GESAMP
Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection

GESAMP 44/3
10 August 2017
ENGLISH ONLY

44th session
Agenda item 3

# REPORT OF THE ADMINISTRATIVE SECRETARY OF GESAMP

## Activities and achievements of the Sponsoring Organizations of GESAMP since the 43rd session

### Introduction

1 The Executive Committee met once by teleconference in the intersessional period, on 6 April 2017 to discuss WG and correspondence group arrangements, WG funding issues, preparations of reports and additional support for the GESAMP Office. There has been regular communication among the GESAMP Office, the Chair of GESAMP and the members of the Executive Committee for the strengthening of the GESAMP activities. As a result, GESAMP's Working Groups and correspondence groups have been very active, as will be reported under agenda item 4 and 7.

2 GESAMP 44 will be informed of the outcomes of the next session of the Executive Committee, which will be held on Monday, 4 September 2017.

### Activities and achievements of the Sponsoring Organizations of GESAMP

3 The Administrative Secretary of GESAMP traditionally reports on the activities and achievements of the Sponsoring Organizations of GESAMP with the aim to provide GESAMP with an account of their involvement in the protection of the marine environment and their interest in the activities GESAMP undertakes.

4 This document provides a summary of the Organizations' achievements since GESAMP 43 (14to 17 November 2016) from IMO, IAEA, UNESCO-IOC, FAO, UN, UNDP and WMO.

### *GESAMP Office*

5 Since November 2016, the main activities of the GESAMP Office have been the following:

.1 supporting the activities of the existing working groups and correspondence groups of GESAMP, including the various peer review activities;

.2 assisting in the publication of two GESAMP reports;

.3 maintenance of the current GESAMP website and communication with its users, as and when required;

.4 development of the new GESAMP website; and

.5 preparation of the current session of GESAMP and the side-event on '$CO_2$ in the atmosphere-ocean system: impacts and feedbacks'

**INTERNATIONAL MARITIME ORGANIZATION (IMO)**

**Implementation of the Ballast Water Management Convention**

6 The Ballast Water Management (BWM) Convention was adopted in February 2004 and aims to prevent, minimize and ultimately eliminate the transfer of harmful aquatic organisms and pathogens through the control and management of ships' ballast water and sediments. The entry into force conditions of the BWM Convention were met on 8 September 2016 by the accession of Finland and the Convention will therefore enter into force on 8 September 2017. The number of Contracting Governments is currently 63, representing 68.51% of the world's merchant fleet tonnage.

***Matters directly related to the GESAMP-BWWG***

7 IMO's Marine Environment Protection Committee (MEPC), at its 71st session, granted Basic Approval to two and Final Approval to one ballast water management systems (BWMS) that make use of Active Substances, based on the recommendations of the 34th meeting of the GESAMP Ballast Water Working Group (BWWG). In total there are around 70 type-approved BWMS available.

8 Having considered the report of the Eighth Stocktaking Workshop of the GESAMP-BWWG (STW 8), MEPC 71, inter alia, endorsed several recommendations by the GESAMP-BWWG including a revision of the GESAMP-BWWG Methodology. Some of the most important outcomes are outlined in the following paragraphs.

9 MEPC 71 agreed to a procedure for submission of new data on fresh water testing of BWMS with Final Approval, which will immediately start being applied by the GESAMP-BWWG.

10 MEPC 71 also endorsed the recommendation of the GESAMP-BWWG that, in all cases where ballast water management involves the addition of an Active Substance to drinking water on board, there should be a submission for approval under the *Procedure for approval of ballast water management systems that make use of Active Substances* (G9).

11 Following a recommendation by the GESAMP-BWWG on the need to review Procedure (G9) and make it mandatory, as a consequence of the review and decision to make the *Guidelines for approval of ballast water management systems* (G8) mandatory, MEPC 71 requested the GESAMP-BWWG to specify what amendments it recommends to Procedure (G9).

12 Finally, MEPC 71 approved the revised Methodology for information gathering and conduct of work of the GESAMP-BWWG (BWM.2/Circ.13/Rev.4), which will be applied to all submissions for Basic Approval to MEPC 74 and onwards, and subsequent submissions for Final Approval of those systems.

***Other matters***

13 In light of the imminent entry into force of the BWM Convention, MEPC 71 dealt with an extraordinary number of topics related to ballast water management and made a large number of relevant decisions, including approval of draft amendments to the Convention for adoption after its entry into force and a BWMS Code. The Secretary-General will circulate the amendments upon entry into force of the Convention, with a view to adoption at MEPC 72 along with the BWMS Code. A summary of the most important outcomes is provided in this section.

*Amendments to regulation B-3 of the BWM Convention*

14 MEPC 71 approved draft amendments to regulation B-3 of the BWM Convention, to provide an appropriate timeline for ships to comply with the ballast water performance standard

described in regulation D-2 of the Convention, and a draft MEPC resolution on *Determination of the date referred to in regulation B-3, as amended, of the BWM Convention*. MEPC 71 also adopted resolution MEPC.287(71) on *Implementation of the BWM Convention* with a view to facilitating the smooth and uniform implementation of the amendments to regulation B-3.

*Code for approval of ballast water management systems*

15 In adopting the revised Guidelines (G8), MEPC 70 had agreed that they should be made mandatory after the entry into force of the BWM Convention and renamed as "Code for approval of ballast water management systems" (BWMS Code). MEPC 71 approved the BWMS Code and related draft amendments to regulations A-1 and D-3 of the BWM Convention making the Code mandatory.

16 MEPC 71 also approved in principle consequential amendments to the *Guidance on scaling of ballast water management systems* (BWM.2/Circ.33) and the *Guidance for Administrations on the type approval process for ballast water management systems in accordance with Guidelines (G8)* (BWM.2/Circ.43), to be kept in abeyance for final approval at MEPC 72 in conjunction with the adoption of the BWMS Code.

*Guidance on various issues*

17 Having considered relevant proposals, MEPC 71 approved the following new circulars:

.1 BWM.2/Circ.61 on *Guidance on methodologies that may be used for enumerating viable organisms for type approval of ballast water management systems*;

.2 BWM.2/Circ.62 on *Guidance on contingency measures under the BWM Convention*, noting that the *Guidelines for Ballast Water Management and development of Ballast Water Management plans* (G4) should be consequently reviewed as a part of the experience-building phase associated with the BWM Convention; and

.3 BWM.2/Circ.63 on *Application of the BWM Convention to ships operating in sea areas where Ballast Water Exchange in accordance with regulations B-4.1 and D-1 is not possible*.

18 Moreover, MEPC 71 approved revised *Guidance on entry or re-entry of ships into exclusive operation within waters under the jurisdiction of a single Party* (BWM.2/Circ.52/Rev.1).

*Survey and certification*

19 The *Interim Survey Guidelines for the purpose of the BWM Convention under the Harmonized System of Survey and Certification* (BWM.2/Circ.7) had been kept in abeyance until the BWM Convention enters into force. MEPC 71 instructed the Sub-Committee on Implementation of IMO Instruments at its next session (III 4, scheduled from 25 to 29 September 2017) to incorporate the aforementioned Interim Survey Guidelines in the next amendment of the HSSC Guidelines, with a view to submission to the IMO Assembly's forthcoming meeting (A 30, scheduled from 27 November to 6 December 2017) for adoption. In addition, MEPC 71 instructed III 4 to introduce provisions in the HSSC Guidelines for validating the compliance of individual BWMS with regulation D-2 of the BWM Convention in conjunction with their commissioning.

20 MEPC 71 also approved draft amendments to regulations E-1.1.5, E-5.8 and E 5.9.1 of the BWM Convention, related to endorsements of additional surveys on the International Ballast Water Management Certificate (IBWMC), and a unified interpretation of Appendix I of the BWM Convention (Form of the IBWMC) on how the IBWMC should be completed.

*Revision of Guidelines on ballast water exchange and risk assessment*

21 MEPC 71 adopted amendments to the *Guidelines for ballast water exchange* (G6), to incorporate a ballast water reporting form, and the *Guidelines for risk assessment under regulation A-4 of the BWM Convention* (G7), to better clarify the relationship between the Guidelines and the same risk area (SRA) concept. The two revised Guidelines were adopted through resolutions MEPC.288(71) and MEPC.289(71), respectively.

*"Ballast Water Management – How to do it" manual*

22 A manual titled "Ballast Water Management – How to do it" was being developed by the Sub-Committee on Pollution Prevention and Response (PPR) over a number of sessions and the Sub-Committee's work was concluded at its latest session (PPR 4, 16 to 20 January 2017). MEPC 71 finalized and approved the manual for publication, which will be carried out as soon as possible by the IMO Secretariat.

*Experience-building phase*

23 Having considered the report of a correspondence group that had been established to further develop the experience-building phase associated with the BWM Convention, including developing a plan for gathering and analysing data, MEPC 71 adopted resolution MEPC.290(71) on *The experience-building phase associated with the BWM Convention,* and encouraged Member States and interested parties to commence the data gathering associated with the experience-building phase at their earliest convenience, in anticipation of the future approval of the data gathering and analysis plan.

*Future work*

24 Being the first session of the Marine Environment Protection Committee after the entry into force of the BWM Convention, MEPC 72 (scheduled from 9 to 13 April 2018) is primarily expected to adopt the amendments to regulations A-1, B-3, D-3, E-1 and E-5, as well as the BWMS Code. MEPC 72 is also expected to deal with other issues related to ballast water management, including issues emanating from the PPR Sub-Committee and the GESAMP-BWWG.

**Amendment of the Anti-fouling Systems Convention**

25 The Anti-fouling Systems (AFS) Convention was adopted in October 2001 and aims to prohibit the use of harmful anti-fouling paints used on ships. The Convention entered into force on 17 September 2008 and the number of Parties is currently 76, representing 93.70% of the world’s merchant fleet tonnage. The Convention has not been amended since its entry into force.

26 At present, Annex 1 to the AFS Convention prohibits the use of organotin compounds acting as biocides in anti-fouling paints used on ships, and has a mechanism to prevent the potential future use of other harmful substances in anti-fouling systems. In this context, MEPC 71 considered a proposal to amend Annex 1 to the Convention, to include controls on cybutryne, and agreed to include a relevant new output in the PPR Sub-Committee's biennial agenda for 2018-2019 and the provisional agenda for PPR 5 (scheduled from 5 to 9 February 2018), which will consider the initial proposal. The outcome of the deliberations of PPR 5 will be considered by MEPC 72, which will determine how the matter will progress further.

**Biofouling management**

27 The Biofouling Guidelines were adopted in July 2011 and are intended to provide a globally consistent approach to the management of biofouling, which is the accumulation of various aquatic organisms on ships’ hulls, in order to minimize the transfer of invasive aquatic species. Biofouling

management can also be an effective tool in enhancing energy efficiency and reducing air emissions from ships.

28 The IMO Secretariat has developed and submitted to the Global Environment Facility (GEF), through UNDP, a proposal for a project titled "Building Partnerships to Assist Developing Countries Minimize the Impacts from Aquatic Biofouling" (GloFouling Partnerships). This proposal was approved by the GEF Council in May 2017 and the IMO Secretariat is now in the process of developing the full project document, with a view to the project starting in the second half of 2018.

**MARPOL Annex I (Prevention of pollution by oil)**

**Unified interpretations of regulations 1.23 and 36.2.10 of MARPOL Annex I**

29 MEPC 71 approved unified interpretations of regulation 1.23 concerning the regulatory deadweight to be entered on relevant statutory certificates, and of regulation 36.2.10 concerning categorizing of terminal hose flush water from a Single Point Mooring (SPM) or a Conventional Buoy Mooring (CBM) as the disposal of residues under regulation 36.2.10.

**Protecting the Arctic from heavy fuel oil**

30 MEPC 71 agreed to add a new output in its work programme on the development of measures to reduce risks of use and carriage of heavy fuel oil (HFO) as fuel by ships in Arctic waters. This new output will appear on the agenda for its next session (MEPC 72) in April 2018.

31 Member Governments and international organizations were invited to submit concrete proposals on what type of measures should be developed, including the scope of the work, to MEPC 72, so that clear instructions can be given to the PPR Sub-Committee which will carry out the detailed technical work, starting at PPR 6 in 2019.

