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European Union and its Member States contribution for the 2019 United Nations Informal Consultative Process on Oceans and the Law of the Sea “Ocean Science and the United Nations Decade of Ocean Science for Sustainable Development”

European Union

The global community has increasingly recognised the role and importance of oceans for sustainable development for a global population projected to surpass nine billion by 2050¹. Concomitantly, many countries are increasingly promoting a sustainable blue economy that can boost growth, jobs and innovation while ensuring conservation of biodiversity and environmental sustainability. It has been estimated that the output of the global ocean economy is around 1.3 trillion euros and could more than double by 2030² thus potentially contributing to global sustainable development objectives and particularly the eradication of extreme poverty. Consequently, specific commitments have been adopted as outcomes of sustainable development fora to protect and restore oceans and marine ecosystems, and to manage ocean resources sustainably, in accordance with international law, to deliver on all three dimensions of sustainable development in order to ensure their conservation and sustainable use for present and future generations.

The EU considers that in order to move successfully to such a sustainable blue economy, it will be necessary to reduce pressures on oceans and strengthen our knowledge and understanding of oceans and ecosystem functions and connectivity, as well as of the impacts of different human activities and pressures, including cumulative impacts. This knowledge should underpin measures to sustainably manage, protect and restore marine and coastal ecosystems and prevent further degradation, in a context of an improved and responsible ocean governance framework. In this regard, technological advances and improved marine research will be required, including to sustainably unlock the unexploited economic potential of oceans and seas, to provide for food and other resources without increasing pressures on them, as well as to contribute to the alleviation of pressure on land, freshwater and ocean resources, and also to enhance understanding of the role of ocean in climate change and in greenhouse gas exchanges, in order to prevent and mitigate negative effects. This will however necessitate considerable investment in highly skilled human resources, assets and

¹<https://www.un.org/development/desa/en/news/population/world-population-prospects-2017.html>

²The ocean economy in 2030, OECD Publishing, Paris (2016)

equipment. Maximum benefit can be provided to society if knowledge and data are shared. We also consider that it is equally important to improve access to existing knowledge as well as fill marine data gaps.

In view of the above, the European Union and its Member States would like to reiterate their support for the decision taken by the United Nations General Assembly to proclaim the United Nations Decade of Ocean Science for Sustainable Development for the 10-year period beginning on 1 January 2021. We also welcome the opportunity offered by the twentieth meeting of the UN Informal Consultative Process to provide input into the preparations for the Decade of Ocean Science.

The EU and its Member States are actively involved in the negotiations on a new 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 in areas beyond national jurisdiction; one of the core principles of this instrument should be the use of the science-based approach **in order to ensure that adopted measures are also based on the best-available science**. The European Union remains fully committed to the achievement of oceans-related objectives, particularly those of SDG 14 of the UN's 2030 Sustainable Development Agenda. It has outlined its vision in different documents, including, in particular in the "Joint Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on International ocean governance: an agenda for the future of our oceans and strategies"³. This Communication is an integral part of the EU's response to the 2030 Agenda and contains 14 specific sets of actions in three priority areas:

- Pillar 1: improving the international ocean governance framework;
- Pillar 2: reducing pressure on oceans and seas and creating the conditions for a sustainable blue economy; and
- Pillar 3: strengthening international ocean research and data.

Some of these actions identified in this Communication, in particular but not only those under Pillar 3 (Actions 12, 13 and 14 described below), can be considered as complementary to the objectives of the UN Decade. They build on the established track record of the EU and its Member States in funding marine and maritime research and improving data availability and interoperability – the EU and its Member States spend approximately EUR 2 billion a year on marine research which include over EUR 260 million from the Horizon 2020 research and

³JOIN(2016) 49 final of 10 November 2016

innovation programme. Furthermore, these actions have been developed with the knowledge that international cooperation, including the pooling of resources, is necessary to ensure and enhance the knowledge base needed for the effective management of the oceans.

- Action 12: A coherent EU strategy on ocean observation, data and marine accounting

This action seeks to ensure reliable and accessible ocean data to underpin sustainable management of oceans as well as to promote international, regional and bilateral cooperation to integrate separate marine data holdings. Under this action, the European Maritime Observation and Data Network (EMODnet) is contributing to the General Bathymetric Chart of the Oceans (GEBCO) international effort to map sea beds while work is also underway to assess compatibility with major data platforms operated by countries such as the US, Japan and Australia. Other important initiatives include the European Seas Observatory NETWORK (ESONET) and the Network of Excellence and the European Multidisciplinary Seafloor Observatory (EMSO). Another project relates to enable ocean data cooperation between the EU and China by connecting EMODnet with the China's National Marine Data and Information Service (NMDIS). The EU has earmarked 3.5 million euro for this purpose.

Another example of action under this pillar is the work on scanning priorities for marine accounts and developing experimental marine ecosystem accounts, with some test cases such as sea-grass accounts, fish biomass accounts and seafloor integrity accounts being developed in the EU Project on Integrated Natural Capital and Ecosystem Services Accounting (KIP INCA) as well as the European Environment Agency.

From a global perspective, the Commission aims to support open access and interoperability of data, for example in the context of the Group on Earth Observations/ Global Earth Observation System of Systems (GEO/GEOSS) and the European Global Ocean Observing System (EuroGOOS) (involving also the Copernicus Marine Service). It is also actively involved in the G7 initiative Future of the Seas and Oceans.

- Action 13: Strengthening investment in 'blue' science and innovation

In line with the European Cloud initiative Communication⁴, the EU is developing a pilot Blue Cloud, as part of the European Open Science Cloud. Through its Horizon 2020 program, the EU has provided funding for the SeaDataCloud⁵ project as well as Innovation Booster for its Blue Cloud Pilot initiative. The EU will also support research for oceans observations and

⁴<https://ec.europa.eu/digital-single-market/en/news/communication-european-cloud-initiative-building-competitive-data-and-knowledge-economy-europe>

⁵<https://www.seadatanet.org/About-us/SeaDataCloud>

forecasting which will federate existing scientific clouds and research infrastructures and support the development of cloud-based services, thus bringing all the advantages of this new technology to scientists.

In addition, the EU has been working with G7 partners to advance action plans for global action on ocean observation including on integrated ocean observing systems on the Atlantic, the Mediterranean and the Arctic. In 2017, the EU provided EUR 10 million to finance several research infrastructure projects (such as ARICE - Arctic Research Icebreaker Consortium: A strategy for meeting the needs for marine-based research in the Arctic⁶ - and EUMarineRobots⁷).

- Action 14: International ocean research, innovation and science partnerships

Cooperation on marine research and innovation aims to contribute to tackle the challenges linked to the Atlantic Ocean, including ocean observation, food security, polar research and climate variability. The EU pursued the implementation of activities under the All Atlantic Ocean Research Alliance initiated with the signature of the Galway Statement on Atlantic Ocean Cooperation in 2013 with the United States and Canada, which is widely recognised as a model of international cooperation and science diplomacy having gained a lot of momentum in the last years. This triggered the interest of the countries bordering the South Atlantic, paving the way for a more ambitious cooperation addressing the challenges of the Atlantic as a whole, culminating in the signing of the Belém Statement on Atlantic Research and Innovation Cooperation in 2017 with Brazil and South Africa. Furthermore, in 2018, the European Commission signed bilateral Administrative Arrangements on Marine Research and Innovation Cooperation with Argentina and the Republic of Cabo Verde. This will further expand the work on the All Atlantic Ocean Research Alliance.

The EU has allocated over EUR 60 million for the period 2018-2019 through Horizon 2020 to support this cooperation. In parallel, the EU supported the development of the South-South Science Plan under the leadership of Brazil and South Africa.

