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GESAMP

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

REPORT OF THE 45th SESSION OF GESAMP

Rome, Italy, 17 to 20 September 2018



Food and Agriculture
Organization of the
United Nations



UNESCO



IOC



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ISA

100



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IMO FAO UNESCO-IOC WMO UNIDO IAEA UN Environment UNDP

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REPORTS AND STUDIES

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EXECUTIVE SUMMARY

0.1 Introduction: The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) held its 45th session hosted by the Food and Agriculture Organization (FAO) in Rome, Italy, from 17 to 20 September 2018. GESAMP was established in 1969 by a number of United Nations' Organizations as a Joint Group to encourage the independent, interdisciplinary consideration of marine pollution and environmental protection matters in order to avoid duplication of efforts within the United Nations system. The main topics considered at this session are described below.

0.2 Evaluation of the hazards of harmful substances carried by ships (WG 1): This working group (WG) evaluates, at the request of IMO, the hazards to the environment and human health of bulk liquid chemicals carried by ships, with over 900 hazard profiles currently on record. The hazard profile contains a unique fingerprint of each substance, providing information on 14 separate human health, environmental, and physico-chemical hazard criteria. WG 1 met once since GESAMP 44, evaluating 11 new substances to assign full GESAMP Hazard Profiles. Furthermore, the Profiles for four substances were either modified or reconfirmed, based on the consideration of new data. GESAMP noted the Working Group's progress with the preparation of the Reports and Studies publication containing the revised hazard evaluation procedure.

0.3 Review of applications for 'active substances' to be used in ballast water management systems (WG 34): GESAMP noted that the Ballast Water Management Convention had entered into force on 8 September 2017. WG 34 convened twice since GESAMP 44 to discuss and evaluate three ballast water management systems. Of these systems one received recommendation for Basic Approval, one received recommendation for Final Approval and one was recommended to not be granted Final Approval. GESAMP noted that the draft publication of the WG 34 Methodology was ready for peer review, with the aim to have the final publication available before the 50th anniversary of GESAMP in 2019. GESAMP also agreed that at present there was no need to have an annual stock-taking workshop to advance the methodology.

0.4 Atmospheric input of chemicals to the ocean (WG 38): GESAMP recalled at its 42nd session, it had approved two new activities for WG 38 to; a) investigate the changing acid/base character of the global atmosphere and ocean and b) assess the impact of these changes on certain air/sea chemical exchange processes. Following two workshops on these issues in 2017, nine papers had been published, or were either submitted in press, or were in preparation.

Finally, GESAMP noted that WG 38 would begin discussions shortly on possible issues for WG 38 to consider in late 2019 and beyond. After

consultations and discussions with WMO, the group will bring these possible issues to the attention of GESAMP next year.

0.5 Establishment of trends in global pollution in coastal environments (WG 39): The purpose of this WG is to contribute to the reduction of stress in the coastal ecosystem by providing stakeholders, scientists and society with an objective a global assessment of pollution trends over the last century in sensitive coastal ecosystems. A draft version of the final WG report was presented, and GESAMP agreed that with the submission of the final report to GESAMP this working group will have fulfilled its terms of reference and can be dissolved. However, it should be made sure, that the database will be maintained and will be made publically accessible in the future.

0.6 Sources, fate and effects of plastics and microplastics in the marine environment (WG 40): GESAMP noted that the 2017/18 period was dedicated to completing ToR 1: to produce guidelines for the monitoring and assessment of marine plastic litter, to encourage a more harmonised approach. The membership of WG 40 has been refreshed to reflect the specific needs for undertaking ToR 1. GESAMP welcomed the significant progress made by the WG and noted the continued strong interest in and commitment to the work of of the WG by the lead agencies as well as additional supporting organizations. It was also noted that further funding would be required to carry out the full, agreed work programme.

0.7 Marine geoengineering (WG 41): Since the last session, the main activity of WG 41 had been the production of the draft final report. Subsequently, the draft final report had been sent for review by GESAMP members and external peer-reviewers and these were received by the Co-Chairs in early August 2018. The Co-Chairs were currently revising the draft final report to take the reviewers comments into account. The Co-Chairs aimed to finalize the report by the end of October 2018. GESAMP noted the progress made and agreed that there was an interest to continue the work of the WG in a second phase. There would be a need to revisit the terms of reference once the WG report had been finalized, to determine which parts of the terms of reference had not been fully addressed to date

0.8 Impacts of wastes and other matter in the marine environment from mining operations, including marine mineral mining (WG 42): GESAMP considered progress made by the WG and discussed the terms of reference for the WG, noting in particular the inclusion of impacts of waste from diamond mining in the remit of the review. Following discussion, it was agreed that impacts of waste from diamond mining should indeed be included in the review. GESAMP welcomed the progress made by the WG, and noted the great interest in its work from several Sponsoring Organizations and observers.