32 The use and carriage of heavy fuel oil is banned in Antarctic waters under MARPOL Annex I and the Polar Code recommends that Member States follow the same practice in the Arctic.

**Ship recycling**

33 Following the adoption of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, in May 2009, the MEPC has finalized and adopted all six guidelines required under the terms of the Convention to facilitate the global implementation of its requirements in a uniform and effective manner. Thus the whole package for Member Governments to ratify the Convention is in place. To date, six States, i.e. Belgium, Denmark, the Congo, France, Norway and Panama have ratified or acceded to the Convention, whose combined merchant fleets constitute 21.23 % of the gross tonnage of the world’s merchant fleet, and whose combined ship recycling volumes constitute 112,161 gross tonnage.

**Review of MARPOL Annex V (Garbage)**

34 The revised MARPOL Annex V was adopted by resolution MEPC.201(62) and entered into force on 1 January 2013, thus establishing a prohibition on the discharge of all types of garbage into the sea except in the cases explicitly permitted under the Annex.

35 MEPC 70 adopted further amendments to MARPOL Annex V related to products which are hazardous to the marine environment (HME) substances and Form of Garbage Record Book, with an expected entry into force date of 1 March 2018. The amendments provide criteria for the classification of solid bulk cargoes as harmful to the marine environment and are aimed at ensuring that such substances are declared by the shipper if they are classed as harmful and are not discharged.

36 MEPC 71 adopted the *2017 Guidelines for the implementation of MARPOL Annex V* (resolution MEPC.295(71)), revoking its 2012 Guidelines. The main purposes of these Guidelines are to assist: (1) governments in developing and enacting domestic laws which implement Annex V; (2) shipowners, ship operators, ships' crews, cargo owners and equipment manufacturers in complying with requirements set forth in Annex V and relevant domestic laws; and (3) port and terminal operators in assessing the need for, and providing, adequate reception facilities for garbage generated on all types of ships.

**Issues related to MARPOL Annex II and IBC Code**

37 MEPC 69 adopted amendments to the appendix to MARPOL Annex II, which updated the summary table, setting out the revised GESAMP Hazard Evaluation Procedure.

38 MEPC 70, having noted the concurrent decision by MSC 96 approved a Unified interpretation which aimed to facilitating global and consistent implementation of survival requirements of the IBC Code (MSC-MEPC.5/Circ.11). The Committee also approved an *Example of a Certificate of Protection for products requiring oxygen-dependent inhibitors* (MSC-MEPC.2/Circ.16), further to concurrent approval by MSC 96.

**OSV Chemical Code**

39 MEPC 71 approved the draft Code for the transport and handling of hazardous and noxious liquid substances in bulk on offshore support vessels (OSV Chemical Code), for submission to the thirtieth IMO Assembly for adoption later this year.

**MARPOL Annex VI (Prevention of air pollution from ships)**

***Consistent implementation of regulation 14.1.3 of MARPOL Annex VI***

40 MEPC 70, having approved a final report of the assessment of fuel oil availability, decided that the sulphur content limits for fuel oil in regulation 14.1.3 of MARPOL Annex VI shall become effective on 1 January 2020.

41 In this regard, MEPC 71 approved a new output on "Consistent implementation of regulation 14.1.3 of MARPOL Annex VI" and agreed the scope of work needed, for inclusion in the PPR Sub-Committee's biennial agenda for 2018-2019.

42 In addition, MEPC 71 also approved the holding of an intersessional meeting on consistent implementation of regulation 14.1.3 of MARPOL Annex VI, under the PPR Sub-Committee, in the second half of 2018, subject to endorsement by the Council.

***Fuel oil quality***

43 MEPC 67, following a discussion on fuel oil quality, established a correspondence group to develop draft guidance on quality-assurance for fuel oil delivered for use on board ships and to consider the adequacy of the current legal framework in MARPOL Annex VI in relation to fuel oil quality. MEPC 69, having considered a report of the group, re-established the correspondence group to further develop draft guidance on best practice for fuel oil purchasers/users and Member States/coastal States and instructed it to submit a report to MEPC 71.

44 MEPC 71, having considered a report of the correspondence group, further developed draft guidance on best practice for fuel oil purchasers/users, with a view to finalization at MEPC 72, and re-established the correspondence group to further develop draft best practice for Member States/coastal States and instructed it to submit a report to MEPC 73.

***EEDI review***

45 Amendments to MARPOL Annex VI, regulations for the prevention of air pollution from ships, adding a new chapter 4 to Annex VI on regulations on energy efficiency for ships to make mandatory the Energy Efficiency Design Index (EEDI), for new ships, and the Ship Energy Efficiency Management Plan (SEEMP) for all ships entered into force on 1 January 2013.

46 Regulation 21.6 of MARPOL Annex VI requires, at the beginning of phase 1 (1 January 2015), the Organization to "review the status of technological developments and, if proven necessary, amend the time periods, the EEDI reference line parameters for relevant ship types and reduction rates set out in this regulation". MEPC 67 established a correspondence group to review the status of technological developments relevant to implementing phase 2 of the EEDI regulatory framework which begins in January 2020.

47 MEPC 70 considered a final report of the correspondence group and, following consideration, agreed to retain the current reduction rates, time periods and the EEDI reference line parameters of EEDI phase 2 requirements for ship types other than ro-ro cargo ships and ro-ro passenger ships. MEPC 70 further agreed that it would be necessary to start a thorough review of EEDI phase 3 requirements (1 January 2025 and onwards), including discussion on its earlier implementation and the possibility of establishing a phase 4. Currently, phase 3 requirements provide that new ships be built to be 30% more energy efficient compared to the baseline.

48 MEPC 71, having considered EEDI phase 2 requirements for ro-ro cargo and ro-ro passenger ships, approved draft amendments to regulation 21 of MARPOL Annex VI regarding EEDI requirements for ro-ro cargo and ro-ro passenger ships, with a view to adoption at MEPC 72.

49 MEPC 71 also established a correspondence group on review of the Energy Efficiency Design Index (EEDI) beyond phase 2, to report on progress by MEPC 72 and make a recommendation to MEPC 73 on the time period and reduction rates for EEDI phase 3 requirements.

***Amendments to MARPOL Annex VI and associated guidelines***

50 MEPC 71, having considered draft amendments to MARPOL Annex VI, adopted:

.1 amendments to MARPOL Annex VI to designate the North Sea and the Baltic Sea as emission control areas for nitrogen oxides ($NO_X$) Tier III control with an effective date of 1 January 2021, including exemption provisions to allow ships fitted with dual fuel engines or with only Tier II engines to be built, converted, repaired and/or maintained at shipyards located in $NO_X$ Tier III ECAs; and

.2 amendments to the information to be included in the bunker delivery note (appendix V to MARPOL Annex VI) relating to the supply of marine fuel oil to ships which have fitted alternative mechanisms to address sulphur emission requirements.

51 MEPC 71 also adopted 2011 Guidelines addressing additional aspects to the $NO_X$ Technical Code 2008 with regard to particular requirements related to marine diesel engines fitted with selective catalytic reduction (SCR) systems.

***Further technical and operational measures to enhance energy efficiency***

52 MEPC 68 agreed that the development of a data collection system for ships should follow a three-step approach, consisting of data collection and data analysis, followed by decision making on what further measures, if any, are required. This approach was reaffirmed by MEPC 69 and led to the approval of draft amendments to chapter 4 of MARPOL Annex VI to introduce a mandatory data collection system for fuel oil consumption of ships.

53 MEPC 70 adopted amendments to Chapter 4 of MARPOL Annex VI including a new regulation 22A on a mandatory data collection system for fuel oil consumption. Under the amendments, ships of 5,000 gross tonnage and above will be required to collect consumption data for each type of fuel oil they use, as well as other, additional, specified data including proxies for transport work. The aggregated data will be reported to the flag State after the end of each calendar year and the flag State, having determined that the data has been reported in accordance with the requirements, will issue a Statement of Compliance to the ship. Flag States will be required to subsequently transfer this data to an IMO Ship Fuel Oil Consumption Database. IMO will be required to produce an annual report to the MEPC, summarizing the data collected.

54 MEPC 71, having considered necessary guidelines for uniform implementation of data collection system for fuel oil consumption:

.1 adopted 2017 Guidelines for Administration verification of ship fuel oil consumption data;

.2 adopted 2017 Guidelines for the development and management of the IMO Ship Fuel Oil Consumption Database; and

.3 approved an MEPC circular on Submission of data to the IMO data collection system for fuel oil consumption of ships from a State not Party to MARPOL Annex VI.

***Reduction of GHG emissions from ships***

55 UNFCCC Parties attending COP 21 adopted the 2015 Paris Agreement on Climate Change. MEPC 70 welcomed the entry into force of the Paris Agreement on 4 November 2016.

56 MEPC 70, following consideration, approved a Roadmap for developing a *Comprehensive IMO strategy on reduction of GHG emissions from ships*, which foresees an initial GHG reduction strategy to be adopted in 2018. The Roadmap contains a list of activities, including further IMO GHG studies and significant intersessional work, with relevant timelines and provides for alignment of those new activities with the ongoing work by the MEPC on the three-step approach to ship energy efficiency improvements. This alignment provides a way forward to the adoption of a revised strategy in 2023 to include short-, mid-, and long-term further measures, as required, including implementation schedules. Subsequently, the first intersessional working group (ISWG-GHG 1) was held from 26 to 30 June 2017.

57 MEPC 71 noted the draft outline of the structure of the initial IMO GHG Strategy, and approved the terms of reference for the second and third meetings of the Intersessional Working Group on reduction of GHG emissions from ships (ISWG-GHG 2 and ISWG-GHG 3) to be held in October 2017 and April 2018 respectively.

58 MEPC 71 welcomed the progress achieved and invited Member States and international organizations to continue this work in a constructive and efficient manner at the two forthcoming intersessional meetings, with a view to the adoption of the initial Strategy at MEPC 72 (spring 2018).

**Oil pollution preparedness and response**

59 The OPRC-HNS Technical Group, at its twelfth session, agreed to establish a correspondence group (CG) under the leadership of Canada and France with a view to revising the IMO Dispersant Guidelines in light of latest developments, especially, the Deepwater Horizon incident. The parts of the guidelines dealing with surface application of dispersants have now been approved by MEPC, with the remaining part devoted to Sub-Sea dispersant application currently under development. This part takes into account the experience gained from the Deepwater Horizon incident as well as the subsequent scientific studies and technical developments initiated

by the public sector and the industry. This final part of the IMO Dispersant Guidelines is expected to be considered by the PPR 5, in February 2018.

60 MEPC 70 agreed to include a new output, the development of a “Guide on practical methods for the implementation of the OPRC Convention and OPRC-HNS Protocol” in the post-biennial agenda of the Committee, and work is expected to commence on this guidance document during PPR 5.

**London Convention and Protocol (LC/LP)**

61 Since the 43rd session of GESAMP, the following developments may be of interest to GESAMP. The Scientific Groups of the LC/LP met for their joint annual session (LC 40/LP 12) from 27 to 31 March 2017, at IMO headquarters.

***Disposal of fibreglass vessels***

62 The Scientific Groups noted that further information on the disposal of fibreglass vessels was needed, and recommended a collation of information on the scale of the problem, through the means of a literature review, in order to identify key knowledge gaps relating to impacts of fibre-reinforced plastic vessels dumped or placed in the marine environment.

**Specific guidelines for assessment of platforms or other man-made structures at sea**

63 The Groups initiated the revision of the *Specific guidelines for assessment of platforms or other man-made structures at sea,* through an intersessional correspondence group on the revision of the specific guidelines, under the lead of Norway, with assistance from Canada. The target dated for completion of the revision is 2019.

***Riverine and marine disposal of tailings and associated wastes from mining operations and deep seabed mining***

64 The Scientific Groups noted the progress made by GESAMP on the issue of impacts of wastes and other matter in the marine environment from mining operations, including deep-sea mining, as well as the establishment of a GESAMP working group (WG 42) under the co-lead of IMO and UN Environment.