In addition, an Atlantic Seabed Mapping International Working Group was established under the Galway Statement to help coordinate mapping activities of the three partners, which includes ship-time and data sharing, which identifies the steps required to implement a seabed mapping strategy for mapping in the Atlantic Ocean. The Working Group has undertaken six international transatlantic seabed mapping surveys using the latest technologies. Ground-

⁶<http://www.europeanpolarboard.org/activities/scientific-initiatives/arice/>

⁷<https://www.eumarinerobots.eu/>

breaking discoveries, including previously uncharted undersea volcanoes and mountains, have been made.

In the context of the Mediterranean region, the EU is working with EU and non-EU member countries through the EU-MED GSO BLUEMED WG on the BLUEMED initiative that aims at fostering marine research and innovation cooperation for a healthy, productive and resilient Mediterranean Sea. The EU supports this initiative through Horizon 2020 with over EUR 50 million. In addition, the EU also financially supports actions in the Black Sea, specifically, the General Fisheries Commission for the Mediterranean's (GFCM) scientific project (BlackSea4Fish) which seeks to enhance data collection and scientific evaluation in Black Sea as well as the development of the Aquaculture Demonstrative Centre in the Black Sea.

Advancing ocean science and identifying gaps in knowledge and ocean science

The EU's Marine Strategy Framework Directive⁸ aims to achieve Good Environmental Status (GES) of the EU's marine waters by 2020 and to protect the marine biodiversity and the resource base upon which marine-related economic and social activities depend. Its objective is to ensure that Europe's seas are clean, healthy and productive by addressing the cumulative impacts of anthropogenic pressures on the marine environment. It promotes a holistic ecosystem-based approach to management of the oceans and plays a key role in the EU's Integrated Maritime Policy, representing its environmental pillar. It also requires that EU Member States, when devising and implementing their marine strategies, work regionally (four EU regions: Baltic Sea, North-east Atlantic Ocean, Mediterranean Sea, Black Sea) or subregionally (NE Atlantic and Mediterranean are divided into four subregions each). The Directive is already helping to improve our understanding of the marine environment in the EU and the state it is in.

The seas are however vast ecosystems, with complex interactions, which can be hard to reach and monitor. Globally, most of the oceans remain to be mapped and their biodiversity or ecosystem functions remain to be identified. Very little is known about the deep sea. Lack of data and resources is still an important issue in addressing conservation and sustainable use of oceans and seas. The development of new technologies and observing systems is required to monitor human impacts on the marine environment, in particular related to eutrophication, seabed integrity, non-indigenous species, underwater noise and other energy sources, fisheries, and pollution from contaminants and litter. This pressure-impact relationship and the development of indicators is where the science-policy interface is of high importance.

⁸Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)

The degradation of our seas is particularly acute in marine coastal habitats, where the effects of multiple anthropogenic pressures are causing widespread loss of critical marine coastal habitats, which is projected to increase with climate change. Due to their role in supporting biodiversity and food webs, their loss is in turn leading to a decrease in critical ecosystem services, such as fisheries and natural coastal defences, and a reduction in the capacity of oceans to sequester carbon dioxide and help mitigate climate change, current abatement and others. Consequently, further knowledge and best practice are urgently required to stimulate active restoration, as well as developing strategies to return ecosystems to a healthy state within reasonable timeframes.

As a part of the cooperation of the EU and the European Regional Sea Conventions (RSCs), regional quality status reports of the marine waters around Europe have been developed by these RSCs. These reports are an important contribution to the World Ocean Assessment and may contribute to the Oceans' Chapter of Global Sustainable Development Report.

The work on monitoring and assessments coordinated in regional fora may give an important input for follow-up and review of progress towards ocean-related Agenda 2030 and SDG 14.

Strengthening ocean science in developing countries

According to the first World Ocean Assessment, the main capacity needs were crosscutting issues among the regions, in particular:

- (i) Data accessibility and data sharing;
- (ii) The provisions for mentoring and training opportunities for less experienced scientists and practitioners;
- (iii) Data collection and marine habitat mapping to inform management of ecosystems, biodiversity and fisheries;
- (iv) Improvement of professional capacities to assess socioeconomic issues; and
- (v) Capacity to conduct integrated and ecosystem-services assessments.

Examples of EU projects involving a capacity building and science-policy interface dimensions include:

- As part of its thematic programme on **Global Public Goods and Challenges**⁹ (GPGC), which aims to contribute to the solution of global problems through global development outcomes that will be inclusive and sustainable within planetary boundaries, the EU is financing two important projects that seek to contribute to enhancing the science-policy interface in collaboration with partner developing countries:

⁹https://ec.europa.eu/europeaid/sites/devco/files/mip-gpgc-2014-2017-annex_en.pdf

1) Ecosystem-Based Approach for the Mediterranean facilitating development of monitoring programmes, regional data management and creating science-policy interface in that effort¹⁰; and

2) Supporting enhanced implementation of the Strategic Plan for Biodiversity 2011-2020 assisting the Convention on Biological Diversity and its contracting parties to achieve the Aichi Biodiversity Targets 6, 10 and 11. Specifically, since 2014, the EU has supported CBD Secretariat programmes of work (including the Nagoya and Cartagena Protocols) with about €5 million for the biennium 2015-2016 and 2017-2018, including in support of capacity building on marine biodiversity, in particular for the EBSAs workshops.

- **Copernicus Marine Environment Monitoring Service (CMEMS)**

The EU Space Strategy has recalled the need for the sustainability and continuity of the Copernicus earth observation programme including all required satellite capacity supporting the Copernicus marine service for ocean observation and forecasting and the climate service.

The European Union has invested EUR 23 million in its Copernicus marine environment monitoring service in 2017 and 2018. It provides information services for climate change and seasonal forecasts, coastal and environmental monitoring, marine resources management (including fisheries and energy) and maritime safety, and for the first time, includes Ocean Monitoring Indicators, including on biochemistry, which are important for measuring ocean health and long-term trends. These have been published in the Ocean State Report¹¹.

The Copernicus Marine Service provides support to a variety of policies and initiatives, including the Global Climate Observing System (GCOS) implementation plan, the G7 'Future of the Seas and Oceans' initiative and the 2030 Agenda, including SDG14. With a view to strengthen international data cooperation and exchange, the Copernicus programme has signed cooperation arrangements with Brazil, Chile, Columbia, India, Serbia, Ukraine and the African Union in 2018 to encourage the use of Copernicus data and the internationalisation of European Earth Observation companies. Furthermore, the European Union launched four regional projects worth EUR 8 million under its satellite monitoring programme (Copernicus)¹² in Africa in February 2018. The projects, bringing together 18 African countries and the African Union with EU support, aim to develop services related to fisheries and aquaculture, coastal vulnerability and risk management, coastal ecosystems

¹⁰http://www.rac-spa.org/ecapmed_ii

¹¹<http://marine.copernicus.eu/2nd-ocean-state-report-available/>

¹²<https://www.copernicus.eu/en/services/marine>

monitoring, ship traffic monitoring and the development of regional ocean forecast centres in Africa and the Indian Ocean.

- **Atlantic Ocean Tuna Tagging programme**¹³ - **AOTTP** (EU contribution: EUR13 Million)

The AOTTP of the International Commission for the Conservation of Atlantic Tunas (ICCAT) aims at providing evidence-based scientific advice to developing coastal states and other ICCAT Contracting Parties to support the adoption of effective conservation and management measures. Tuna tagging activities at sea began in June 2016 in the territorial waters of the Azores. More than 96 000 tropical tuna (about 80 % of the project target) have already been tagged and released and more than 14 000 have been recovered. The data collected through the tuna tagging (tuna fish growth, mortality and migration patterns) will be used to support stock assessments, research and the future sustainable management of tropical tuna. Scientists and technicians from developing countries, both men and women, have been involved in tagging (36 persons trained) and recovery activities (50 persons trained). New capacity building activities will be organised by ICCAT to train scientists from developing countries in data analysis and modelling.