0.9 Contribution to other UN processes: GESAMP reconfirmed its willingness to contribute to the second cycle of the UN Regular Process, to the second World Ocean Assessment, and decided to follow developments closely with a view to identify possibilities for involvement by GESAMP, at the request of the Sponsoring Organizations.

0.10 GESAMP reconfirmed its strong interest to actively engage in and contribute to the development and implementation of the International Decade of Ocean Science for Sustainable Development. GESAMP decided to identify 2-3 GESAMP Members to specifically follow the development of the Decade and identify opportunities and timing for engagement and report back to GESAMP and the Sponsoring Organizations on this by e-mail.

0.11 Side event on 'Harmful algal blooms and food security and safety in the context of climate change': GESAMP and FAO organized a special side event. The session, which was attended by approximately 40 participants, was intended to provide an overview of existing scientific knowledge and databases on harmful algal blooms and their impact on food security and food safety, as well as bring some clarity on how climate change can exacerbate this problem. The participants also considered how this ties in with GESAMP's existing and/or future work.

0.12 Identification of new and emerging issues regarding the degradation of the marine environment: On the issue of the Impact of armed conflict on the marine environment GESAMP agreed that, given its previous work on related issues, and its relevance to several of the Sponsoring Organizations, it would appropriate for GESAMP to further scope out the issue in the intersessional period.

0.13 GESAMP considered a joint proposal by FAO and IMO for the establishment of a new GESAMP Working Group, focused specifically on sea-based sources of marine litter. It was envisaged that this Working Group would support, in particular, the mandates and programmes of work related to sea-based programmes of work relating to marine litter within FAO and IMO, as well as other interested Sponsoring Organization. GESAMP agreed in principle to the establishment of the working group on sea-based sources of marine litter and related matter, under the co-lead of FAO and IMO, pending the development of a full working group proposal, including detailed terms of reference, in the intersessional period.

0.14 Scoping activities: GESAMP considered the progress of six Correspondence Groups that had been developing scoping papers in the intersessional period: 1) Relevance of inputs of disinfection byproducts (DBPs) into the marine environment; 2) Impacts of residues of chronic oil spills; 3) Causes and impacts of massive accumulations of the brown macro-algae Sargassum in the nearshore environment of the

Caribbean and West Africa; 4) Issue of emerging pollutants in pharmaceutical waste and other novelty chemicals; 5) Sand and gravel mining; and 6) Update the Information on Sources of the Main Pollutants Impacting the Global Marine Environment (The 80:20 Conundrum). GESAMP agreed on the future work for each of the scoping activities in the intersessional period.

1 INTRODUCTION

1.1 The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) held its 45th session from 17 to 20 September 2018, in Rome, Italy, hosted by the Food and Agriculture Organization (FAO). The session was chaired by Mr. Peter Kershaw, with Mr. Manmohan Sarin as Vice-Chair. The session was preceded by the GESAMP Executive Committee (ExCom) meeting and an informal meeting of the GESAMP members, both held in parallel, on 17 September 2018.

Adoption of the agenda

1.2 The meeting approved the provisional agenda, which is attached as Annex I to this report. The list of documents submitted to this session is shown in Annex II to this report and the list of participants in Annex III.

1.3 Ms Vera N. Agostini, Deputy Director, Fisheries and Aquaculture Policy and Resources Division, FAO, welcomed GESAMP to Rome and the 45th session of GESAMP. In her welcoming remarks, Ms Agostini noted the relevance of GESAMP's work to its Sponsoring Organizations, and not least to the implementation of the 2030 Agenda for Sustainable Development and SDG 14. She also noted other areas where the work of GESAMP could be relevant from FAO's perspective, such as ocean acidification and Marine Protected Areas.

1.4 The Chair expressed GESAMP's gratitude to FAO for hosting the session for the first time since 2003, and in particular for having the opportunity for an extensive dialogue on issues of mutual interest within the FAO remit.