***Marine litter and microplastics***

65 The Scientific Groups held an extensive discussion, and considered several informative submissions on the topic of microplastics, in particular in relation to the monitoring and assessment of dredged material and sewage sludge. The Groups agreed that Parties should redouble efforts to share knowledge and technical expertise with regard to the analysis of plastics, including microplastics, in dredged material and sewage sludge (in particular), with a view to developing methods to enable routine, reliable monitoring, assessment and reporting of microplastic contaminant levels in such waste streams as soon as possible.

***Science Day 2017***

66 As part of the joint session, a half-day seminar took place on the "Waste prevention audits", which focussed on the importance of waste prevention audits within the process of assessing wastes and reducing marine pollution, and the concern raised over the issue of microplastics and how they could be addressed in future through the LC/LP.

***Joint session of the Scientific Groups***

67 The next meeting of the governing bodies of the LCLP will be held from 9 to 13 October, at IMO Headquarters. The next joint session of the LC/LP Scientific Groups is tentatively scheduled for late April/early May 2018.

## INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)

68 IAEA Environment Laboratories (NAEL) report on activities at its 3 marine profile laboratories: Marine Environmental Studies Laboratory (MESL), Radioecology Laboratories (REL) and Radiometrics Laboratory (RML).

### Marine Environmental Studies Laboratory (MESL) Activities

***Production of Certified Reference Materials and Interlaboratory Comparison exercises***

69 Two Certified Reference Materials (CRM) were produced: i) CRM IAEA-459 (persistent organic contaminants in marine sediment); ii) CRM IAEA-436 (trace elements and methyl mercury in fish sample). A new CRM - IAEA 476 for trace elements and methyl mercury in biota sample is under production and a characterization and homogeneity studies are on-going. IAEA's CRMs are produced to assist Member States improving quality of measurement results in the analysis of trace elements, Methyl Mercury and persistent organic pollutants in marine environmental samples, in view of assessing pollution levels and trends and enhancing seafood safety.

70 NAEL participated in the proficiency tests for trace elements and organic pollutants in marine samples organised by the Quasimeme. NAEL participated also in the GEOTRACES inter-laboratory comparison for the determination of ultra-low levels of mercury and methylmercury in the open ocean.

***Strengthening data quality assurance of Regional Seas laboratories participating in marine monitoring programmes***

71 NAEL provided technical support for strengthening the capability of Mediterranean laboratories to accurately analysing contaminants in marine samples in the framework of the MED POL programme. MED POL is the Programme for the Assessment and Control of Pollution in the Mediterranean Region of UNEP/Mediterranean Action Plan. Designated national monitoring laboratories in Mediterranean countries benefit by being able to use the analytical support of NAEL in the development in their quality assurance programs for the determination of trace elements and organic contaminants in marine environment.

72 NAEL organised two Proficiency Tests to assist Member States strengthening data quality assurance in laboratories participating in marine pollution monitoring programmes. In total 60 laboratories from 16 Member States participated in these exercises:

.1 Analytical Performance Study for MEDPOL: Determination of trace elements in marine sediment sample: 28 laboratories from 14 Mediterranean Member States (Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Montenegro, Morocco, Slovenia, Tunisia, Turkey); and

.2 2 Analytical Performance Study for MEDPOL: Determination of chlorinated pesticides, PCBs and petroleum hydrocarbon in marine biota sample: 32 laboratories from 14 Mediterranean Member States (Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Italy, Lebanon, Montenegro, Morocco, Slovenia, Spain, Tunisia, Turkey).

73 NAEL organised two training courses on the analysis of contaminants in marine samples:

.1 Training workshop on the analysis of Trace Elements in marine samples for laboratory practitioners in MEDPOL countries, 24/10-4/11/2016 (6 trainees from 6 Mediterranean Member States); and

.2 Training workshop on the analysis of Organic Contaminants in marine samples for laboratory practitioners in MEDPOL countries, 24/10-4/11/2016 (5 trainees from 5 Mediterranean Member States).

74 One scientist from Sri Lanka Atomic Energy Authority visited NAEL laboratory and was trained on the analysis of stable isotopes of Carbon and Nitrogen using Isotopic Ratio Mass Spectroscopy (IRMS). The training was provided in the framework of the IAEA's Technical Cooperation Project SRL7005 (Sri Lanka). One scientist from Philippine Nuclear Research Institute was trained on the production of Certified Reference Materials. One scientist from the National Institute of Metrology, LNE France and one scientist from Polish Geological Institute made scientific visits to NAEL to be informed on the lastest developments related to the analysis of trace elements, mercury and methylmercury using ICP-MS and GC-AFS techniques respectively.

75 NAEL hosted the Thirteenth Expert Meeting of Bonn-OSINet, the Bonn Agreement Oil Spill Identification Network of Experts to promote the stable isotopes methodologies for fingerprinting oil and other emerging contaminants.

76 A new agreement between IAEA/NAEL and UNEP/MAP to continue the collaboration on strengthening data quality assurance in marine pollution monitoring in the Mediterranean region is under final discussion. Already two Proficiency Tests and two Training Courses are under preparation. The project is on-going and will be completed within 2017.

77 A Practical Arrangement, for collaboration on data quality assurance and traceability of mercury measurements in marine environment was signed between IAEA NAEL and the French Institute of Metrology LNE, Paris, France in February 2017.

78 Practical Arrangement for collaboration on environmental forensic studies, based on high level trace elements isotopic ratios measurements in marine environment was signed between IAEA/NAEL and the University of Warsaw, Poland in January 2017.

***Developing tools for assisting Member States to analyse contaminants and long lived radionuclides in marine samples and to identify their sources***

79 NAEL continued the development and validation of monitoring methods, which were published in peer reviewed journals and presented in International Conferences: i) Method for emerging contaminants in sea water: case study of the rare earth elements ii) Method for lead isotopic ratios in seawater; iii) Method for ultralow-levels $Th^{232}$in seawater; iv) Method for toxic elements in biota samples, based on solid sampling; v) Method for dissolved and particulate petroleum hydrocarbons and their stable carbon isotopes in seawater. Analytical methodologies developed in NAEL for emerging and regulated contaminants and for the determination of stable isotope ratios in the marine environment were promoted via 8 publications in peer review journals/books and 10 presentations at scientific conferences.

80 To help in the implementation of the Minamata Convention NAEL continued the development, validation and dissemination of recommended analytical methods for monitoring mercury and methyl mercury in the marine environment. Several methods dealing with the determination of mercury and methylmercury in seawater by application of different analytical techniques have been recently validated.

81 A number of analytical methods are under validation including the determination of: i) low level trace elements in seawater; and ii) petroleum hydrocarbons and organochlorinated compounds in sediments and biota samples.

82 A worldwide interlaboratory comparison on determination of trace elements and methyl mercury in marine biota samples is on-going and will be finalised by the end of 2017.

## Radioecology Laboratory (REL) activities

### *Strengthening capabilities for biotoxin monitoring in seafood through research and development, training and cooperation*

83 The receptor binding assay for harmful algal bloom (HAB) toxin detection continues to be in full operation at NAEL for research and development applications and for technology transfer and capacity building. NAEL laboratory performance is assessed through successful participation to Quasimeme proficiency testing (PT) exercises for paralytic shellfish poisoning. The RBA method is also being used to study biotoxin food web transfer and metabolism. It is being optimized for application to the emerging ciguatera toxins and its proficiency assessed on new seafood sample matrices to broaden its regulatory application. The RBA method was put in operation in a new country in 2017 (Morocco) where it is being assessed as a potential replacement of the mouse bioassay, currently in use for regulatory purposes.

84 NAEL provides technical and scientific support to over 40 Member States (MSs) in Latin America, Asia-Pacific and Africa to build capacity in HABs management through 12 national and regional technical cooperation projects. NAEL continues to host fellowships and internships to transfer the RBA technology to IAEA MSs (total of 8 individuals in 2016 from Indonesia, Philippines, Morocco, Tunisia, Cuba, and France, and 2 individuals, 6 months each in 2017). NAEL is joining efforts with other national and international organisations (IOC-UNESCO, US-NOAA, Malarde Institute in French Polynesia, IFREMER France, IRTA Spain) to improve knowledge and enhance capabilities in HABs management and participates actively at the International Panel on HABs.

85 Member State participants (Cuba, Thailand, Brazil, France, and Spain) of the Coordinated Research Project (CRP) on the application of the RBA techniques for improving coastal management met at IRTA Spain in 2017. A major achievement included i) the sampling and screening of over 60 fish for the preparation of a reference fish matrix material, ii) the establishment of first culture of toxic benthic HABs from Cuba, iii) findings of high diversity of benthic toxic genera of ostreopsis associated with a mass mortality of sea-urchin and iv) raising risk for ciguatera poisoning with the findings of Gambierdiscus species in North and South East coast of Brazil. CRP project findings were communicated through five presentations at international conferences.

86 The Philippine Nuclear Research Institute was re-designated as an IAEA collaborating centre to work on HABs in the context of environmental and global change. The plaque was inaugurated during the 2016 General Conference in Vienna. In this framework and with the support of a PUI project, the capacity of PNRI was enhanced with the purchase and setup of an LC-MS/MS.

87 With the support of a PUI project (funded by the United States) on “Capacity building for the detection and quantification of PSP and CFP toxins in seafood for the management and the mitigation of HABs impacts Phase II”, a field sampling mission is being prepared in collaboration with the Marshall Islands Marine Resources Authority (MIMRA) at Ailinglaplap coral atoll in the Marshall Islands in view of preparing fish matrix reference material for Pacific Ciguatoxins.

88 Research findings and IAEA activities on HABs were communicated through over 10 publications in journals, international conference proceedings, technical reports or online news articles and student theses. We will highlight the publication of a joint IAEA- IOC/UNESCO Manual and Guide for Designing and Implementing a Plan to Monitor Toxin Producing Microalgae.

***Partnership with the Collaborative Research Centre, SFB 754, at the University of Kiel, Germany***

89 SFB 754 addresses the threat of ocean deoxygenation and its consequences on the global climate-biogeochemistry system. Originally, the low oxygen content of oxygen minimum zones (OMZ) is due to a natural process of enhanced oxygen consumption related to the remineralization of sinking organic matter produced in the nutrient rich surface waters. Some of the richest fisheries in the world supported by these nutrient rich surface waters are predicted to by highly impacted by the oxygen decline.

90 After two intensive field work campaigns in upwelling areas off the coast of Peru and Mauritania, NAEL participated in February 2015 in the SFB 754 science retreat to exchange and discuss recent results. NAEL will continue the collaboration with scientists involved in SFB754, to further contribute with more detailed data on carbon fluxes to the ongoing studies of the climate-biogeochemistry system.

***Research and development of nuclear application for studying contaminants and essential elements in marine biotas***

91 NAEL continued to use radiotracers to investigate bioaccumulation of contaminants and essential elements in marine organisms and to assess seafood safety concerns of Agency Member States. The focus for this period was on (1) factors affecting accumulation of trace metals in farmed fish, (2) effect of multiple stressors (ocean acidification, hypoxia, temperature in parallel with metals, toxins and radionuclides contamination) on fish and corals, (3) the dynamic of caesium contamination and depuration in sediment and (4) caesium incorporation in various invertebrates and fish. For the caesium experiments, the NAEL REL team investigated the exposure of different marine species through various exposure pathways to better understand the fate of accidental releases of this radionuclide into the marine environment, and to be able to address the following key questions, How is caesium accumulated? What is the major pathway and what is the transfer mechanism through the food chain? What is the overall environmental risk? The results of these studies will help to better understand, for example, the high levels found in the tissue samples of some species in Fukushima using laboratory experiments and modelling. A project on marine microplastics as vector for contaminant transfer to marine organisms has been initiated and first experiments will start in 2017.

***Activities of IAEA NAEL's "Ocean Acidification International Coordination Centre (OA-ICC)"***

92 The IAEA NAEL OA-ICC continues to help advance international activities in ocean acidification science, capacity building and communication.