- **PEUMP – Pacific EU Maritime Programme**¹⁴ (EU and Sweden contribution: EUR 45 Million)

The PEUMP programme supports sustainable management and development of fisheries for food security and economic growth, while addressing climate change resilience and conservation of marine biodiversity. The programme brings three regional agencies — the Secretariat of the Pacific Community (SPC), Fisheries Forum Agency (FFA) and Secretariat of the Pacific Regional Environment Programme (SPREP) — together with the University of the South Pacific (USP) and several non-government organisations. Activities are conducted at regional, national and local levels and cover both oceanic tuna fisheries and coastal fisheries.

A specific component of PEUMP consists in supporting the USP in education, vocational training and research in the field of marine sciences. Other components will also support research on the state of the stocks, both oceanic and coastal.

¹³<https://www.iccat.int/aottp/en/index.html>

¹⁴<https://www.ffa.int/node/2105>

- **PESCAO - Improved Regional Fisheries Governance in Western Africa**¹⁵ (EU contribution: EUR 15 Million)

The PESCAO programme aims at improving regional fisheries governance in Western Africa through better coordination of national fisheries policies. The overall objective is to enhance the contribution of fisheries resources to sustainable development, food security and poverty alleviation in West Africa. The specific objective is to improve regional fisheries governance in the region through better coordination of national fisheries policies. Component 3 of the programme (5M EUR) will support coordinated approaches for shared fisheries management. Three projects have been selected involving Western African universities, EU research institutes and FAO. These projects should reinforce capacities and improve knowledge of pelagic and demersal stocks in Western Africa.

- In **Madagascar**, the EU is also funding the education of marine engineers at the Institute for marine science (424 000EUR). Under the **FISHERMAN** project (491 000EUR), the EU is supporting the development of a regional master programme in fisheries management in the South Western Indian Ocean.

- Furthermore, scientists from developing countries are also obtaining training in marine research and science through a number of projects funded by the Research and Innovation Programme Horizon 2020.

Emerging technologies

Challenges in applying a holistic approach towards understanding and addressing cumulative impacts of anthropogenic pressures remain and thus, multidisciplinary and transdisciplinary research on oceans is needed to address this. A long-term approach to cross-sectorial technological cooperation is required. In particular, new applications for maritime technologies in extreme environments (deep-sea, seabed, Arctic) require new material properties and functions. Such applications need to be reliable, safe, efficient, economically feasible, and environmentally friendly over their entire life cycle. Public-Private partnerships across sectors can deliver breakthroughs on a range of enabling technologies including structures, platforms, new materials, sensors and marine bionics. In relation to the Arctic, the European Commission, Finland and Germany co-hosted the second Arctic Science Ministerial on **25-26 October 2018** to increase capacity to respond to major societal

¹⁵<https://www.efca.europa.eu/en/content/pescao>

challenges in the Arctic, encourage further scientific cooperation among a large number of countries and representatives of indigenous peoples.

Deep-sea ecosystems are some of the most fragile and little understood on Earth. As a result, the knowledge needed to ensure a sustainable exploration and exploitation and to build appropriate policy frameworks is scarce. In particular, only limited areas of the seafloor have been mapped at a resolution sufficient to undertake meaningful resource assessments or exploration scenarios. A coherent and long-term monitoring and research effort is needed to support evidence-based governance of the deep-sea biological, mineral and energy resources. This should also include scientific input to technological developments to ensure sustainable exploration and exploitation. In this respect, the EU has funded through its research and innovations programme, several research projects (for example MIDAS¹⁶, EUR 12 Million) and has also earmarked EUR 1.5 million to provide the International Seabed Authority (ISA) with elements to develop a Regional Environmental Management Plan along the Mid-Atlantic Ridge¹⁷.

The biotechnology sector is estimated to have a large potential for growth and is considered an enabler to other industries. Its development will require an increasing need for developing tools and knowledge for sustainable development of marine based products.

Moving to economically viable ocean energy technologies is a huge step towards decarbonization and the growth of the blue economy in many coastal areas. As part of the European Commission's internal Low Carbon Energy Observatory (LCEO) project, the Joint Research Centre (JRC) is developing an inventory of Future Emerging Technologies relevant to energy supply. A new EU report from its Joint Research Centre, [Future emerging technologies for the ocean energy sector: innovation and game-changers](#)¹⁸, offers policy makers and all other ocean energy stakeholders an array of innovations that can bring ocean energy to the market.

Physical, chemical, biological, ecological, and geological data need to be integrated to form a holistic understanding of hazards, risks and changes in the marine environment. Ocean observations require a range of infrastructures which are expensive to develop, operate, maintain and upgrade. This calls for an overarching coordination and prioritization of research and monitoring capacities through a strategy driven by societal needs.

¹⁶<http://www.eu-midas.net/>

¹⁷C(2016) 8422 final in line with fiche 1.3.1.1.

¹⁸<https://ec.europa.eu/jrc/en/publication/workshop-identification-future-emerging-technologies-ocean-energy-sector>

The United Nations General Assembly established a Technology Bank¹⁹ to strengthen Least Developed Countries' science, technology and innovation capacities, foster development of national and regional innovation ecosystems, and generate home grown research.

Integration of traditional knowledge in ocean research

In the context of the EU's BEST initiative²⁰, the EU has funded the Pisuna project²¹ concerning traditional knowledge, which has the following objectives:

- Increase local capacity to quantify, document and manage the living resources
- Increase local involvement in natural resource management
- Increase the ability to change management as species change distribution and abundance
- Increase dialogue between fishers and hunters with scientists and the government.

Science policy interface

The [STAGES Project](#) was a Coordination and Support Action under the EU's 7th Research Framework Program (EUR 1 Million). Its aim was to improve the scientific knowledge base supporting the implementation of the Marine Strategy Framework Directive (MSFD) to help achieve a Good Environmental Status (GES) in EU marine waters by bridging the science-policy gap and improving the scientific knowledge base. This involved:

- a. Identifying, extracting and synthesizing the knowledge generated through EU and national research funded activities relating to the MSFD, and making this information widely accessible to policy makers and MSFD stakeholders.
- b. Establishing where further research needs to be conducted to improve the scientific knowledge underpinning implementation of the MSFD.
- c. Providing pragmatic and ready-to-use recommendations to establish an effective European science-policy platform to support GES research and implementation of the MSFD.

Key deliverables from this project can be found at: [Recommendations for a Science to policy interface](#)²².