1.5 The Chair also recognized the services of Mr. Stefan Micallef, Administrative Secretary for GESAMP, who could not attend the session due to his imminent retirement from UN service. It was noted that Mr. Micallef had more than 20 years of experience in GESAMP, initially as a member of WG 1, then as Technical Secretary for WG 1, and finally as Administrative Secretary. The Group thanked Mr. Micallef for his long service and dedication, and wished him best of luck in the future.

2 REPORT OF THE CHAIR OF GESAMP

2.1 The Chair recalled that it had been another productive period for GESAMP. The main focus, since the 44th session, had been on the planned activities of the Working Groups. He also stressed that it was pleasing to note that the Working Groups have been particularly productive this year in terms of the completion of reports or advanced drafts for publication in the Reports & Studies Series.

2.2 The support from the UN Sponsoring Organizations is greatly appreciated and GESAMP urged that this level of support should be maintained and, if at all possible, increased. The independence,

credibility and cost-effectiveness of the GESAMP model is well recognised, and the continuing delivery of high quality outputs are appreciated by the target audience and a much wider user-group. This can only be maintained with continuing support from the UN Sponsoring Organizations, financially and in-kind. The addition of the International Seabed Authority as one of GESAMP's sponsoring organizations is most welcome. It has been encouraging to see the efforts being made to maintain or increase this support by agencies, but also to note the success in securing funding from a diverse range of sources for particular working group activities, from governments and regional bodies.

2.3 In recent years intersessional correspondence groups (CGs) have addressed several important issues, to help evaluate whether these are areas GESAMP may wish to develop further. A new CG was established at the 44th Session to update the estimate of the relative importance of land- and sea-based sources of pollution ('the 80:20 conundrum'), and a substantive draft text is available for discussion under Agenda item 7. A progress report would be available for discussion under agenda item 7.

2.4 The Chair acknowledged the continuing efficient and enthusiastic support of the GESAMP Office, including the contribution of Ms Chrysanthe Kolia as the GESAMP Administrative Coordinator. The Chair wishes to record his personal appreciation of the support and helpful counsel of Mr. Fredrik Haag, as Technical Secretary for IMO, and to welcome the arrival of Mr Andrew Birchenough, bringing the Office back to full strength.

2.5 The Office continues to receive ad-hoc requests for GESAMP to contribute to UN, intergovernmental and regional initiatives, as well as less formal requests for advice or support from the media and those in the education sector. It is encouraging to see that GESAMP is seen as a source of reliable information and advice.

GESAMP and the wider community

2.6 The Chair attended the Annual Science Conference of PICES, which took place in Vladivostok in September 2017. He took part in the special session on microplastics, presenting the current work plan of GESAMP WG 40, as well as taking part in discussions with the PICES Marine Environmental Quality Committee.

2.7 The Chair was invited, by UN Environment, to be a panel member for the Science-Policy-Business Forum, which immediately preceded the 3rd UN Environment Assembly (UNEA-3) in Nairobi, in November 2017. The panel session was entitled: 'Saving oceans from plastic pollution – a look at alternative materials and green design'. He also contributed to a number of sessions during UNEA-3, related to marine litter and plastics.

2.8 The Chair was invited to attend a number of other international events during the year, but had to decline due to a number of factors, including resource constraints.

Action by GESAMP

2.9 GESAMP continues to be recognised as a source of reliable and impartial science assessment and advice. This accolade can only be maintained if there is sufficient in-kind support and financial backing to provide a vibrant programme, providing a cost-effective service for the agencies and responding to requests from external bodies to contribute GESAMP experience and expertise. There appear to be two components to ensuring that GESAMP can thrive:

- .1 for the Sponsoring Organizations to commit to supporting GESAMP both in terms of sponsoring Members to attend the annual Session and offering financial support for working group and other ad hoc activities; and
- .2 to pursue partnerships between Sponsoring Organizations and external funding bodies such as industry, foundations, intergovernmental bodies, national governments and NGOs.