93 A regional workshop addressing the impacts of ocean acidification and adaptation strategies in the Red Sea and the Gulf of Aden was organized in Jeddah, the Kingdom of Saudi Arabia, 18-20 January 2016, in partnership with the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA). The aim of the workshop, which gathered 30 participants representing 7 countries from the region, was to raise awareness about ocean acidification and its potential socio-economic impacts, assess needs for training, and identify opportunities for regional and international cooperation on OA monitoring. The OA-ICC also supported a practical training course on ocean acidification on the island of Inhaca, Mozambique, 8-12 February 2016. The course was organized by the University of Gothenburg (Sweden) and the Global Ocean Acidification Observing Network (GOA-ON) and focused on ways

of setting up meaningful ocean acidification experiments with limited infrastructure and resources. In addition, discussions continued to advance the development of an African ocean acidification network (OA-AFRICA) as initiated at the OA-ICC training course in South Africa (Cape Town, 2-6 November 2015). Fifteen students from 9 African countries participated in the course.

94 A group of 20 early-career scientists representing 11 nations in Latin-America and the Caribbean attended an OA-ICC training course on ocean acidification, 5-10 September 2016, Ensenada, Mexico, organized in partnership with the Center for Scientific Research and Higher Education of Ensenada (CICESE) and the Autonomous University of Baja California (UABC). The training course sought to give participants entering the field of ocean acidification a solid theoretical framework and practical hands-on experience needed to set up meaningful experiments. An additional goal was to offer the participants networking opportunities for future collaborative research projects in Latin America and the Caribbean, including through the recently launched Latin American Ocean Acidification Network (LAOCA).

95 The OA-ICC also supported a more advanced, practical workshop on carbonate system measurements specifically targeted to countries involved in LAOCA, held at Universidad Autónoma de Baja California, Ensenada, Mexico, from 3-10 December 2016. Six young researchers from four IAEA Member States (Argentina, Brazil, Ecuador and Peru) were able to deepen their knowledge in ocean acidification observing system design, carbonate chemistry measurement methodology, handling and calibration of instruments and sensors, and use of carbonate system computing tools.

96 In addition to training, the project also continued to provide opportunities for scientists from developing Member States to attend key international conferences to present their work on ocean acidification, network with colleagues and initiate collaborations. The project supported 4 scientists from 3 IAEA developing Member States to attend a special session on ocean acidification and its interaction with other ocean change drivers at the MARES Conference “Marine Ecosystems Health and Conservation”, Olhão, Portugal, 1-5 February 2016. The OA-ICC also supported the attendance of eight early-career scientists from six IAEA Member States (Brazil, Barbados, El Salvador, India, Kenya and Philippines) at the Global Conference on Climate Change Adaptation for Fisheries and Aquaculture (FishAdapt), 8-10 August 2016, Bangkok, Thailand.

97 The OA-ICC co-sponsored the largest international gathering on ocean acidification - the 4th International Symposium on the Ocean in a High-CO2 World - hosted in Hobart, Australia, 3-6 May 2016, by the University of Tasmania, Institute for Marine and Antarctic Studies (IMAS), New Zealand, and the Commonwealth Scientific and Industrial Research Organization (CSIRO), Australia. The event, held only every four years, discussed the key latest developments in ocean acidification science, identified future research needs and trends, and offered prime networking opportunities to hundreds of scientists working on ocean acidification from all over the world. Thanks to the support of the OA-ICC, 16 scientists from 11 developing IAEA Member States were able to attend the Symposium and present their research. The OA-ICC also provided an exhibition booth showcasing the project’s work and resources provided to the ocean acidification community.

98 The OA-ICC co-organized the 3rd GOA-ON Science Workshop, which followed the Symposium on the Ocean in a High-CO2 World (8-10 May). The workshop brought together more than 100 scientists from 40 countries and discussed GOA-ON national and regional status, linkages to other global programmes, data management, capacity building etc. Sponsored by the OA-ICC, six researchers from IAEA Members States had the opportunity to present their work and explore opportunities for cooperation with GOA-ON members from across the globe. The project also organized the first in-person meeting of the GOA-ON Biology Working Group, 10-11 October 2016 at the IAEA Environment Laboratories in Monaco. The meeting brought together 14 participants from 9 countries and identified three tasks needed to advance biological OA monitoring:

.1 provide a biologist's perspective on an ocean acidification observing network;

.2 revisit the requirements of an ocean acidification biological monitoring program; and

.3 develop a biological index allowing to link biogeochemical changes to ecosystem impacts.

99 The Fourth Annual Meeting of the OA-ICC Advisory Board took place on 2 May 2016 in Hobart, Australia, taking advantage of the presence of many of its members on the occasion of the 4th International Symposium on the Ocean in a High-CO2 World. The Board discussed the project's activities and achievements over the past year, and identified areas for improvement and priorities for the future.

100 After two OA-ICC expert meetings on international data management in 2015, work have progressed with partners to advance data portals on both observing (via GOA-ON) and biological response OA data. Prototypes were show-cased at the various meetings in Hobart mentioned above.

101 The OA-ICC also continued to work actively to coordinate discussions and efforts to develop simplified methodology to study ocean acidification, both in the laboratory and in the field. An expert meeting on ocean acidification research methodologies, organized in the framework of the IAEA Technical Cooperation project "Supporting a Global Ocean Acidification Observing Network – Towards Increased Involvement of Developing States" (INT7019), was convened 12-14 October 2016 at the IAEA Environment Laboratories in Monaco. The goal of the meeting was to advance discussions on the development of simplified protocols and ocean acidification «starter kits», in particular for research institutes with limited infrastructure and capacities.

102 The project hosted the first meeting of the "Oceans Solutions Initiative" Working Group in Monaco, 22-24 November 2016. The goal of the initiative is to contribute to the next IPCC assessment by reviewing four clusters of potential solutions to ocean acidification and climate change (mitigation, protection, repair, and adaptation) by assessing their relevance in terms of efficiency, feasibility, benefits and potential risks.

103 Two young researchers from Namibia and South Africa were supported by the OA-ICC to speak at a side event entitled: "From the U.S. West Coast to the Ivory Coast: Building Scientific and Political Capacity to Respond to Ocean Acidification", organized by the U.S. Department of State at the UNFCCC COP22, 9 November 2016, Marrakech, Morocco. The event highlighted efforts to address ocean acidification in Africa and showcased some of the activities previously organized by the OA-ICC and its international partners. The OA-ICC also contributed to a multi-partner exhibition booth at COP22, led by the Plymouth Marine Laboratory aiming to bring the science of ocean acidification and warming to decision makers. Building on success at previous COPs, the stand was trilingual (English, French, Arabic) and featured the policy briefing document «Hot, sour and breathless: ocean under stress», alongside other useful information and films.

104 Finally, work on the online OA-ICC resources continued on a day-to-day basis with updates of the OA-ICC News Stream and Website, as well as the OA-ICC Bibliographic Database, now containing 4300 references, and the OA-ICC Data Compilation on the Biological Response to Ocean Acidification, now offering access to 907 data sets from 852 scientific articles. An article describing the data compilation was published in the journal «Earth System Science Data» in February 2016.

## Radiometrics Laboratory (RML) activities

### *IAEA's project for "Marine Monitoring: Confidence Building and Data Quality Assurance"*

105 With a view to assisting the Government of Japan in its objective of making the Sea Area Monitoring Plan comprehensive, credible and transparent, the IAEA, through its Environment Laboratories, is helping to ensure the high quality of data and to prove the comparability of the results. A 3-year project 'Marine Monitoring: Confidence Building and Data Quality Assurance' (2014 – 2016) was initiated as a follow-up activity to recommendations made on marine radioactivity monitoring in a report issued by the IAEA in 2013 which reviewed Japan's efforts to plan and implement the decommissioning of the Fukushima Daiichi Nuclear Power Station. Six sampling missions and interlaboratory comparisons (ILCs) and three proficiency tests (PTs) were organized during this project. The project was concluded with a report published in 2017 showing that Japan's sample collection procedures follow the appropriate methodological standards required to obtain representative samples. The results obtained in ILCs demonstrate a high level of accuracy and competence on the part of the Japanese laboratories involved in the analyses of radionuclides in marine samples for the Sea Area Monitoring programme, corroborating the conclusions of the PTs. The project was extended for a period of 4 years.

### *IAEA Regional Technical Cooperation project RCA RAS/07/028 (Asia-Pacific) "Enhancing Regional Capabilities for Marine Radioactivity Monitoring and Assessment of the Potential Impact of Radioactive Releases from Nuclear Facilities in Asia-Pacific Marine Ecosystems"*

106 This is a new IAEA Regional Technical Cooperation Project running in the Asia-Pacific region under the "Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific" (RCA) aiming to improve the integrated regional quality-assured capabilities for marine radioactivity monitoring and for impact assessment of routine and accidental releases of radioactivity into the marine environment. The project, which runs between 2017-2020, is training scientists and laboratory staff from the region in analytical and assessment techniques for radioactivity in seawater, sediment and biota.

### *IAEA Regional Technical Cooperation project RAF7015 (Africa) "Strengthening Regional Capacities for Marine Risk Assessment Using Nuclear and Related Techniques"*

107 Due to the transboundary nature of marine pollution this project aims at assisting Member States to determine the sources of contaminants on a national and regional scale and to strengthen their capacities to analyse radionuclides, organic and inorganic pollutants in marine samples for assessing marine pollution and risk for humans. The objectives of the project are to complement and strengthen the regional capacities for monitoring marine pollution and for risk assessment using nuclear and related techniques to address trans-boundary pollution for sustainable use of marine ecosystem services and enhance socio-economic benefits and to generate national and regional databases for decision makers. Eighteen Member States are strongly cooperating in employing an integrated regional approach for effective marine monitoring. NAEL technically supports the implementation of the project by providing expertise in radionuclides measurement, QA/ QC aspects, trace elements contamination in marine organisms and seafood safety issues. (REL, RML)

### *IAEA Regional Technical Cooperation project RAF7017 (Africa) "Promoting Technical Cooperation among Radio-Analytical Laboratories for the Measurement of Environmental Radioactivity"*

108 The project is aiming to enhance the competency of the Member States in the monitoring and assessment of the environmental impact of nuclear and NORM industries. Specific objectives of the project are to establish an integrated regional quality-assured capability for the radioactivity analysis of environmental samples and to improve the competency of laboratories for the analysis of environmental samples via increased collaboration between the members of the ALMERA-

Africa regional group of the world-wide network of Analytical Laboratories for the Measurement of environmental Radioactivity (ALMERA) and mentorship by advanced laboratories in the ALMERA network. Thirty two Member States are involved in a wide range of project activities related to radioanalytical techniques and quality management. NAEL technically supports the implementation of the project by providing expertise in radionuclides measurement and QA/ QC aspects.

***IAEA Technical Cooperation project MHL7001 "Developing a National Radioactivity Monitoring Capacity in the Marshall Islands"***

109 This project has been designed to build capacity in the Marshall Islands to enable local scientists to undertake environmental radioactivity monitoring and to provide advice on radiation exposure and subsequent health consequences. The radioactive source of most concern in the Marshall Islands is the residual contamination resulting from the use of some of the islands in the 1940s and 1950s by the USA as atmospheric nuclear weapons test sites. An important objective of the project is to assist the Marshall Islands' technical personnel in addressing concerns and a current lack of understanding by the public regarding the nuclear weapons testing-related legacy issues. Therefore, there will be a strong emphasis on public engagement. The IAEA Environment Laboratories conducted an expert mission to the atoll in December 2016 to review existing sampling and laboratory capabilities and protocols and to help define the requirements for establishing a national radioactivity monitoring capability. Training and procurement of radiometric equipment has been undertaken in 2017. The project is due for completion in December 2017. A follow-up project – MHL2016002 – which aims to continue to develop this capacity has been planned for 2018 to 2021.

***Analytical quality services***

110 Production of Certified Reference Materials for radionuclides in marine samples: A new IAEA reference material is the final phases of the certification process and will be available in 2018: IAEA-465 Radionuclides in Baltic Sea sediment.

111 Proficiency Testing:
After finalising 5 PTs in between 2012 and 2016, the IAEA will organise in 2017 a sixth PT exercise with seawater samples spiked with H-3, Sr-90, Co-60, Cs-134 and Cs-137. Approximately sixty participants will take part in the 2017 proficiency test.