¹⁹<http://unohrills.org/technologybank/>

²⁰http://ec.europa.eu/environment/nature/biodiversity/best/index_en.htm: A voluntary scheme for Biodiversity and Ecosystem Services in Territories of European overseas which aims to support the conservation of biodiversity and sustainable use of ecosystem services including ecosystem-based approaches to climate change adaptation and mitigation in the EU Outermost Regions (ORs) and Overseas Countries and Territories (OCTs)

²¹http://www.pisuna.org/uk_index.html

²²http://www.stagesproject.eu/images/STAGES/deliverables/STAGES_D4.2.pdf

Belgium

Belgium welcomes the topic for the 2019 UN Informal Consultative Process on Oceans and the Law of the Sea and wishes to share its initiatives, thus far, in conceptualizing and contributing to the Decade of Ocean Science. In particular, Belgium wishes to highlight the following activities:

- Belgium (Flanders) has contributed a comprehensive response to the survey of the Global Ocean Science Report II. Belgium (Flanders - coordinated by Flanders Marine Institute - VLIZ) is leading (together with Canada) in matters of Marine Science Reporting through the conceptual developments for its national reporting through the Compendium for Coast and Sea (www.compendiumcoastandsea.be). Belgium is actively sharing experiences and best practices in this matter with other networks, consortia, initiatives;
- Belgium (Flanders) is co-chair to the GOSR-II initiative editorial board (Dr. Jan MEES, VLIZ);
- Belgium (Flanders) has made a financial contribution for travel funding to the GOSR-II editorial board meeting May 2019;
- Belgium (Flanders) is currently identifying the areas of potential collaboration and contributions to, and actively preparing the UN Decade of Ocean Science for Sustainable Development, starting with interviews and surveys in the marine science community by VLIZ. The preliminary outcomes will be presented at its annual Marine Science Day 13 March 2019, when a wider support and input from the Marine Science community will be collected.
- Belgium (Flanders, VLIZ) is actively involved in the collaboration of Marine Science programmes and (strategic) agendas at the sea basin level: North Sea and joint North Sea and Baltic Sea collaboration (CSA BANOS) as well as at Joint Programming level (JPI –Oceans) and European level (European Marine Board, and its Flagship Publication ‘Navigating the Future V’ which will be launched at the next EUROCEAN conference in Paris, June 2019).
- Belgium (Flanders) is supporting the secretariat of the Ocean Biogeographic Information System OBIS, which is playing an increasingly important role in marine biodiversity issues at sea basin and global scale.
- Belgium (Flanders, VLIZ) is the coordinator and host of the European Node EurOBIS. VLIZ is also the coordinator of the World Register of Marine Species (WoRMS),

which serves as the taxonomic backbone to OBIS. WoRMS is an initiative supported by over 140 taxonomic editors worldwide.

- Belgium (Flanders, VLIZ) is the developer and host of other data and information systems, such as the Sea Level Monitoring Facility (global) and the Marine Regions (global) (see datasystems at www.vliz.be)
- Belgium (Flanders, VLIZ) is actively developing Ocean Literacy programs at regional and local level;
- Belgium (Flanders-VLIZ) is chairing the Task Team on the Transfer of Marine Technology (TMT) and Clearing House Mechanism (CHM) for Capacity Development Strategy of the IOC-UNESCO, which will report to the IOC CD group of experts and to be addressed to the IOC general assembly in summer 2019.
- Belgium (Flanders) actively contributes to the programming of new courses and trainings at the IODE Project Office in Ostend, with support of the Flanders Marine Institute, in the context of the Ocean Teacher Global Academy OTGA. This is one of the specific projects and programmes supported through the Flanders UNESCO Science Trust Funds (FUST).
- About FUST: Belgium (Flanders) is now in the process of renewing (by the Government before the elections in May) its five-yearly trust fund agreement with UNESCO (which covers, besides IOC, also our contribution to other UNESCO Science Programmes, and has no 'pre-earmarked' funding for any individual programme), which over the last phase 2014-2018 contributed some 4.67 million USD to IOC projects such as Ocean Teacher Global Academy, SPINCAM, Caribbean Marine Atlas II, ...

Finland

National and regional frameworks to implement ecosystem approach to management of human activities are paramount for achieving several SDG 14 targets, e.g. 14.1. on pollution, 14.2. on sustainable management and 14.6. on overfishing. They also constitute a major element of the Science-Policy interface for the sustainable use of Marine resources and safeguarding integrity and resilience of marine ecosystems. Approximately 40% of world's population lives on close vicinity of coastlines and significant human activities in the catchment and coastal waters as drivers subject coastal and shelf marine ecosystems to increasing multiple human pressures.

Pressures like environmental pollution and eutrophication by nutrients from land, poorly regulated fishing, habitat destruction or alteration by resource extraction, marine litter and discharge of chemical substances or energy are causing unwanted impacts in the marine environment. These locally or regionally-induced pressures are superposed by global pressures from human activities threatening marine ecosystems as warming seawater temperatures, ocean acidification and changes in physical properties of the ecosystems due to global warming.

The impacts of human pressures manifest themselves throughout the marine ecosystem as loss of biodiversity and decline of ecologically or commercially important species, harmful algal blooms and adjacent toxin production threatening human health, oxygen deficiency due to high primary productivity, harmful effects to marine mammals from noise or marine litter, siltation, bleaching of coral reefs, effects of environmental pollutants on marine life, among others.

These impacts are alleviated by managing pressures from human activities through ecosystem approach to management, where ecosystem state and amounts of pressures are guiding the acceptable levels of human activities. There are multiple frameworks employing implementation of ecosystem approach to management in place, some of them national some regional (e.g. regional seas conventions) and in Europe extending across several regional seas (MSFD). Also maritime spatial planning, a tool to plan the spatial distribution and placement of various human activities and ecosystem assets is closely related to the successful implementation of the ecosystem approach.

Adaptive management frameworks across the world Ocean have their many forms but share also common elements. Status of the ecosystem components is a major guiding aspect for sustainable use. In addition, level of human pressures and impacts of human activity on

ecosystems are often estimated. Frameworks regularly include socio-economic considerations and may contain explicit indicators for economic or social performance of the Ocean economy and communities involved in it. The complex nature of human drivers, pressures and impacts they cause, further affected by shifting baselines from Global change complicate the application of ecosystem approach, as multiple pressures and their cumulative impacts need to be simultaneously assessed.

We propose a topic on *presentation and comparison of various national and regional frameworks on implementation of ecosystem approach to manage human activities in coastal and shelf waters in the world Ocean*. In particular, emphasis would be in *systems of ecological objectives, associated indicators and their translation into integrated assessment*, taking also assessment of cumulative impacts into account. Integrated assessment lies in the core of sustainable Ocean economy and, together with Marine spatial planning is crucial for equitable use of marine resources. The goal of discussion would be to understand the current spectrum of frameworks in marine ecosystem assessments and look into elements necessary for safeguarding the sustainable use of the marine resources pursuant to multiple SDG 14 targets.

France

Dans le cadre de la Décennie internationale des sciences océaniques pour le développement durable, la France poursuivra et amplifiera son implication dans la recherche océanographique, notamment à travers sa participation aux actions coordonnées et menées sous l'égide de l'UNESCO par la Commission océanographique intergouvernementale (COI).

La France a témoigné de son soutien à cette initiative tant dans le cadre de la participation de la délégation française aux travaux préparatoires coordonnés par la COI qu'à l'occasion de sa proclamation par les Nations Unies en décembre 2017.

C'est ainsi que Frédérique Vidal, Ministre de l'Enseignement supérieur, de la Recherche et de l'Innovation, a confirmé ce soutien en introduisant une Conférence scientifique de haut niveau organisée par la COI et la Plateforme Océan-Climat les 10 et 11 septembre 2018 au Siège de l'UNESCO à Paris, intitulée « De la COP21 à la Décennie des Nations Unies pour les sciences océaniques au service du développement durable (2021-2030) ».

Au travers de l'élaboration d'une feuille de route, la France a réaffirmé son engagement à mettre en œuvre les objectifs de développement durable tant sur le plan national qu'international. Il s'agit d'assurer la cohérence des politiques en faveur du développement durable et de renforcer la synergie dans la mise en œuvre entre l'agenda 2030 et l'accord de Paris.

La feuille de route sur la mise en œuvre des objectifs de développement durable par la France est pilotée en concertation avec l'ensemble des parties prenantes. Elle est portée par un comité regroupant ministères et société civile. Ce comité veille à la coordination de son élaboration et de sa mise en œuvre, et à la mobilisation de l'ensemble des acteurs.

Cette feuille de route définira des priorités d'action pour la France et renforcera la dynamique collective pour l'atteinte des objectifs de développement durable.