3 REPORT OF THE ADMINISTRATIVE SECRETARY OF GESAMP

Outcome of the meeting of the Executive Committee of GESAMP (ExCom)

3.1 GESAMP noted that ExCom had met on Monday 4 September 2017.

3.2 ExCom discussed the financial and in-kind support, which the ten Sponsoring Organizations of GESAMP committed to in order to support the activities of GESAMP in 2018-2019. ExCom noted that the Sponsoring Organizations present, intended to, as a minimum, continue their support to the level of the previous years. The ExCom noted with great appreciation that the International Seabed Authority (ISA) had formally joined GESAMP as one of the Sponsoring Organizations in the intersessional period.

3.3 The ExCom also discussed the progress with the implementation of the communications and outreach, and noted that the GESAMP Office had recently launched the new website.

The GESAMP Office

3.4 The IMO Technical Secretary for GESAMP informed the meeting of the latest developments in the GESAMP Office, which is hosted at IMO as a co-sponsoring arrangement between the Sponsoring Organizations. GESAMP noted that the GESAMP Office continues to provide administrative support and coordination to GESAMP activities and its working groups. Since the last session, the main

activities of the GESAMP Office had 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 finalization and maintenance of the new GESAMP website;
- .4 preparation of the current session of GESAMP and the side-event on 'Harmful algal blooms and food security and safety in the context of climate change'; and
- .5 preparation for the 50th anniversary of GESAMP in 2019.

Activities and achievements of the Sponsoring Organizations of GESAMP since its last session

3.5 GESAMP considered the Administrative Secretary's report (GESAMP 45/3). The Administrative Secretary also presented an overview of the activities and achievements of the Sponsoring Organizations of GESAMP since GESAMP 44 in 2017. The highlights of these achievements are reported in detail in Annex IV to this report.

Action by GESAMP

3.6 GESAMP reiterated that the information contained in the report of the Administrative Secretary is unique and highly informative, as it provides a succinct but comprehensive overview of the work of the ten Sponsoring Organizations in the field of marine environmental protection, and the scientific aspects in particular. It was therefore proposed that the report should be given a more prominent place on the GESAMP website.

4 PLANNING OF GESAMP ACTIVITIES

4.1 Evaluation of the hazards of harmful substances carried by ships (WG 1)

4.1.1 A report of the activities of Working Group 1 (WG 1) was given by Mr Thomas Höfer, Chair of the working group.

4.1.2 GESAMP noted that since the last meeting of GESAMP, Working Group 1 had met once. The 55th session (EHS 55) was held in London from 30 April to 4 May 2018. The full report had been published as EHS 55/9, available on the GESAMP website at: www.gesamp.org/work/groups/1/sessions-reports.

Main use of GESAMP/EHS outputs

4.1.3 As outlined in previous reports to GESAMP, the GESAMP Hazard Profiles (GHP) developed by WG 1:

- .1 contain a unique fingerprint for each substance, providing information on fourteen separate human health, environmental and physico-chemical hazard criteria and consist of an alphanumeric notation designed to communicate the hazards;
- 2 are published by IMO annually as the GESAMP Composite List (circulated together with the meeting report as a PPR.1/Circular), which are placed on the IMO website for the use of maritime Administrations, the shipping industry and chemical manufacturers; and
- .3 provide the basis for the pollution categorization of over 900 substances. MARPOL Annex II and the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) utilise these profiles to determine the pollution category, ship type and carriage conditions for each chemical, for the purposes of bulk carriage in ships.

4.1.4 GESAMP recalled that the latest draft version of the Chapter 21 of the International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk (IBC Code) makes direct reference to GHP ratings for all carriage conditions including environmental protection, ship safety, and occupational health.

4.1.5 GESAMP noted that the GESAMP Composite List is the only global list of hazard classifications/ratings used for regulating hazardous chemicals on a global scale based on guidance given by the United Nations Globally Harmonized System of Classification and Labelling of Chemicals (GHS). GESAMP discussed potential conflicts with other international or regional hazard classifications (like those carried out under European regulations by the European Chemicals Agency ECHA). The Chair of WG 1 confirmed the challenge and the potential discrepancies created even when using the same GHS hazard criteria. Such potential differences after scientific evaluations by expert groups have already been identified by studies done under the United Nations' GHS programme. To identify such cases at an early stage, WG 1 is regularly checking the situation (e.g. by comparing specific hazard classifications/rating along the lists published). Additionally, a number of submissions by industry in the past were based on the fact that official national hazard classifications were not identical to the GESAMP hazard rating.