***MARIS database***

112 In 2016-2017 the IAEA's MARine information System (MARiS), an open-access global database for marine radioactivity measurements accessible on Internet (maris.iaea.org), is entering a new phase of development and update. Development areas include adding new data, updating and improving the website, and interacting with the wider environmental data networks. To improve data discoverability and accessibility, there are plans to link to the outfacing data portal GEOSS (Global Earth Observation System of Systems). In response to the increasing need to educate the wider general audience on the topic of marine radioactivity and the issues surrounding it FAQ pages were developed to be launched in 2017. In addition MARiS is engaged with the RiO5 working group – Radioactivity in the Oceans, 5 Decades Later – that is supported by SCOR, the Scientific Committee on Oceanic Research. In 2017, MARiS was updated with the 2017 HELCOM (Baltic Marine Environment Protection Commission - Helsinki Commission) MORS (Monitoring of Radioactive Substances) database, and will form a central part of the data collection effort of IAEA's Coordinated Research Project (CRP) K41017 "Behaviour and Effects of Natural and Anthropogenic Radionuclides in the Marine Environment and their Use as Tracers for Oceanography Studies".

***IAEA CRP K41015: "Radioanalytical and isotopic studies of climate trends and variability in marine paleo-records"***

113 This 4 years CRP was initiated in 2017, following the recommendations of an expert's meeting held in 2016 at he IAEA. The project aims to use paleo proxy records to study trends and variability in past climate. It will build upon the previous CRP "Nuclear and isotopic studies of the El Niño phenomenon in the ocean", which used nuclear and isotopic tool to study the El Niño effect in the Pacific Ocean. This new CRP will expand and take a broader temporal and spatial scope to include the study of other lower-frequency climate phenomena found in different ocean regions. The CRP will focus on the second part of the Holocene (0–5000 yBP) with emphasis on the more recent time period (0-1500 yBP), and there is scope to link this time period to more recent samples that overlap the instrumental record for the purposes of calibration, comparison and application to present day climate issues (1950 is the established reference date for 0 yBP (years before present)). The first Research Coordination Meeting was held at the Environment Laboratories in Monaco in March 2017.

***IAEA CRP K41016 project "Study of temporal trends of pollution in selected coastal areas by the application of isotopic and nuclear tools"***

114 GESAMP suggested that the IAEA supports the development and implementation of nuclear applications to coastal pollution studies. A CRP proposed in 2008 as an unfunded activity, was finally initiated in 2016. The main aim of the CRP is to develop new insights on the application of isotopic and nuclear tools in the study of temporal trends of pollution in coastal areas. The overall objective of the CRP is to provide Member States with improved and harmonised environmental archive dating tools to evaluate sources and temporal trends of pollutants, which will enable them to sustainably manage their coastal marine environment. Specific research objectives are to establish a scientific platform to improve the radiometric dating methods for defining time-trends of pollution, to verify the improved and harmonized common approach on a broad range of case studies in selected coastal areas with high sedimentation rates and to appraise pollution sources using stable- and radio- isotopes. After a 4 years period it is expected to achieve a streamlined, harmonised and validated methodology for sediment dating which will assure reliable, high quality, comparable data on temporal trends of pollutants from coastal areas in different geographical regions.

***IAEA CRP K41017: "Behaviour and Effects of Natural and Anthropogenic Radionuclides in the Marine Environment and their Use as Tracers for Oceanography Studies"***

115 This CRP aims to develop and apply methods combining advanced and rigorous data treatment and modelling approaches for determination of spatial and temporal patterns, behaviour and effects of radionuclides in the marine environment in order to provide Member States with methodological guidance, data and information on levels, trends, effects of radionuclides and their applications to oceanographic process studies. The expected outcomes of this CRP include improved guidance for IAEA Member States for assessing marine radioactivity according to harmonized, best practice methodologies; an updated, comprehensive understanding of the behaviour and effects of natural and anthropogenic radionuclides in the global marine environment and of processes affecting their distributions and increased capacity for the application of radiotracer techniques to oceanographic research. The CRP started in 2017 and is due for completion in 2022.

**INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (IOC of UNESCO)**
**Global Ocean Science Report (GOSR)**

116 On World Oceans Day, 8 June 2017, IOC-UNESCO presented the first ever global stock-taking of marine science at the United Nations' Ocean Conference in New York. The Global Ocean Science Report identifies and quantifies the key elements of ocean science at the national, regional and global scales, including workforce, infrastructure and publications. It is the first collective attempt to systematically highlight opportunities as well as capacity gaps to advance international collaboration in ocean science and technology. Developed as a resource for policy-makers, academics and other stakeholders seeking to harness the potential of ocean science to address global challenges, the Report makes a case for increased funding in view of the ocean's economic importance and key role in regulating the climate.

117 To be published every five years, the inaugural Report also serves as an instrument to assess progress in the accomplishment of Sustainable Development Goal (SDG) 14 on the conservation and use of the oceans, seas and marine resources. The full Report, in English, as well as the Executive Summary, in the six official UN languages, are available online.

**Ocean acidification**

118 Ocean acidification (OA) is a global concern and is a risk to marine biodiversity, ecosystems and human society, and in order to improve the knowledge and close existing observation gaps in this regard IOC-UNESCO is an active member in the Global Ocean Acidification Observing Network (GOA-ON). IOC-UNESCO particularly supports the development of improved recommendations regarding biological observation to measure the impact of ocean acidification is strongly supported by the IOC-UNESCO. One element is the co-leadership in the biological working group of GOA-ON).

119 IOC further hosted the annual Executive Council meeting of GOA-ON in April 2017 at UNESCO Headquarters. This meeting was used to outline the upcoming goals and objectives, to plan future actions (e.g. the implementation plan, capacity building activities), but also to advance with the methodology for the SDG indicator 14.3.1, which addresses ocean acidification.

120 IOC participated and co-organized several side events related to ocean acidification at the Preparatory committee of the UN Ocean Conference in February 2017 and at the conference in June 2017 itself. IOC's is highly involved and partner in several voluntary commitments related to ocean acidification –e.g., #OceanAction15274; #OceanAction16542, #OceanAction15798.

121 GOA-ON has now 354 members, from 64 countries (2015: 150 scientists, 31 countries) and is constantly growing. New members from Latin America (members from: Chile, Venezuela, Ecuador, Nicaragua) and the Western Pacific (members from: Philippines, Malaysia, South Korea, Thailand, China, Palau, Indonesia, Micronesia, Fiji, Hong Kong) joined the network since the 43rd session of GESAMP. In addition, a strong increase in African scientists joining the network was noticed. While before only experts from South Africa participated in the network now researchers from: Angola, Mozambique, Kenya, Nigeria, Algeria, Cameroon, Senegal, Egypt, Ivory Coast, Congo, Namibia, South Africa, Mauritius, Tanzania and Nigeria are part of the group.

122 The IOC, IOC-WESTPAC, established an Ocean Acidification Observing Working Group in the Western Pacific in 2015/2016. With adapted guidelines for measuring the chemical and biological impacts of ocean acidification, this group of experts started chemical measurements and deployed the devices needed to detect the effects of increasing $CO_2$ concentrations on coral growth and survival.

123 In 2016, the platform of the UNFCCC COP22 was used to raise awareness for ocean acidification, highlighting the anthropogenic impact on marine environment, which going to lose its capacity to act as a carbon sink. During the conference several high-level side events and

workshops were organized with the support of IOC, resulting is an improved profile of IOC within the scientific and political community.

124 All these activities feed into the actions undertaken by IOC to equip countries to fulfil the agenda 2030, SDG 14 to protect the ocean and its resources.

**Blue Carbon**

125 The Blue Carbon Initiative, established in 2011 by the IOC, the International Union for the Conservation of Nature (IUCN) and Conservation International (CI) works to develop management approaches, financial incentives and policy mechanisms for ensuring the conservation, restoration and sustainable use of coastal blue carbon ecosystems. The IOC is highly involved in the Blue Carbon Scientific Working Group, which provides the scientific foundation for the Blue Carbon Initiative by synthesizing current and emerging science on blue carbon and by providing a robust scientific basis for coastal carbon conservation, management and assessment. Priority research of the Scientific Working Group functions in close partnership with the Initiative's Policy Working Group.

126 IOC is further one coordinating member of the International Blue Carbon Partnership, a unique body which brings together governments, NGOs, IGOs and UN-Agencies.

127 IOC-UNESCO supported the organization of related side events at the Preparatory committee of the UN Oceans Conference in February 2017 and at the conference in June 2017 itself. In collaboration with the Blue Carbon Partnership these events gave the opportunity to connect high level representatives and scientists to raise awareness for the central role of these ecosystem for carbon sequestration. IOC is further partner in a Blue Carbon Voluntary commitment - #OceanAction15003.

128 The 2016 annual workshop of the scientific working group of the Blue Carbon Initiative with the support of IOC-UNESCO, took place in Manado, Indonesia, September 2016.

**De-oxygenation**

129 De-oxygenation is a global problem in coastal and open regions of the ocean, and has led to expanding areas of oxygen minimum zones and coastal hypoxia. In the coastal ocean, the number of reported dead zones has increased exponentially since the 1960s with more than 600 systems now. The recent expansion of hypoxia in coastal ecosystems has been primarily attributed to global warming and enhanced nutrient input from land and atmosphere. The global extent and threat to human health and marine ecosystem services of ocean deoxygenation are just beginning to be appreciated; the social and economic consequences have yet to be determined but are likely to be significant. To create awareness towards the impacts of deoxygenation on the marine environment and finally ocean and human health an IOC expert group – the Global Ocean Oxygen Network- was formed. After the establishment of the Global Ocean Oxygen Network (GO2NE) at the 49th session of the IOC Executive Council a draft of a technical brief, summarizing the threat of decreasing oxygen concentrations in the coastal seas and open ocean is completed. This publication is currently in its final stages and will be published in September/October 2017. The first working group workshop was hosted by IOC in September 2016 and a half-day workshop was conducted at the 10th International Scientific WESTPAC Conference, which resulted in the formation of a regional WESTPAC O2NE (Western Pacific Ocean Oxygen Network). To increase the awareness among policy makers about the risk of low oxygen areas in the coastal and open ocean, the impacts on ecosystem services, ocean and human health, GO2NE organized a side event at the UN Oceans Conference in June 2017. This event also highlighted the voluntary commitment submitted by IOC with regard to deoxygenation - #OceanAction15767. Furthermore, GO2NE is further participating in the organization committee of the international conference 'Ocean Deoxygenation: Drivers and Consequences – past – present – future, in Kiel, Germany, 3-7 September 2018.

**Time Series**

130 Since 2013 the establishment of an interdisciplinary IOC working group, the International Group for Marine Ecological Time Series (IGMETS), has offered the possibility to improve model projections and forecasts needed to understand open ocean and coastal changes. IGMETS has delivered several products as a global map, a global assessment, and an interactive visualizer. This group of experts was decided to be supported during the 49th session of the IOC Executive Council. IGMETS focuses on ship based time series globally, analyzing phyto- and zooplankton together with nutrients and physical information (temperature, salinity), and couples these global observations with synoptic satellite data to obtain spatially distributed information. The information provided addresses new scientific questions and serves a well-established community of practice related to ship-based time series. The IGMETS report will publish its report in September 2016.

131 As from 2016 an affiliated group has worked specifically to investigate Climate Change and Global Trends of Phytoplankton in the ocean, in particular the coastal ocean (TrendsPO). The Group continues the comparative analysis and synthesis of long time series data sets compiled by SCOR WG137, and expands the focus not only to the continental shelf and open oceans, but also to estuarine and upstream freshwater ecosystems where perturbations from terrestrial, atmospheric, oceanic sources and human activities converge to cause changes that ramify across local and global scales. The Group examines the land and sea connectivity using long time series of available data.

**Harmful Algal Blooms**

132 A number of Task Teams, working groups and activities are operating and reporting to the IOC Intergovernmental Panel on HABs (IPHAB). Several of the groups contribute to the development of a '*Global HAB Status Report*' with the aims of compiling an overview of HAB events and their societal impacts; providing a worldwide appraisal of the occurrence of toxin-producing microalgae; and assessing the status and probability of change in HAB frequencies, intensities, and range resulting from environmental changes at the local and global scale. The development of this report is intimately linked with the systematic compilation of HAB data in OBIS and the IOC Harmful Algal Event Data base HAEDAT and is funded by Flanders and cosponsored by the IAEA.