La recherche présente, par essence, une dimension transversale qui alimente l'ensemble des objectifs mondiaux du développement durable, non seulement en vue de l'atteinte de l'ODD 14 concernant la vie aquatique, mais également ceux concernant la lutte contre la faim, la santé et le bien-être, les énergies propres, l'industrie et l'innovation, les villes et communautés durables dont la plupart se situent sur le littoral, la production et la consommation responsables, et la lutte contre le changement climatique.

Ainsi, s'agissant de l'ODD14 - « Conserver et exploiter de manière durable les océans, les mers et les ressources marines aux fins du développement durable », et sans être exhaustif à ce stade, la feuille de route a été adoptée par l'État français le 15 novembre 2018. Il est notamment prévu d'accompagner un programme scientifique ambitieux pour l'observation et la connaissance des écosystèmes marins et côtiers :

- développer une meilleure compréhension des liens du triptyque « océan-climat-biodiversité » ;
- soutenir la création d'une plateforme ouverte des connaissances sur le milieu marin ;
- mieux coordonner les comités scientifiques de l'IPBES et du GIEC ;
- développer la recherche sur l'adaptation et la résilience des écosystèmes marins et côtiers, les solutions fondées sur la nature, sur le biomimétisme et le génie écologique ;
- développer la recherche sur la toxicité des micro-polluants sur les écosystèmes marins ;
- cartographier les fonds sous-marins, identifier les sources hydrothermales ;
- développer la recherche sur la désoxygénation du milieu marin.

La recherche irriguera à la fois la capacité d'expertise des pouvoirs publics chargés de réguler et d'intégrer les différentes activités et la capacité d'innovation des acteurs économiques.

La communauté scientifique française qui s'intéresse à la mer, aux espaces marins et aux activités maritimes occupe une place de premier plan au niveau international. Elle est portée par les organismes de recherche nationaux tels que l'IFREMER, le CNRS, l'IRD et plusieurs universités et grandes écoles (notamment à Aix-Marseille, Bordeaux, Brest, Caen, La Rochelle, Lille, Montpellier, Nantes, Paris, Perpignan). La France dispose d'une flotte océanographique labellisée très grande infrastructure de recherche qui fédère les moyens navals nationaux permettant de mener des recherches en milieu marin côtier et hauturier dans de nombreux domaines scientifiques. L'utilisation de cette infrastructure est ouverte à des échanges et des partenariats dans des domaines d'intérêts communs.

Sur les dix prochaines années, la France poursuivra ses efforts pour développer de front les recherches fondamentales et finalisées et l'appui à l'innovation et à la connaissance nécessaire pour conduire les politiques publiques. Cet effort représente un effectif de près de **3700 scientifiques, ingénieurs et techniciens, pour un budget de l'ordre de 600 millions d'euros par an.**

La France s'est engagée, à la fois directement et à travers des structures européennes (initiatives de programmation conjointe sur l'eau, les océans et le changement climatique), dans les grandes initiatives pour l'observation de la terre et des océans à l'échelle internationale (GEO, GEO-BON, ARGO, IODP, Future Earth) ou européenne (EURO ARGO, EMSO, Copernicus) pour l'ouverture et le partage des données (IODE, GBIF), pour la connaissance et la prévention des risques (notamment les tsunamis), pour le développement des capacités et le transfert de technologies marines.

Elle soutient et promeut des initiatives associant des partenaires publics et des mécènes privés, contribuant à une approche globale de la biodiversité des océans, telles que Tara Océan et les projets qui s'appuient sur l'analyse des données et échantillons collectés sur tous les océans du monde.

De façon plus générale elle promeut l'ouverture de la science, la mobilisation des nouveaux outils numériques et de l'intelligence artificielle en vue de contribuer à la prochaine grande avancée scientifique en matière de modélisation de la biodiversité et des écosystèmes.

À l'échelle méditerranéenne, elle participe notamment à l'initiative BLUEMED financée par la Commission Européenne dans le cadre du programme Horizon 2020.

Elle participe à la montée en puissance d'une thématique océan visible dans le futur programme de recherche développement Horizon Europe, et mène une réflexion pour inciter les équipes françaises à accroître leur participation.

La France soutient également l'implication du G7 dans le domaine de l'océanographie. Elle participe au groupe de travail "*G7 Future of the Seas and Oceans*" pour promouvoir la thématique « Améliorer les réseaux d'observation de l'océan, les systèmes de données et les autres infrastructures océanographiques ainsi que leurs mécanismes de coopération et de partenariat afin de répondre aux besoins de toutes les nations d'ici à 2030 ».

La France s'implique également sur la thématique de la biodiversité et accueillera la session plénière de l'IPBES à Paris du 29 avril au 4 mai 2019.

Par ailleurs, dans le cadre des négociations concernant l'élaboration d'un nouvel instrument juridique sur la conservation et l'utilisation durable de la biodiversité dans les zones au-delà des juridictions nationales qui se sont engagées à New York, les chercheurs français se coordonnent, sous l'égide de l'alliance nationale AllEnvi et de la Fondation pour la recherche sur la biodiversité, pour apporter leur expertise aux négociateurs.

Greece

1. Institute of Oceanography-Hellenic Centre for Marine Research – Brief Outline

The Institute of Oceanography (IO) is the leading Institute of the Hellenic Centre for Marine Research in Greece, and was established in 1985, evolving from the former Institute of Oceanography and Fisheries Research (IOFR, 1975-1985). Today it is considered as the main provider of oceanographic research in Greece, and acts as the official consultant to the Greek government on marine and maritime issues. In the last 30 years, it has played a leading role in the progress of the oceanography of the Eastern Mediterranean, the deepest (depth >5000 m) part of the Mediterranean Sea, with high geomorphological, and biochemical complexity, by designing and implementing numerous oceanographic research projects, establishing fixed observational/monitoring networks, and establishing enhanced modelling and forecasting services. Meanwhile, the IO was present in the Western Mediterranean, it was significantly involved in the Black Sea research, and since 2010 it expanded its research activities by conducting several cruises in the Red Sea, while it has occasionally participated as a research partner in the Atlantic and Pacific Oceans. On an international level, it is recognized as one of Europe's major research establishments in the region of the Eastern Mediterranean, an important tool to promote and expand the European Research Area in Marine Science. It has undertaken a variety of EU projects, both as a coordinator and/or major partner, thus building its reputation as a competent and reliable institution.

2. IO's research objectives for the future

The Institute of Oceanography is the prime Institute of Greece with respect to marine scientific research. Within this framework the study of deep seas (mineral resources, biodiversity, CO₂ storage, etc.), deeper understanding of the functioning of biogeochemical cycles (the carbon cycle), continuous observation of the seas and the seabed (permanent observatories and platforms, autonomous systems – Argo floats, gliders), oceanographic forecasts of the status of the seas, improvement of numerical models, development of remote sensing and technological development in selected sectors are included among its objectives over a 10-year horizon. A prerequisite is the development of an appropriate framework for co-operation with national and private stakeholders for the joint development of products and services, the approach to major societal challenges and the adoption of emblematic actions of broad societal impact (for example: deep-sea explorations; removing plastics from the sea and coasts, environmental awareness of tourists and visitors; high-level training and education of a new generation of marine scientists).

3. Greece and the UN Decade of Ocean Science for sustainable development

Greece is following policies, scientific choices and priorities and draws up a new 5-year programming 2021-2025, according to the respective priorities of international organizations, European and global, such as the UNESCO Intergovernmental Oceanographic Commission-IOC, the European Marine Board of the European Science Foundation and the European Commission. Within the existing scientific potential and research infrastructures, Greece will actively engage in future initiatives aiming at the sustainable development and exploitation of the oceans on the basis of the following objectives:

- **Science integration** through multi-disciplinary, collaborative and holistic approaches to marine science, taking into account ecosystem-based and precautionary approaches.
- **Scientific capacity building** through more effective training, knowledge exchange and technology transfer.
- **Science engagement with society** to promote better understanding of the marine environment, highlighting the role which marine science can play in helping to inform decision makers and the need to engage relevant stakeholders in defining scientific priorities.
- **Science-based societal debate** on how best to develop governance of oceans and seas using science to inform the development of policy, law and sustainable economic development.

