that context, it is intended that the Technology Bank for the Least Developed Countries will promote and facilitate the identification, utilization and access of appropriate technologies, as well as their transfer to the least developed countries, while respecting intellectual property rights and fostering the national and regional capacity of the least developed countries for the effective utilization of technology to bring about transformative change.

44. States have been encouraged to make further use of the Criteria and Guidelines on the Transfer of Marine Technology of the Intergovernmental Oceanographic Commission. It was noted that trade can be an important tool to facilitate and accelerate the dissemination of environmental technologies around the world, including those that contribute to ocean health and the conservation of marine resources.

IV. Existing partnerships

45. A great number of partnerships cover various aspects of target 14.a of the Sustainable Development Goals, with some of them covering multiple targets of Goal 14.[8] Those partnerships involve a range of stakeholders and modalities. Stakeholders include States, intergovernmental organizations, international and national non-governmental organizations, scientific institutions, networks and projects, foundations and other private entities. United Nations organizations are involved in many partnerships, often in relation to one of their core mandates. Some partnerships contribute to the science-policy interface.

46. Beyond the global observation systems mentioned above, examples of partnerships identified in the submissions for the Ocean Conference included the Partnership for Observation of the Global Oceans; the Argo Program, which comprises a broad-scale global array of temperature- and salinity-profiling floats; FAO partnerships with Google and Global Fishing Watch; the Pacific Islands Universities Research Network; the Pacific Islands Global Ocean Observing System; the Division for Ocean Affairs and the Law of the Sea, Intergovernmental Oceanographic Commission and Korea Maritime Institute training course on the conduct of marine scientific research under the United Nations Convention on the

[8] See https://sustainabledevelopment.un.org/partnerships/goal14/ for a list of partnerships identified in the preparatory work for the Ocean Conference.

Law of the Sea; and the Global Universities Partnership on Environment and Sustainability. The European Union Horizon 2020-funded Project BlueBRIDGE and the iMarine initiative offer a framework for future partnership development to address gaps. The secretariat of the Convention on Biological Diversity coordinates the Sustainable Ocean Initiative, a global capacity-building partnership that supports the achievement of the Aichi Biodiversity Targets and relevant Sustainable Development Goals.

47. To promote observations in polar regions, the World Climate Research Programme and the Prince Albert II of Monaco Foundation are promoting, together with other co-sponsors, the Polar Challenge. A reward will be given to the first team to complete a 2,000-km continuous mission under the Arctic or Antarctic sea ice using an autonomous underwater vehicle.

48. The relatively large number of partnerships addressing science and technology issues in relation to oceans may conceal limited effectiveness, lack of resources, fragmentation and duplication. More work is needed to assess their impact as a whole, as well as their impact on individual countries or groups of countries.

49. The Technology Facilitation Mechanism, set up pursuant to the 2030 Agenda, seeks to advance knowledge-sharing and multi-stakeholder collaborations through which science, technology and innovation can accelerate progress towards achieving the Sustainable Development Goals. As a component of the Mechanism, the annual Science, Technology and Innovation Forum provides opportunities to take those collaborations forward with regard to Goal 14. Its online platform, currently in development, will also facilitate such exchanges in the future.

V. Possible areas for new partnerships

50. Submissions made as part of the preparations for the Ocean Conference in terms of areas for new partnerships included the following:

(a) New partnerships could focus on capacity-building activities, in particular in developing countries, in the field of marine scientific research, as well as on transfer of marine technology;

(b) Strategic partnerships between United Nations entities and universities and research institutes could add value by filling existing capacity gaps. Partnerships could be developed with the Intergovernmental Oceanographic Commission, the United Nations Environment Programme, large marine ecosystem programmes, local and international reference universities and regional marine science associations;

(c) Regional or subregional centres could be used as hubs to deliver a suite of activities covering the whole spectrum of needs for marine scientific research in relation to Sustainable Development Goal 14 and associated capacity-building;

(d) Under the auspices of the Intergovernmental Oceanographic Commission and the International Hydrographic Organization, the General Bathymetric Chart of the Oceans is planning to launch “Seabed 2030: a roadmap for future ocean floor mapping”;

(e) Through its member States, the Intergovernmental Oceanographic Commission is considering launching a long-term international ocean science initiative to support the implementation of the 2030 Agenda. Building on the capacity needs identified in the Global Ocean Science Report, a dedicated capacity development fund would be established to facilitate the transfer of technology and

the development of ocean research infrastructure in developing countries, especially small island developing States and the least developed countries;

(f) Country experts could be trained and supported by cross-boundary learning experiences, such as internships or training fellowships, to support implementation;

(g) National ocean advisory councils, with national and regional mentoring support, could support national coastal and marine management and progress towards achieving Goal 14;

(h) The creation of a Pacific ocean research alliance, supporting the policy and sectoral approaches of the Pacific Ocean Alliance and the Marine Sector Working Group of the secretariat of the Pacific Regional Environment Programme;

(i) Partnerships to train and retain staff in small Pacific countries;

(j) Developing a dedicated segment on ocean-related science and technology under the technology facilitation mechanism that Member States decided, in the Addis Ababa Action Agenda of the Third International Conference on Financing for Development, to establish, while avoiding duplication with other existing mechanisms in that area;

(k) A new partnership, building on existing efforts, for the enhancement of a global El Niño information system to enable scientists to better predict the El Niño/Southern Oscillation and other ocean oscillations;

(l) Strengthening maritime and coastal safety services, in particular for small island developing States and the least developed countries (including early warning of coastal inundation, optimization of search and rescue and environmental emergencies and operations, and investigation of cost recovery mechanisms for marine services).

VI. Guiding questions for the dialogue

51. The following questions could be considered during the dialogue:

(a) How can partnerships help the international community enhance scientific understanding of the functioning of the ocean and its interactions with human systems?

(b) How can it be ensured that capacity-building and technology transfer meet the identified needs of developing countries in the long term, moving away from project-based funding and externally identified priorities?

(c) Do technological developments (autonomous platforms, new sensors) and new observing frontiers (deep ocean, under ice) represent opportunities to bring in new partners to sustained observations? What types of partnerships could be put in place to encourage and better monitor the transfer of marine technologies to developing countries?

(d) What partnerships are needed to create science and technology roadmaps that support strong, innovative and resilient ocean-based economies in small island developing States?