133 Another key activity under IPHAB is on Ciguatera Fish Poisoning (CFP) which the most extensive human illness caused by harmful algae. The IPHAB has initiated the development of a UN Coordinated Ciguatera Strategy involving the Food and Agriculture Organization of the United Nations (FAO), the International Atomic Energy Agency (IAEA), and the World Health Organization (WHO).

134 The long term focus of the IOC Harmful Algal Bloom (HAB) programme is on improved understanding of the factors controlling HAB events and thereby improving management and mitigation options. The scientific key questions have for more than a decade been addressed jointly with the Scientific Committee on Oceanic Research (SCOR) through research programmes. The current decadal IOC-SCOR research programme to meet societal needs in a changing world is entitled GlobalHAB and launched in May 2017 its science and implementation plan (www.globalhab.info).

**IOC Joint action with ICES and IMO on Ballast and other Ship Vectors**

135 The ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors (WGBOSV) critically reviews and reports on the status of shipping vector research with an emphasis on new developments in ballast water treatment technology, risk assessment, ballast water sampling devices, and selection of ballast water exchange zones. The WG also discusses and evaluates the sampling strategies to ensure that international guidelines are based on accurate scientific

information, thereby helping to achieve consensus on difficult and technical issues. The ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors (WGBOSV) met at the NOAA Northeast Fisheries Science Center in Woods Hole, USA, on 15–17 March 2017, including a joint meeting on 15 March with the Working Group on Introductions and Transfers of Marine Organisms (WGITMO). WGBOSV considered two ToRs jointly with WGITMO, examining biofouling as vector for the introduction and transfer of aquatic organisms on small boats and large ships (ToR e) and examining the effect of climate change on the establishment of aquatic species in the Arctic (ToR d).

136 WGBOSV members have submitted numerous manuscripts about methods for collection and analysis of ballast water samples to a special issue in the Journal of Sea Research, and developed a submission to the International Maritime Organization concerning the type of scientific data that should be collected during the experience-building phase after entry-into-force of the ballast water convention. Two additional scientific review papers were initiated and progressed intersessionally. One new recommendation came out of the meeting: to formalize the role of the International Maritime Organization (IMO) with the WGBOSV and to formalize the cooperation between ICES, IMO and Intergovernmental Oceanographic Commission (IOC) through a submission from ICES Secretariat to IMO Secretariat. As last year's recommendation to initiate discussion/coordination with other Arctic organisations (e.g. PAME, CAFF) with a view to jointly address non-native species issues in the Arctic has not yet been responded to, it has been restated in this report.

137 Full report at http://www.ices.dk/community/groups/Pages/WGBOSV.aspx

**Nutrient's coastal Impacts research**

138 Nutrient over-enrichment of coastal ecosystems is a major environmental problem globally, contributing to problems such as harmful algal blooms, dead zone formation, and fishery decline. Yet, quantitative relationships between nutrient loading and ecosystem effects are not well defined. The IOC Nutrients and Coastal Impacts Research Programme (N-CIRP) is focussing on integrated coastal research and coastal eutrophication, and linking nutrient sources to coastal ecosystem effects and management in particular. A key component in the implementation strategy is a four-year Joint UNEP-IOC Global Environment Facility (GEF) Project 'Global foundations for reducing nutrient enrichment and oxygen depletion from land-based pollution' which was launched in March 2012. The IOC is leading the Project research component which delivers global and local models for impact of nutirent loading. As part of the implementation strategy for N-CIRP, IOC also actively participates in a UNEP led ´Global Partnership on Nutrient Management' (GPNM) with intergovernmental organizations, non-governmental organizations and governments. GPNM has an online information portal to enable GPNM partners to monitor progress on implementing activities related to the sustainable use of nutrients. The platform provides a knowledge hub, networking opportunities and promotes global discussions on sustainable nutrient management.

**Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socio-Economic Aspects – World Ocean Assessment**

139 The 1st World Ocean Assessment report under the United Nations was finalized in December 2015 and released in January 2016. Hundreds of scientists from many countries, representing various disciplines and steered by a 22-member Group of Experts, examined the state of knowledge of the world's ocean and the ways in which humans benefit from and affect it

140 IOC contributed to this effort by providing scientific and technical support throughout this five-year process. In December 2016, the UN General Assembly (UNGA A/RES/71/257) following the recommendations of the Ad Hoc Working Group of Whole decided to launch a new cycle of assessment, WOA-II (2016–2020). The Ad Hoc Working Group also adopted a Programme of Work for the period 2017-2020.

141 As part of its decision, the UNGA established a new Group of Experts to carry out the assessment, building on an international pool of experts. It also called for the appointment of national focal points to facilitate the implementation of the programme of work of the second cycle of the Regular Process, in particular with respect to the nomination process for additional experts to the Pool of Experts, the swift communication between the scientific community, the Group of Experts, the Pool of Experts, the Bureau and the secretariat of the Regular Process, as well as awareness-raising matters.

142 The programme of work for the period 2017-2020 for the second cycle of the Regular Process, which was adopted by the Ad Hoc Working Group of the Whole on the Regular Process at its meeting from 3 to 9 August 2016 and endorsed by the General Assembly in its resolution 71/257 of 23 December 2016 on "Oceans and the Law of the Sea" (paragraph 299), envisages a total of ten regional workshops to be held in two rounds beginning from the second half of 2017 and continuing into 2018. These workshops will serve to, inter alia, raise awareness, provide information, and receive feedback on the First Global Integrated Marine Assessment ("World Ocean Assessment I"), generate interest from the scientific community, contribute to capacity-building and inform the scoping and preparation phases and the collection of regional-level information and data for the preparation of the assessment(s) of the second cycle. In order to facilitate the holding of workshops for the second cycle of the Regular Process, the Bureau of the Ad Hoc Working Group requested the Group of Experts to review the applicability of the Guidelines to the first round of regional workshops of the second cycle of the Regular Process since the focus of the workshops is different from those of the first cycle. In that regard, the Group of Experts was requested to either revise the Guidelines, or prepare new Guidelines as required. The Group of Experts has prepared elements for new Guidelines which were approved by the Ad Hoc Working Group at its meeting of 17-18 April 2017. It also considered and adopted the terms of reference and working methods for the Group of Experts for the second cycle.

143 Pursuant to paragraphs 299 and 307 of General Assembly resolution 71/257, the Group of Experts also prepared three Technical Abstracts based upon World Ocean Assessment I. These are meant to provide a way to share WOA –I findings and support other ocean-related intergovernmental processes, namely the 2030 Agenda for Sustainable Development; General Assembly resolution 69/292: 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 (BBNJ); and the United Nations Framework Convention on Climate Change.

144 The 2016 UNGA resolution also Invited IOC as well as other UN bodies to assist in the implementation of the second cycle of the Regular Process with regard to the following activities: awareness-raising, the identification of experts for the Pool of Experts, technical and scientific support to the Bureau and the Group of Experts, hosting workshops and meetings of the writing teams, capacity-building and the scoping process for the assessment(s) of the second cycle.

145 To respond to the UNGA invitation to continue supporting the Regular process, the IOC may continue to provide support to the Regular Process in the following manner:

(i) Engaging IOC Member States and their experts into the Process, particularly to encourage new nominations to the dedicated pool of expert that will support the WOA-II implementation;

(ii) assistance with the information (incl. communication) and data management aspects of WOA-II;

(iii) the co-organization of regional workshops on the Regular Process through IOC's Regional Subsidiary Bodies;

(iv) the conduct of capacity-building activities related to marine assessment in view of regional requirements, possibly in cooperation with UN Environment;

(v) the provision of assessment products, results and data upon request from the lead authors and experts in charge of the WOA report preparation;

(vi) hosting of group of experts meetings and/or writing team meetings;

(vii) support to the WOA report editorial process; and

(viii) communication to scientific community and IOC Member States on the objectives of the Regular Process.

**Transboundary Water Assessment Programme**

146 IOC completed the implementation of the marine components of the Transboundary Water Assessment Programme (TWAP) funded by GEF. From the IOC perspective, TWAP is the first integrated and global marine assessment that the Commission is leading, and the results produced have the potential to inform a number of ocean governance mechanisms; these include the GEF, other UN agencies with an ocean mandate, other global assessment processes such as WOA and Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES), regional seas organizations, and LME commissions, as well as Member States. In order to conduct this assessment, IOC established a consortium of institutional partners and experts for the current Open Ocean and LMEs assessments (these include for e.g. NOAA, IGBP, GESAMP, UNEP-WCMC, University of British Colombia, National Center for Ecological Analysis and Synthesis (NCEAS), amongst others).

147 The final TWAP deliverables released in July 2016, include a set of technical assessment reports for LMEs and Open Oceans, as well as summary for decision-makers, and a data portal where indicators can be visualized and data downloaded (www.onesharedocean.org).

148 The TWAP Full size project as implemented by UNEP as Implementing Agency, UNEP's Division of Early Warning and Assessment (DEWA) as Executing Agency, and the following lead agencies for each of the water system categories: the International Hydrological Programme (IHP) of the UNESCO for transboundary aquifers including groundwater systems in small island developing states (SIDS); the International Lake Environment Committee Foundation (ILEC) for lake basins; UNEP-DHI Partnership - Centre on Water and Environment (UNEP-DHI) for river basins; and the IOC/UNESCO for large marine ecosystems (LMEs) and the open ocean. The institutional partnerships forged in this assessment are envisioned to seed future transboundary assessments.

**OBIS**

149 Between May 2016 and May 2017, the Ocean Biogeographic Information System (OBIS) grew with 133 datasets to a total of 48.4 million records, and not less than 45 publications have cited OBIS in the first half of 2017. OBIS is organized around national, regional and thematic OBIS nodes, which are responsible for the data flow from data providers to the central OBIS node, including ensuring the quality of the data. The OBIS secretariat at the IODE project office integrates all the data in a central, open-access database.

150 Two new OBIS nodes were established in the first half of 2017. The Institute of Oceanography and Environment (INOS) of the University of Malaysia Terengganu joined the OBIS network as the OBIS node in Malaysia. INOS is already an IODE Associate Data Unit as well as a Regional Training Centre under UNESCO-IOC's OceanTeacher Global Academy. This institute is a premier centre of excellence in Malaysia that focuses its activities on oceanic and marine related research and post-graduate training. INOS will support the OBIS activities in the

Asian region and will organise an OBIS training course for Asian OBIS nodes and candidate OBIS nodes in October 2017.

151 The Permanent Commission for the South Pacific (CPPS) has become an IODE Associate Data Unit and joined OBIS as a new OBIS node. CPPS is an intergovernmental body created in 1952. This Regional Maritime Organization promotes and articulates the cooperation and coordination of the maritime policies of its Member States: Chile, Colombia, Ecuador and Peru. CPPS administrates two online information systems: the Information System on Marine Biodiversity and Protected Areas (SIBIMAP) and the geoportal of the Southeast Pacific Data and Information Network to Support the Integrated Coastal Area Management Project (SPINCAM). One of the CPPS objectives is become a knowledge node in the region and provide a permanent platform to integrate data from different projects and programmes carried out in the region.

152 In December 2016, the Biology and Ecosystems Panel of the Global Ocean Observing System (GOOS BioEco), the Marine Biodiversity Observation Network (MBON) of the Group on Earth Observations Biodiversity Observation Network (GEOBON), and OBIS signed a collaboration agreement to build a sustained, coordinated, global ocean system of marine biological and ecosystem observations by enhancing existing observation scope and capacity, identifying essential ocean variables, collecting the observations deemed necessary to best assess ocean living resources, implementing best practices and international standards, and enhancing global capacity to ensure continuity of global marine biological and ecosystem observations for the long term. OBIS continues to be an important information source for the identification of Ecologically or Biologically Significant Areas (EBSAs) of the Convention on Biological Diversity (CBD).

**UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP)**

153 During the 2016-17 intersessional period, UNDP's Ocean Governance programme continued implementation and development of a broad portfolio of ocean projects including management of Large Marine Ecosystems, 'greening' the shipping industry, integrated coastal management, sustainable fisheries, and support to SIDS in applying 'ridge to reef' integrated natural resources management approaches.