Evaluation of substances

4.1.6 The main work carried out at the last session concerned the evaluation of substances, as per the usual practice. Data on eleven new substances were

evaluated and full GESAMP Hazard Profiles (GHPs) were assigned, accordingly. The GHPs for four substances were either modified or reconfirmed, based on consideration of new data.

4.1.7 GESAMP noted that WG 1 had informally discussed the procedures and the workload when evaluating new substances. The total volume of data sets, the number of publications linked to the submitted data and the risk assessment reports on the chemical substances involved have all increased significantly during the last decade. The main reason for such an increase in the volume of data sets is the European chemicals policy with the requirements set under the so-called REACH regulation. Under this European legislation, the chemical industry has not only to establish a full set of safety information including competent summaries of scientific studies, but also to compile specific Chemical Safety Reports (CSR). Such reports usually exceed one hundred pages (often running into several hundred pages as in the cases of the substances evaluated during EHS 55) and are of a confidential nature. With the number of submissions to be evaluated during a five-day session, a full study of such documents by all members of the Working Group is not possible. New ways of making such confidential information available for the Working Group's experts in preparation of the meeting should be discussed. It was noted that there are legal restrictions for circulation of confidential data and practical challenges concerning the overall workload of the members of the Working Group when such homework would be introduced. The situation will be further discussed within WG 1.

The evolution of the Guidance on evaluation and hazard ratings

4.1.8 In 1982, almost ten years after work started on the assessment of the environmental hazards of substances carried by ships, GESAMP decided to publish the working procedures which had been written in different technical reports over the years as Reports & Studies No. 17 "The Evaluation of the Hazards of Harmful Substances Carried by Ships". Seven years later, in 1989, GESAMP published a further report No. 35 under the Reports & Studies series with more sophisticated criteria for ratings. This report showed more detailed sets of criteria to be used for ratings and guidance on measuring taint in fish as well as a data submission format. The guidance and the rating system from 1989 was successfully used for nearly ten years.

4.1.9 In the late 1990s the group was involved in the creation of a global approach to the hazard classification and labelling of chemicals and discussed the influence of biodegradation, the effects of floating substances (creating oil-like slicks) and a better inclusion of specific test data from the standardised studies introduced by OECD starting in the 1980s. The amendments to the GESAMP Hazard Evaluation Procedure were published in 2002 as "Revised GESAMP Hazard Evaluation Procedure for Chemical Substances Carried by Ships" (Reports & Studies No. 64). A further ten years later, experience

showed a need for very limited refinements of the procedure based on discussions concerning individual ratings but in particular the practise by maritime administrations and the industry to use the hazard profile for a number of carriage requirements. A second edition of Reports & Studies No. 64 was published in 2014.

4.1.10 As already discussed during the last GESAMP sessions, ongoing work at IMO on revised and new regulations for shipping (e.g. the IBC Code for chemical tankers and OSV Code for offshore supply vessels) asks for a more sophisticated evaluation of the inhalation hazard, and on a realistic scientific evaluation of mineral slurries. Emergency responders asked for the inclusion of an additional scientific evaluation of the flammability and explosion hazard. Extended and more sophisticated guidance for the evaluation and the hazard ratings of chemicals (substances and mixtures) is now needed, after more than 15 years of work based on the guidance published in 2002 as Reports & Studies No. 64.

A revised GESAMP Hazard Evaluation Procedure

4.1.11 The Group initiated discussions on possible future amendments to the existing guidance during the 53rd session in 2016, developed first drafts intersessionally and finalized draft texts and rationales during the 54th session in 2017. In 2018, at the 55th session, the Group considered the draft revision of this Hazard Evaluation Procedure that had been prepared intersessionally by EHS expert sub-groups under the coordination of the Chair.

4.1.12 Having recalled the agreed timeline for completion of the revision of the Hazard Evaluation Procedure for finalization and publication in early 2019, the Group comprehensively reviewed the draft that had been prepared intersessionally and concluded that all technical and scientific matters had been considered sufficiently and to the satisfaction of the Group.

4.1.13 The Group, inter alia, further developed the draft text that had been developed intersessionally, describing the procedure used by the WG 1 for assigning ratings to mixtures for all columns. Due to time constraints, the Group was not able to create a final version of the draft text pertaining to mixtures and agreed to further refine the already comprehensive draft during the weeks immediately following EHS 55. The Group managed to finalize all other parts of the draft revision of Hazard Evaluation Procedure and requested the Secretariat to effect editorial correction and to incorporate the text pertaining to the assignments of ratings to mixtures.