To the extent that the Decade of Ocean Science for Sustainability aims to enhance the profile of marine science worldwide and indirectly to increase the demand for marine research and innovation, ocean science should be regarded as a "long-range science" and therefore requires international cooperation to strengthen society, preserve the environment and create knowledge to support ocean management and develop useful products, services and employment.

Italy

In the framework of the preparatory works of the UN Decade of Ocean Science for Sustainable Development (2021–2030), and with reference to the Roadmap for its implementation, Italy affirms the intention of pursuing those objectives, in alignment with relevant initiatives and with its long and well-known experience in marine and maritime scientific research, with particular reference to valuing the uniqueness of the Mediterranean region.

Indeed, Italy has a leadership role in the *BLUEMED Research and Innovation Initiative*, endorsed by the member States of the European Union and the Union for the Mediterranean (Valletta Declaration on Strengthening Euro-Mediterranean Cooperation on Research and Innovation, 4 May 2017), and coordinates the action that supports the implementation of the *Strategic Research and Innovative Agenda*.²³ The *BLUEMED Pilot Initiative on Healthy Plastic Free Mediterranean Sea* has been launched recently, clearly in line with the societal outcomes of the Decade Roadmap.

This context is complemented by cooperation frameworks acting at sub-regional scale, such as EUSAIR (the European Strategy for the Adriatic and Ionian Region) and WestMED (the Western Mediterranean Maritime Initiative).

In particular, the efforts of the BLUEMED Italian community, engaging scientists, decision makers, private stakeholders and the civil society, led to the publication of the *BLUEMED Italian White Paper: an overview of relevance, obstacles and proposals of the key sectors for a Blue Growth*.²⁴

Together with its G7 partners, and in line with previous G7 commitments and the 2030 agenda, setting a global framework for sustainable development, Italy supports the 2018 *Charlevoix Blueprint for Healthy Oceans, Seas and Resilient Coastal Communities*, which, among its several objectives for achieving effective and innovative solutions to protect the world's oceans and seas, recognizes the value of ocean science, observation and seabed mapping for improving the availability of data and their dissemination.

Of particular interest for the perspectives of Italy are also the discussions held at the high-level meeting on the “*States General on Marine Scientific Research in Italy*”, convened at University of Milan-Bicocca from 26 to 28 September 2018. The outcome document of the meeting, drafted by experts in various fields of ocean science and planned to be released in

²³ http://www.bluedmed-initiative.eu/wp-content/uploads/2018/12/BLUEMED-SRIA_Update_2018.pdf.

²⁴ BLUEMED Italian White Paper Working Group (2018). *The BLUEMED Italian White Paper: an overview of relevance, obstacles and proposals of the key sectors for a Blue Growth*. Roma: CNR Edizioni.

2019, is intended to be transmitted to all relevant Italian authorities. Building on the past ten years of experience in ocean science, the aim is to facilitate the setting of the Italian priorities in marine research and the sustainable economic uses of the sea for the next decade.

The meeting was attended by more than sixty ocean-science representatives from Italian public institutions involved in marine scientific research locally and globally. The Presidents and Directors of the following entities, among others, contributed to the discussions: the National Research Council of Italy (CNR), hosting the IOC-UNESCO National Coordination Body; the National Inter-university Consortium for Marine Sciences (CoNISMa); the National Technology Cluster “Blue Italian Growth” (CTN-BIG); the National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA); the Central Institute for Marine Scientific Research and Applied Technology (ICRAM); the Hydrographic Institute of the Navy (IIM); the National Geophysics and Volcanology Institute (INGV); the Italian Institute for Environmental Protection and Research (ISPRA); the National Experimental Oceanography and Geophysics Institute (OGS); and the Zoological Station Anton Dohrn. The Director General of the European Multidisciplinary Seafloor and water-column Observatory – European Research Infrastructure Consortium (EMSO-ERIC) and a representative of the Mediterranean Science Commission (CIESM) also provided their views.

The following issues were addressed, under specific agendas organized in ten thematic round-tables:

1. Marine environment and the coastal belt;
2. Abiotic and biotic marine resources in the deep marine environment;
3. Biotic marine resources, with particular regard to the EU marine strategy;
4. Research infrastructure, including shipbuilding and marine robotics;
5. Sustainability and economic uses of the sea;
6. Blue biotechnologies;
7. Skills and jobs in ocean science;
8. Legal aspects of ocean science;
9. Socio-economic aspects of ocean science;
10. Co-ordination of Italian research in national and international programmes, projects and institutions.

As far as the legal aspects are concerned, participants made a call for the drafting of a comprehensive Italian legislation on marine scientific research and for the strengthening of research on new threats for the marine environment, such as pollution from plastics and

micro-plastics and the use of air-guns. The importance of marine scientific research for policies of adaptation to global warming and sea-level rise was also stressed.

Among the research and development priority areas identified in the Decade Roadmap, including capacity building and accelerated technology transfer, training, education and ocean literacy, and in the context of the global ocean literacy programme led by IOC-UNESCO, it is worth mentioning the recent initiative called “Ocean Literacy Italia” (OLI), which aims at promoting at the national level the seven Ocean Literacy principles by targeting students, professionals, decision-makers, governmental authorities, and the public at large.

Finally, it is worth to recall that the Italian scientific community is dramatically engaged in enhancing and strengthening technology innovation and knowledge advancement to ensure the oceans and, in particular, the Mediterranean Sea protection by hazards and by all forms of overexploitation and mis-uses. Against this background, science reveals to be a crucial element in the implementation of Blue Growth in all Mediterranean maritime and coastal zones.

Latvia

Latvia participates in several projects financed by the European Union (EU) funds and in EU programmes related to marine scientific research, in such a way contributing to the implementation of Latvia`s international obligations and EU legislation concerning marine environmental protection and sustainable use of marine resources, in particular, EU Marine Strategy Framework Directive 2008/56/EC (hereinafter – MSFD).

Most current projects and programmes with involvement of the Latvian Institute of Aquatic Ecology - scientific institute conducting basic and applied research in marine ecology and environment and acting as a competent institution in Latvia regarding marine monitoring and assessment, inter alia, for the MSFD implementation:

- Ministry of Environmental Protection and Regional Development as a competent institution for the implementation of the MSFD in Latvia carries out the project “Improvement of knowledge in the field of marine environment” (2017 – 2022) financed by the European Maritime and Fisheries fund (EMFF) under the Union priority „Fostering implementation of the integrated maritime policy”. The aim of this research project is to improve the knowledge basis on the state of marine environment, pressures and their cumulative impacts on marine environment, as well as to assess socio-economic aspects and value of marine ecosystem and its services - to define measures needed to reach the objective of achieving a good environmental status in marine waters under the jurisdiction of Latvia as required by the MSFD;

- EU framework programme for Research and Innovation “Horizon 2020” - sub-programme "Integrating Activities for Advanced Communities" project "SeaDataCloud - Further developing the pan-European infrastructure for marine and ocean data management” (11/2016 - 11/2020). More information - <https://www.seadatanet.org/About-us/SeaDataCloud>;

- BONUS²⁵ programme "Blue Baltic 2017-2020" project "BASMATI - Baltic Sea maritime spatial planning for sustainable ecosystem services". The objective of the project is to develop integrated and innovative solutions for maritime spatial planning (MSP) from the local to the Baltic Sea Region scale through a decision-support tool building on interactive information technology, and aiming at informing multi-level governance systems for their

²⁵ BONUS, the joint Baltic Sea research and development programme for years 2010-2017, was started by the BONUS member states together with the EU and officially launched in September 2010 by a co-decision of the European Parliament and the European Council as a *Treaty on the Functioning of the European Union* (TFEU) Article 185 activity.

management of ecologically and socio-economically sound network of protected marine areas in the Baltic Sea;

- MARS - the European Network of Marine Stations for collaboration to address fundamental marine research issues”. More information - www.marinstations.org;

- SUBMARINER - Network for Blue Growth - a Baltic Sea network for promotion of innovative and sustainable use of marine resources. More information - www.submariner-network.eu.