154 UNDP/GEF ocean projects under implementation included the Caribbean Sea and N. Brazil Shelf LMEs project (CLME+; www.clmeproject.org); GloBallast Partnerships (with IMO, completed its 17 year operational period in June 2017, http://globallast.imo.org ); PEMSEA (www.pemsea.org ); Pacific SIDS Ridge-to-Reef programme (www.pacific-r2r.org/); Global Marine Commodities Project; Coastal Fisheries Initiative (LAC Component, www.fao.org/in-action/coastal-fisheries-initiative/en/); Pacific Oceanic Fisheries Management 2 (with FAO, FFA and SPC, www.ffa.int/node/1732); Global Maritime Energy Efficiency Project (GloMEEP, with IMO, http://glomeep.imo.org); LME:LEARN (with IOC/UNESCO); Yellow Sea Large Marine Ecosystem project (http://yslme.iwlearn.org ).

155 In addition, over the last 12 months, UNDP secured approval for GEF financing of four new ocean and coastal projects of relevance to the work of GESAMP; these include:

- Reducing Pollution and Preserving Environmental Flows in the East Asian Seas through the Implementation of Integrated River Basin Management in ASEAN Countries (in cooperation with ASEAN and PEMSEA);

- Building Partnerships to Assist Developing Countries Minimize the Impacts from Biofouling - GloFouling Partnerships (in cooperation with IMO); Strengthening capacity for international cooperation in the ecosystem-based management of the Antarctic Large Marine Ecosystem (in cooperation with CCAMLR); and

- Catalysing implementation of a Strategic Action Programme for the Sustainable Management of Shared Living Marine Resources in the Humboldt Current System (HCS).

156 UNDP also participated in and contributed to a number of global ocean conferences and related meetings and symposia, including the Ocean Conference (5-9 June 2017); UN High Level Political Forum (oceans/SDG14 side events); 2016 & 2017 Stockholm World Water Week (SDG6/14 Source-to-Sea sessions); Large Marine Ecosystems Conference (5-9 Dec 2016); ocean lectures to Int'l Ocean Institute Master's program (Malta, Dec 2016). Linked to the June Ocean Conference, in 2017 UNDP launched a series of ocean publications:

- Sea, My Life (UNDP/GEF Biodiversity & International Waters);
- The Large Marine Ecosystem Approach: An Engine for Achieving SDG14 (UNDP/GEF, IOC/UNESCO, LME:LEARN);
- Large Marine Ecosystems & Sustainable Development: A Review of Strategic Management Processes and Goals (UNDP/GEF);
- The GloBallast Story: Reflections from a Global Family (GEF/UNDP/IMO GloBallast programme); and
- Making Waves: Community Solutions, Sustainable Oceans (GEF/SGP, Equator Initiative).

157 In support of the Ocean Conference, UNDP also launched and managed the Ocean Action Hub (www.oceanactionhub.org) which remains in place as a platform to promote networking, news/info, sharing of best practice and partnership building in support of SDG14 and the Ocean Conference Voluntary Commitments.

**FOOD AND AGRICULTURE ORGANIZATION (FAO)**

**FAO study on "Microplastics in fisheries and aquaculture: occurrence and impacts"**

158 With the support from UNEP, and, in particular with Norwegian funding, FAO carried out an assessment study on "Microplastics in fisheries and aquaculture: occurrence and impacts".

159 The preparation of a draft review document was commissioned. The resulting draft review document was then shared with a range of international experts in the fields of ecology of marine microplastics pollution, fisheries and aquaculture, and seafood safety risk assessment, modelling and management. A technical workshop was convened in December 2016 in Rome with a range of selected invited experts who discussed and worked on the review document. A number of attending experts had also contributed to GESAMP Working Group 40 on microplastics, and Dr Peter Kershaw kindly agreed to chair the workshop in Rome.

160 The experts also assessed the potential impact of microplastics and related contaminants on fish consumers' health and the consequences on fish productivity. The results show no evidence that microplastics' ingestion has negative effects on wild or farmed aquatic organisms. While humans can be exposed to microplastics through fish consumption, current scientific evidence shows that the effect is negligible for the largest microplastics. It is thought that the risk associated with the consumption of fishery and aquaculture products contaminated with microplastics is negligible and their benefits are known to be numerous.

161 However, the report highlights some knowledge gaps, in particular regarding smaller sized microplastics and nanoplastics. Eventual risks linked to nanoplastics are likely to be higher than for microplastics. Nonetheless, measures should be taken at international, governmental and

consumer levels to undertake cost-effective seafood safety risk assessments on micro- and nanoplastics and associated polymers, to reduce plastic use and encourage the use of alternative materials, recycling and the adoption of sustainable practices in using plastics and managing plastic pollution.

162 Following several review efforts and revisions the document “Microplastics in fisheries and aquaculture: occurrence and impacts” is being published as a FAO Fisheries and Aquaculture Technical Paper.

163 Clearly, this initiative has benefited significantly from previous efforts by GESAMP WG 40. FAO is grateful to GESAMP, its chairperson and to GESAMP WG 40, as well as to all partner agencies for their interest and support in this initiative.

## WORLD METEOROLOGICAL ORGANIZATION (WMO)

164 WMO is the authoritative voice on the state and behaviour of the Earth’s atmosphere, its interaction with the oceans, the climate it produces and the resulting distribution of water resources. WMO contributes to ocean-related issues through the observation and monitoring of the ocean, the climate and the composition of the atmosphere; research on the climate and Earth systems; development and delivery of services for disaster risk reduction, including marine hazards; and provision of science-based information and tools for ecosystem effects assessments, policymakers and the general public at regional and global levels.

### Marine observations and applications

165 WMO continues to strengthen the global observing systems through implementation of the WMO Integrated Global Observing System (WIGOS) and WMO Information System (WIS), and observing networks with partners. For instance, the IOC-WMO-UNEP-ICSU Global Ocean Observing System (GOOS) continues to improve its capabilities in climate- and ocean-related services, and recognizes the importance of coastal observations and links to products for societal benefits. WMO is also collaborating with partner organizations such as the IOC-UNESCO to further develop, optimize and maintain in complement to satellite observations and remote sensing technology, *in situ* marine meteorological and oceanographic (metocean) observing networks in support of applications such as weather forecasting and operational meteorology, monitoring, understanding and prediction of climate variability and climate change at various time scales, ocean forecasting and marine services activities, the protection and sustainable development of the ocean and marine environment, and the efficient management of marine resources, including disaster risk reduction in coastal regions.

166 In face of evolving requirements and advances in observing technology, and in response to GCOS requirements in particular, the WMO and the IOC of UNESCO through the Joint WMO-IOC Commission for Oceanography and Marine Meteorology (JCOMM) are revising observing network implementation targets and addressing the means to reach those targets in the most cost-effective way. WMO also continues its collaboration with IMO and IHO for coordinated and standardized metocean information, forecasts and warning services for safety of life and property at sea, improved marine environment and sustainable management of natural resources, with due focus on Polar Regions.

### Climate science and the oceans

167 A significant body of oceanographic research of direct benefit for decision-making in climate related risks is spearheaded and coordinated by the WMO-IOC/UNESCO-ICSU co-sponsored World Climate Research Programme (WCRP). Through its scientific leadership to consolidate global and regional efforts to understand the dynamics, the interaction and the predictability of the coupled ocean-atmosphere system, significant improvement has been made in understanding climate variability and changes, as well as the benefit of society and the

environment in which we live – such as predictive experiments for the future state of climate system and project how it will evolve under different emission scenarios.

168 Development of scientific methods for treatment of uncertainty in climate-related decision-making is one of key subjects of research conducted by WCRP; a WCRP Grand Science Challenge on "Regional Sea Level Change and Coastal Impacts"[1] addresses the imperative need for integrated interdisciplinary approach to establish quantitative understanding of regional to local sea level variability, to foster the development of sea level predictions and projections that are of increasing benefit for coastal zone management. The Grand Challenge on "Carbon feedbacks in the Climate System"[2] is investigating land and ocean biogeochemical cycles and feedbacks on $CO_2$ concentrations and climate in order to better understand sources and sinks.

**Monitoring and mitigating climate change**

169 The Global Atmosphere Watch (GAW) continues to assess the latest trends and atmospheric burdens of the most influential long-lived greenhouse gases (LLGHGs). Results are published in WMO/GAW Annual GHG Bulletins[3].

170 In an effort to improve coordination of $CO_2$ observations between atmospheric and ocean communities, a special session on measurements of dissolved greenhouse gases and related ocean tracers was held at the 18th WMO/IAEA Meeting on Carbon Dioxide, Other Greenhouse Gases, and Related Measurement Techniques (GGMT-2015), on 13–17 September, 2015 in La Jolla, California. Recommendations for QA/QC procedures and ocean observations are published as GAW report 229. The 19th GGMT, taking place on 27-31 August 2017 in Dübendorf, Switzerland, also included a session on ocean observations of GHGs.

171 At the 17th World Meteorological Congress, WMO adopted a resolution on the implementation of the Integrated Global Greenhouse Gas Information System ($IG^3IS$)[4] with the aim to expand the observational capacity for GHGs, extend it to the regional and urban domain, and develop the information systems and modelling frameworks to provide information about GHG emissions to society. One of the objectives of $IG^3IS$ is to provide national and sub-national governments with timely and quantified information to support their assessment of progress towards their mitigation goals. This requires improved knowledge of the carbon cycle, including the ocean sink. The implementation of $IG^3IS$ fundamentally relies on the globally harmonized observations of GHGs, including in the oceans, and will require the development of high resolution and complex observing systems, modelling tools and data assimilation techniques.

172 WMO members recognize the issues related to climate geoengineering and that further research is needed to adequately understand the potential feasibility, the effectiveness and risks associated with various techniques. As such, they have requested an assessment of the gaps in scientific understanding on climate engineering and appropriate research to address such gaps, and for it to be conducted in close cooperation with IMO, IOC/UNESCO, IPCC, WCRP and other relevant international, academic and science bodies. As an initial response to this, WMO is a supporting agency of GESAMP WG 41 on marine geoengineering, led by IMO and also with support from IOC/UNESCO, to carry out an assessment of a wide range of marine geoengineering approaches for their potential environmental and socio/economic impacts on the marine environment (and the atmosphere where appropriate) as well as their potential scientific practicality and efficacy for climate mitigation purposes. WMO hosted the WG's second workshop

[1] See http://www.wcrp-climate.org/grand-challenges/gc-sea-level.
[2] See https://www.wcrp-climate.org/gc-carbon-feedbacks.
[3] WMO Greenhouse Gas Bulletin No. 12 (November 2016) Available at http://www.wmo.int/pages/prog/arep/gaw/ghg/ghgbull06_en.html
[4] WMO, 2016. "Integrated Global Greenhouse Gas Information System (IG3IS)". http://www.wmo.int/pages/prog/arep/gaw/ghg/IG3IS-info.html

in Geneva, Switzerland, 26-27 April 2017.

173 During the Ocean Conference held in New York (5-9 June 2017), WMO's Secretary General moderated a partnership dialogue on "Minimizing and addressing ocean acidification", co-chaired by Monaco and Mozambique. The dialogue highlighted several voluntary commitments by governments, the scientific community, private sector, international finance institutions, and other stakeholders to strengthen existing partnerships and also address gaps in areas in which action is most needed. These include enhancing the knowledge on the science of ocean acidification; of its impacts on marine species and ecosystems, and its combined effect with sea warming, oxygen loss, pollution and other stressors; the knowledge of the socio-economic impacts of ocean acidification; and actions in the areas of mitigation, adaptation, protection and restoration.

**Atmospheric composition information in support of marine ecosystem research and assessment**

174 GAW is the only existing long-term international global programme that coordinates observations and analysis of atmospheric composition changes, with a view to help improve understanding of interactions between the atmosphere, the oceans and the biosphere. The GAW Implementation Plan for 2016-2023 places an increased emphasis on the delivery of value-added and cross-cutting products and services that are relevant to society, including climate, weather forecasting, ecosystem sustainability, human health, mega-city development, agricultural productivity and many more.