Netherlands

More than 600 million people live in coastal areas that are less than 10 meters above sea level and 2.4 billion people live within 100 km off the coast. The global blue economy, which includes employment, ecosystem services provided by the ocean, and cultural services, is estimated at between USD 3-6 trillion/year. Fisheries and aquaculture contribute USD 100 billion per year and about 260 million jobs worldwide (UN, 2017). Oceans do not only provide a means of living for humans; they literally enable life on earth. Our oceans produce over half of the world's oxygen; they store 50 times more carbon dioxide than our atmosphere. The world's oceans are crucial in regulating our climate by transporting heat from the equator to the poles (NOAA, 2019). We cannot overemphasize the importance of healthy oceans for humankind.

Major adverse impacts to the ocean ecosystems stem from climate change, unsustainable extraction of marine resources, destruction of marine and coastal habitats, and marine pollution. These impacts all act cumulatively. Economic activity in the ocean is characterized by a complex variety of risks that need to be addressed. The ocean economy has only recently begun to receive the attention it warrants and moves up the international policy agenda. Sound, risk-informed decision-making is key for the ocean's sustainable development, protecting its wealth in biodiversity, and securing its resources for next generations. Science is a cornerstone to provide the necessary insights to understand the system and act accordingly.

The Government of the Netherlands (GoN) and its ocean oriented research institutes therefore welcome the UN initiative for the 2021-2030 Decade of Ocean Science (DoOS).

GoN believes the DoOS should not only align with SDG14 and Agenda 2030 in general, but also explicitly with the UNFCCC Paris Climate agenda (incl. adaptation), with the UNISDR Sendai Framework on DRR, with the conventions on Biodiversity (Rio) respectively on Wetlands (Ramsar), and with the AAA Addis Ababa Action Agenda on Sustainable Financing. In addition, the science policy interfaces and the enabling environment in governance, innovative financing and capacity building are expected to feature in it.

Furthermore, GoN recognizes that it is an essential approach within the DoOS to include Regional Seas, other seas and marine coastal areas as part of the Oceans Science agenda, including the management of marine resources and the protection of the coastal zones to natural disasters. Alike, strategic policy frameworks for better ocean governance by

undertaking sustained efforts to develop an integrated ecosystem-based vision through such instruments as marine protected areas (MPA), marine spatial planning (MSP), integrated coastal zone management (ICZM), integrated water resources management (IWRM), and integrated land management (ILM) are to be part of it.

Next, GoN promotes alignment of the DoOS activities and new emerging initiatives with important EU and NL policies, as, amongst others, circular economy, energy transition, and food security.

The Netherlands is actively contributing to a number of the ongoing initiatives mentioned in the accompanying document by both the EU and some of its member states.

Scientific knowledge and research capacity are fundamental for our understanding of the ocean's responses to pressures and interventions for sustainable management. There is a need for a better understanding of ecosystem processes and functions and their implications for ecosystem conservation and restoration, ecological limits, tipping points, socio-ecological resilience and ecosystem services. In addition, there is a need for a better use of innovation in science and technology. As recommended by the UN, assessments and research on marine and coastal ecosystems and the ecosystem services they provide should be expanded, including with regard to socio-economic aspects and possible future impacts on ecosystems and their resilience to them (UN, 2016, The First Global Integrated Marine Assessment). The importance of ocean science has been recognized to be crucial to inform future management policies.

Dutch knowledge institutes develop knowledge capacity and participate in science for Ocean Action initiatives. They participate in several of the acting consortia and projects in Europe and worldwide, and provide support to the Dutch government on several of its national and international oceans related agendas and collaborative work.

Next to the many good initiatives/programs/projects on oceans' knowledge initiated by the EU, its member states and others abroad, we believe the DoOS provides an extra opportunity to provide in the need for more concerted action, research, in-depth analyses and investigations in concrete solutions and pathways forward. We believe these solutions are to be found by increasing our fundamental knowledge of the ocean's functioning by developing and applying technological innovations and cutting-edge research.

Within the timeframe within which we needed to provide our input regarding possible avenues for the implementation of the DoOS, we cannot be exhaustive, but want to suggest to following:

In relation to the land-sea interface and coastal adaptation:

- A global-scale assessment of future changes (due to climate change) in coastline position, including uncertainty quantification. Initiatives supporting the development of novel efficient modelling techniques to simulate such coastal evolution would be a first step towards achieving this. Furthermore, free availability of robust satellite derived global scale rates of coastline position would be very valuable for the validation of newly developed coastal evolution models.

- A global-scale assessment of future changes in storm surge intensity and frequency. The recent development of the Delft3D Flexible mesh model enables very high-resolution estimates of storm surge heights at the coast. However, applying this model globally, for all IPCC RCPs and several IPCC GCMs is necessary to quantify the associated uncertainty. Ongoing initiatives are only considering one or two RCPs and one or two GCMs.

- Initiatives to develop robust and transferable economic modelling approaches to obtain quantitative risk assessments (using fully probabilistic hazard estimates) of at least the top 20-30 global hotspots for coastal flooding and erosion at 2050 and 2100 planning horizons. This would aid risk-informed adaptation strategies.

- Initiatives to obtain reliable high-resolution nearshore (from 10m above MSL to 20m below MSL) topography and bathymetric data globally. Such data is crucial for coastal flooding and erosion modelling. Reflectance-based satellite imaging approaches have not been very successful in very shallow waters to date. Perhaps microwave satellite data analysis techniques may provide a useful alternative.

In relation to data, data access and innovative technologies:

- We ask for attention to the improvement of data collection and data accessibility for successful ocean management, for instance through the enhancement of cross-border cooperation (as in the EC's flagship project AtlantOS), and the identification of the best scales for collecting and reporting data, analysis, assessment and evaluation.

- International ocean discourse will benefit from open-source sharing of data (including through observation networks and inventories, and user-friendly transparent tools for mapping and visualization). Information services will need to be streamlined and interconnected between local, national, regional, and global levels. The development of citizen science to access data in remote places, such as from the high seas, will help enhance the understanding of the ocean-climate system and improve the modelling of its future

development. A good example is the data acquired through the contributions of the Ocean Volvo Race teams.

Thematic issues

- Further development of our knowledge and understanding of underwater noise (ships, windfarms, explosives, exploration/exploitation of seabed minerals and its regulation, etc), of its (cumulative) impact and relation to acoustics (communication ecologically, human interventions).
- Stepping up of arctic research, such as with respect to temperature rise, melting of the ice, (including on land), especially where systemic understanding of processes and tipping points is limited, in order to reduce the uncertainties of anticipated sea level rise or its impact on specific mammals and food webs (i.e. Bowhead Whale).
- Develop better understanding of the impacts on livelihoods, specifically in developing countries, because of sea level rise and acidification, in order to provide possible adaptation measures or action pathways.
- A better understanding of (the impact of) ALDFG (ghost gear), and avenues to achieve reduction.
- Improvement of our understanding of land-based sources of oceanic pollution to improve our ability to address oceanic pollution, including (micro)plastics, nutrients and harmful chemicals, and eutrophication, or, conversely, the dynamics of the sediment and nutrient systems in relation to ocean productivity and coastal health.
- Improve understanding of the value of integrated and holistic approaches to coastal area protection, its instruments (ref. ICZM/MSP/MPA, IWRM, ILM, CA, DRR), and the (scalable) interventions these support.