175 WMO/GAW has been a long-time sponsor of GESAMP's Working Group on The Atmospheric Input of Chemicals to the Ocean (WG 38). WG 38 has published numerous studies related to the impact of atmospheric deposition of anthropogenic nitrogen to the ocean. WG 38 is now focusing on two new activities approved by GESAMP at its 42nd session: 1) an investigation of the changing atmospheric acidity and the oceanic solubility of nutrients, and 2) an investigation of the impact of ocean acidification on fluxes of non-$CO_2$ climate-active species. The WG developed a list of review papers to be completed on these topics at two simultaneous workshops held at the University of East Anglia, UK, 27 February to 2 March, 2017. See the report from the co-chairman of Working Group 38 submitted to GESAMP 44 for details.

176 One of GAW's cross-cutting activities is the production of global maps of total atmospheric deposition, aerosols and gases for a number of atmospheric chemicals of importance for aquatic (freshwater and marine) and terrestrial ecosystems and human health (e.g. sulphur, ozone, nitrogen and other nutrients) through the application of the emerging technique of measurement-model fusion. A workshop was held at the WMO Headquarters, Geneva, Switzerland on 28 February to 2 March, 2017 to review existing knowledge and information and to develop a project plan. One of the speakers at the workshop was Prof Timothy Jickells, co-chair of GESAMP WG 38, who provided an overview of observation- and model-based estimates of atmospheric inputs to the oceans. A summary of the workshop and a recommended path forward to develop global maps of total atmospheric deposition (starting with sulfur, nitrogen, and ozone) are published on GAW Report No. 234 [5]

177 WMO also collaborates with the marine research community through the Surface Ocean-Lower Atmosphere Study (SOLAS). WCRP has been a long-term sponsor of SOLAS. Scientists from the SOLAS community are also engaged in the work of GESAMP Working Groups 38 and 41. WMO/GAW participated in a SOLAS Science and Society workshop in Brussels, Belgium on October 26 and 27, 2016 that brought together researchers in the field of ocean-atmosphere interactions and social scientists with the goal to explore the following topics: 1) Valuing carbon and the ocean's role, 2) (In) Forming policy across the air-sea interface, and 3) The shipping industry and air-sea interactions. Since then, WMO attended a follow-up workshop at the

[5] http://www.wmo.int/pages/prog/arep/gaw/documents/FINAL_GAW_234_23_May.pdf

American University in Rome (14-15 June 2017) to further advance the preparation of a review paper on Informing policy across the air-sea interface and a second one on Stewardship in the open ocean.

**Prediction and monitoring on shorter time scales**

178 The Polar Prediction Project (PPP[6]), a joint initiative of WWRP and WCRP aims on improving predictability and services in polar regions, including predictions for sea ice. Besides providing guidance on optimizing polar observing systems, it focuses on improving the representation of key processes of the polar atmosphere, land, ocean and cryosphere and their interactions in numerical models. The Year of Polar Prediction (YOPP, mid 2017- mid 2019) is one of the key initiatives of PPP and will cover an extended period of coordinated intensive observational and modelling activities in order to improve polar prediction capabilities on a wide range of time scales in both polar regions. A specific dedicated effort in improving sea-ice observations over the Arctic Ocean is a key highlight for 2017.

**DIVISION FOR OCEAN AFFAIRS AND THE LAW OF THE SEA (DOALOS)**
**OFFICE OF LEGAL AFFAIRS**

**Introduction**

179 Among its core functions, the Division for Ocean Affairs and the Law of the Sea (DOALOS), Office of Legal Affairs, United Nations, carries out the responsibilities entrusted to the Secretary-General under the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (United Nations Fish Stocks Agreement), and as provided by the General Assembly through its annual resolutions on oceans and the law of the sea and on sustainable fisheries. This section is intended to highlight relevant information on developments related to oceans and the law of the sea issues since October 2016.

**Informal Consultative Process**

180 The United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea (the Informal Consultative Process) held its eighteenth meeting from 15 to 19 May 2017 and, pursuant to General Assembly resolution 71/257, focused its discussions on the topic entitled “The effects of climate change on oceans”. As in the past, the meeting was organized around panel presentations by experts representing developed and developing countries and reflecting various perspectives and disciplines, followed by interactive discussions.

181 Prior to the eighteenth meeting of the Informal Consultative Process, the report of the Secretary-General on oceans and the law of the sea was prepared, with a view to facilitating discussions on the topics of focus at that meeting (A/72/70). In particular, the report refers to the work of GESAMP on the topic of focus of the meeting.

182 Pursuant to General Assembly resolution 71/257, the Informal Consultative Process at its nineteenth meeting to be held in 2018 will focus its discussions on the theme “Anthropogenic underwater noise”.

[6] See http://www.polarprediction.net

**Conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction**

183 The Preparatory Committee established by resolution 69/292: 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 held its third and fourth sessions from 27 March to 7 April and from 10 to 21 July 2017, respectively. On 21 July 2017, at the end of the fourth session, the Preparatory Committee adopted, by consensus, its recommendations to the General Assembly, which contain non-exclusive elements of a draft text of an international legally binding instrument under UNCLOS that generated convergence among most delegations (Section A) and some of the main issues on which there is divergence of views (Section B).[7] Furthermore, the Preparatory Committee recommended to the General Assembly to take a decision, as soon as possible, on the convening of an intergovernmental conference, under the auspices of the United Nations, to consider the recommendations of the Preparatory Committee on the elements and to elaborate the text of an international legally binding instrument under UNCLOS (para. 2). The recommendations are contained in the Report of the Preparatory Committee established by General Assembly resolution 69/292: 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.[8]

184 Pursuant to its resolution 69/292, the General Assembly is scheduled, before the end of its seventy-second session, and taking into account the aforementioned report of the preparatory committee, to decide on the convening and on the starting date of an intergovernmental conference, under the auspices of the United Nations, to consider the recommendations of the preparatory committee on the elements and to elaborate the text of an international legally binding instrument under the Convention (para. 1(k)).

185 All documents of the Preparatory Committee are available at its website http://www.un.org/Depts/los/biodiversity/prepcom.htm, including the Chair's overviews of the first, second and third sessions, as well as the Chair's streamlined non-paper on elements of a draft text 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.

**The Regular Process for Global Reporting and Assessment of the State of Marine Environment, including Socioeconomic Aspects**

186 The Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects (The Regular Process) aims to strengthen the science-policy interface by regularly and comprehensively reviewing the environmental and socioeconomic aspects of the world's oceans, both current and foreseeable. The publication of the output of the first cycle, the first Global Integrated Marine Assessment (World Ocean Assessment) was officially launched during the Ocean Conference in New York, on 5 June 2017. In its resolution 70/235, the General Assembly decided to launch the second cycle of the Regular Process.

187 Following the launch of the second cycle of the Regular Process (resolution, 70/235 of 23 December 2015), the General Assembly, in resolution 71/257, decided that the second cycle of the Regular Process will cover five years, from 2016 to 2020, and extended the scope of the second cycle from establishing a baseline to evaluating trends and identifying gaps. The resolution further decided that the Ad Hoc Working Group of the Whole on the Regular Process should facilitate the delivery of the outputs of the second cycle as outlined in the

[7] Sections A and B do not reflect consensus (para. 1).
[8] The Advance, unedited version of the report is currently available at: <http://www.un.org/Depts/los/biodiversity/prepcom_files/Procedural_report_of_BBNJ_PrepCom.pdf>.

Programme of work for the period 2017-2020. The Programme of work, adopted at the seventh meeting of the Ad Hoc Working Group, envisages two key outputs: first, to deliver the second World Ocean Assessment in 2020 and second, to prepare assessments during the second cycle to support other ocean-related United Nations processes. Already, three Technical Abstracts have been produced, namely on the 2030 Agenda, the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, and the impacts of climate change and related changes in the atmosphere on the oceans. These technical abstracts streamline key information contained in the first World Ocean Assessment for policy-makers, and are available at the website of the Regular Process http://www.un.org/depts/los/global_reporting/global_reporting.htm. Further information about the Regular Process is also available from http://www.worldoceanassessment.org/.

188 In accordance with the Programme of work for 2017-2020, a number of regional workshops are to be organized, the first round of which will be held this year. The workshops will assist in scoping regional priorities for the assessments of the second cycle, build capacity, and facilitate outreach and awareness-raising. The first workshop will be held in Lisbon, Portugal from 14-15 September 2017 and will cover the North Atlantic, the Baltic Sea, the Mediterranean Sea and the Black Sea. UNEP will be hosting the workshop for the Arabian Sea, the Red Sea, the Gulf of Aden and the ROPME/RECOFI Sea Area, while IOC-UNESCO will host the workshop for the North Pacific. Workshops will also be hosted for the South Pacific (New Zealand) and the South Atlantic and wider Caribbean (Brazil, 14-15 November 2017).

**The Ocean Conference, including the World Oceans Day celebration**

189 Pursuant to General Assembly resolutions 70/226 and 70/303, the United Nations Conference to Support the Implementation of Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development (The Ocean Conference) was held at United Nations Headquarters in New York from 5 to 9 June 2017. The programme of the Conference consisted of eight plenary meetings, seven Partnership Dialogues and a special event commemorating World Oceans Day on 8 June. Themes for the partnerships dialogues included the following: “Addressing marine pollution”; “Managing, protecting, conserving and restoring marine and coastal ecosystems”; “Minimizing and addressing ocean acidification”; “Increasing scientific knowledge and developing research capacity and transfer of marine technology”. DOALOS was the lead focal point for the organization of the dialogue on “Enhancing the conservation and sustainable use of oceans and their resources by implementing international law as reflected in UNCLOS”.

190 Over 150 side events also took place during the period of the Conference.

191 The Conference adopted, by consensus, the inter-governmentally agreed declaration “Our ocean, our future: call for action” to support the implementation of Sustainable Development Goal 14. The report of the Conference also contains the co-chairs’ summaries of the Partnership Dialogues, as well as a list of 1380 voluntary commitments and partnerships registered within the context of the Conference for the implementation of Goal 14.

192 The advance, unedited version of the report of the Conference, together with other documents related to the Conference, is available at: https://oceanconference.un.org/.

**Sustainable fisheries**

193 Pursuant to resolutions 69/109 and 70/75, the General Assembly conducted a further review of the actions taken by States and regional fisheries management organizations and arrangements (RFMO/As) in response to paragraphs 113, 117 and 119 to 124 of resolution 64/72 and paragraphs 121, 126, 129, 130 and 132 to 134 of resolution 66/68 on sustainable fisheries, addressing the impacts of bottom fishing on vulnerable marine ecosystems and the long-term

sustainability of deep-sea fish stocks, with a view to ensuring effective implementation of the measures therein and to make further recommendations, where necessary, in the context of the informal consultations of the General Assembly on the draft resolution on sustainable fisheries in November 2016.

194 In this regard, in its resolution 71/123, while the General Assembly welcomed the important progress made by States, RFMO/As and those States participating in negotiations to establish a regional fisheries management organization or arrangement competent to regulate bottom fisheries to implement paragraphs 80 and 83 to 87 of resolution 61/105, paragraphs 113, 117 and 119 to 124 of resolution 64/72 and paragraphs 121, 126, 129, 130 and 132 to 134 of resolution 66/68 and address the impacts of bottom fishing on vulnerable marine ecosystems, it noted with concern the uneven implementation of those provisions and that, in particular, bottom fishing continued to occur in certain areas beyond national jurisdiction without an impact assessment having been completed in the 10 years since the adoption of resolution 61/105 (para. 179). The General Assembly called upon, in this regard, States, RFMO/As with the competence to regulate deep-sea fisheries, and States participating in negotiations to establish such organizations or arrangements to take a number of urgent actions regarding bottom fishing in areas beyond national jurisdiction (para. 180; see also paras. 156, 181-191 and 219). The General Assembly decided to conduct in 2020 a further review of the actions taken by States and RFMO/As in response to paragraphs 113, 117 and 119 to 124 of resolution 64/72 and paragraphs 121, 126, 129, 130 and 132 to 134 of resolution 66/68 and paragraphs 156, 171, 175, 177 to 188 and 219 of resolution 71/123, with a view to ensuring effective implementation of the measures therein and to make further recommendations, where necessary, and decided to precede that review with a two-day workshop (para. 192).

195 Relevant resolutions, reports and other documents are available on the Division's website at: http://www.un.org/Depts/los/index.htm