Portugal

Portuguese Committee for the IOC

Portugal is a strong supporter of, and has actively been involved within the IOC in the preparation of the plan and roadmap for the now proclaimed UN Decade of Ocean Science for Sustainable Development (henceforth referred to in this text as *the Decade*), since its initial developing phases.

We firmly believe that the Decade is a timely and unique opportunity to mobilize governments, academia, civil society and mankind as a whole, namely the younger generations, to take the urgent actions and required measures to revert the current state of degradation of the ocean's environment and health, while promoting the protection and the sustainable use of the ocean and its resources for the present and future generations, in line with UN initiatives such as the 2nd World Ocean Assessment and the 2030 Agenda for Sustainable Development and its Goals (SDGs), in particular SDG 14.

In order to define priorities, plan, coordinate and execute the necessary actions, and also to assist the IOC's Secretariat in the preparation of the Implementation Phase of the Decade, Portugal is now creating a National Office for the Decade, under the scope of the Ministry of the Sea, and in coordination with other relevant ministries, to promote national cooperation and combined actions between the scientific community and the various stakeholders, while at the same time coordinating the planning and actions to be developed at national level, in articulation with other national and international programs, IOC and UN initiatives. Portugal is also a candidate to host an IOC Coordination Office for the Decade at the end of the Planning Phase, in 2020.

As stated at the 51st Session of the IOC's Executive Council, at the UNESCO Headquarters, in Paris, Portugal has also offered to host the 2nd Global Planning Workshop for the preparation of the Decade, in 2020, seizing the opportunity that it will be hosting in Lisbon, that same year, together with Kenya, the 2nd UN Ocean Conference. The combination of the two events makes use of the unique opportunity to gather in the same place, at the same time, a very large number of decision makers, scientists and major stakeholders.

During the planning phase of the Decade (2019-2020), and throughout its implementation period (2021-2030), awareness and active engagement of the Portuguese ocean community, and society in general, in the Decade Objectives, will be promoted through nationwide consultations and open meetings with the various stakeholders (including academia, industry, NGOs and the general public).

Multi-stakeholder working groups, targeted workshops and communication events will be organized to promote general awareness and support informed decision on effective actions to be taken to achieve the Decade goals, taking into consideration the results from the World Ocean Assessment I and II. This will be done with particular focus on the Atlantic, taking full advantage of and building on the two major recent initiatives in the Azores, in line with the Galway (2013) and Belém (2017) Statements: the intergovernmental *Atlantic Interactions Research Agenda*, to be implemented through the Atlantic International Research (AIR) Centre, in which Portugal is strongly involved, and the national initiative of the creation of the Observatory for the Atlantic, in the Azores.

Concerning global ocean observation, mapping the seafloor and tsunami early warning systems, Portugal will continue to strengthen its national observation networks and ocean mapping programs, in articulation with other major national, European and international initiatives, such as, for example, the *Atlantic Ocean Research Alliance*, the ARGO observation network (Portugal is now becoming a member), and the *Seabed 2030* initiative. It will also contribute to the objectives of the Decade through its active participation in the various UN and IOC initiatives and working groups (e.g. GOOS, IODE, IPHAB, JCOM), as well as in major European and international programs and initiatives, such as EMSO, IODP, JPI-Oceans, the EU Earth Observation and Monitoring programme – Copernicus, Euromarine, and the Deep Ocean Stewardship Initiative.

As concerns early warning systems, Portugal has taken a major step, in November 2017, through the creation of the Portuguese Tsunami Warning Center, located at IPMA, in Lisbon, a Candidate Tsunami Service Provider (CTSP) for the Northeast Atlantic since January 2018, now in the process of applying for its accreditation.

For Portugal, ocean literacy and the awareness of the importance and objectives of the Decade are considered fundamental, in particular for the younger generations. As such, both during the planning phase (until the end of 2020) and throughout the Decade (2021-2030), outreach actions will be targeted at schools, at all teaching levels, taking advantage and based on the experience of the national participation in several national, European and international funded joint initiatives and projects (e.g. Sea for Society, Sea Change, CETUS, AORA-CSA, AANCHOR), as well as on the highly successful national initiatives such as the *Blue School PT* educational program of the Ministry of the Sea, the *UNESCO Associated Schools Project Network* and the extensive nationwide network of *Science Outreach Centers of the National Program “Ciência Viva”*.

Student training at sea is also considered a priority. Based on a most successful decade of experience and participation in the UNESCO/IOC Training Through Research Program (TTR), Portugal strongly believes that the access of young students and researchers to international ocean research facilities and in particular to scientific training at sea, in a multicultural and multidisciplinary environment, is fundamental. Therefore, we will develop efforts at national level and also through the IOC and the UN, to promote the creation of an international network of TTR centers. Such centers which will promote mobility and exchange of students at international level, to participate in multidisciplinary scientific cruises with a strong training component.

Another major opportunity that will be used to promote the awareness of the importance and vulnerability of the oceans, the objectives of the UN Ocean Decade at national and international level, and the urgent actions that need to be taken, is the series of actions planned, and recently launched, by Portugal for the commemorations of the 500 years of the first circumnavigation voyage carried out by the Portuguese navigator and ocean explorer *Fernão de Magalhães* (Magellan). These will take place between 2019 and 2022, and are being coordinated with similar actions being developed by Spain and other countries, as well as with the commemorating initiatives by the IOC.

United Kingdom

UK ocean science provides public benefit, as part of a global endeavour, by contributing to advancement of scientific knowledge of the ocean. This is both a public good in its own right and can lead to applications, which result directly or indirectly in public benefit. It supports those with responsibility for governing, managing or operating in the ocean environment who seek to do so in a safe and sustainable way. Improving knowledge of the ocean and recognising its influence on society, helps inspire people. Using such information also helps inform and educate, thus allowing us to sustainably grow ocean based economies and secure supplies of food, energy, minerals and natural products. It increases resilience of communities and economic infrastructures to natural disasters; it helps make sense of global-scale environmental change and variability in climate, seasonal weather and biodiversity; and, helps protect and restore the health of several threatened ecosystems that jeopardise our future health, wellbeing and prosperity.

Internationally, the UK is contributing to a global endeavour to support capacity development in ocean science. The UK Government's Global Challenges Research Fund (GCRF), a dedicated Official Development Assistance (ODA) research fund with a budget of £1.5B, supports a number of research projects where marine science is at their core. For example, the £8M SOLSTICE (Sustainable Oceans, Livelihoods and food Security Through Increased Capacity in Ecosystem research in the Western Indian Ocean) Project, which supports regional environmental research capability Ocean, notably in Tanzania, Kenya and South Africa. This Project strengthens the region's ability to effectively deliver evidence-based environmental and socio-economic information, ensuring support for an ecosystem approach to fisheries management.

Cross UK Government funding, such as the Prosperity Fund, the Conflict, Stability and Security Fund (CSSF) and the Newton Fund further support the UK Governments ambitions to deliver capacity development in collaboration with developing countries. Significant examples include the Commonwealth Marine Economies Programme (CMEP), which has at its core a desire to support 17 Commonwealth Small Islands Developing States (SIDS) in developing capacity in the management of their marine estates. Furthermore, the UK is actively engaged in shaping the way nation States support and deliver capacity development and transfer of marine technology via UN processes, in particular the Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO) as well as other UN Fellowship programmes.