Specific work in preparation of EHS 56 in 2019

4.1.14 WG 1 continued its review of flashpoint information for products, extracted from the GISIS bulk chemicals database, and agreed to continue the review intersessionally, with a view to completing the work at EHS 56 for incorporation in the Composite List once the revised GESAMP Hazard Evaluation Procedure had been published.

4.1.15 WG 1 noted the request by IMO on advice with regard to recommended cut-off values to be used when assessing mixtures containing components with long-term health effects. Due to time constraints, the Group was unable to finalize the requested advice. However, the Group noted that, as part of its revision of Reports & Studies No.64, it was in the process of developing text describing the procedure used by the EHS Working Group for assigning ratings to mixtures, including those health hazards. The Group agreed that the relevant text from the revised Reports and Studies No. 64 would form the basis for developing a simplified recommendation, at EHS 56, for consideration by IMO.

4.1.16 After discussing the potential use of such guidance for identifying the risks of chemical mixtures for human health or the marine environment (e.g. as done by WG 34) GESAMP concluded that this would be limited to particular cases only, e.g. some acute effects. However, a general use seems not to be possible.

The Terms of Reference (ToR) for the Working Group

4.1.17 GESAMP noted that the existing terms restrict the scientific evaluation and advice to environmental hazards. However, during the last years, the EHS Working Group had been requested to evaluate occupational hazards for ships' crews and those handling the cargo, as well as to offer advice on maritime emergency response. The GESAMP Hazard Profile is used by IMO and maritime administrations for assigning minimum carriage requirements for the transport of liquid bulk cargoes, in general. Most of these technical requirements target ship safety, many relate to environmental protection and others relate to occupational protection. Upcoming IMO regulations will specify the involvement of the GESAMP EHS Working Group and the use of the GESAMP Hazard Profile in all of these three areas.

Action by GESAMP

4.1.18 Following discussion, GESAMP approved the revised terms of reference for WG 1, as set out at Annex V to this report.

4.1.19 Furthermore, GESAMP noted the WG's progress with the revision of the existing hazard evaluation procedure, and preparation of the manuscript for a new GESAMP Reports and Studies publication with an aim to have this published in late 2018/early 2019. GESAMP agreed that, as the draft revision was the result of a comprehensive review by the Group, it should be subject to a formal review by GESAMP and it should be assigned a new Reports and Studies number. Subsequently, GESAMP invited the Secretariat to take the appropriate action for the revised GESAMP Hazard Evaluation Procedure to be published well before EHS 56.

4.2 Review of applications for “active substances” to be used in Ballast Water Management systems (WG 34)

4.2.1 A report of the activities of WG 34 was given by Mr Jan Linders, Chair of the working group.

4.2.2 GESAMP noted that the International Convention for the Control and Management of Ships’ Ballast Water and Sediments (BWM Convention) was adopted at IMO on 13 February 2004, in response to the increasing concern of the international community with regard to the transfer of invasive species in ships’ ballast water. On 8 September 2017, the Ballast Water Management Convention entered into force. Currently, there are 76 contracting Parties to the treaty, representing 77.08% of the world’s tonnage.

4.2.3 Within this framework, an approval procedure has been set up for those ballast water management systems that make use of an Active Substance or Preparation to comply with the Convention. The procedure consists of a two-step approach for granting Basic Approval and Final Approval. The approval is granted by the Marine Environment Protection Committee (MEPC) based on the advice provided by the Ballast Water Working Group of the GESAMP (WG 34). There is a third step, the type approval granted by an Administration, but that is outside the remit of WG 34.

4.2.4 The more general outline, scope and aim of the BWM Convention have been addressed in the report to the GESAMP 35 (see document GESAMP 35/5/1) and will only be referred to here as the terms of reference of WG 34 have not changed.

4.2.5 This report focuses on the main activities of WG 34, which consist of the evaluation of several ballast water management systems (BWMS) and the further development of the Methodology of the Group, which has been accepted as a ‘living’ document. This means that the Methodology will be a discussion item at (almost) each meeting of the Group and changes and improvements are made, as appropriate (see further below).

Ballast water management systems

4.2.6 ‘Active Substances’ are defined by the Convention as “substances or organisms, including a virus or a fungus, that have a general or specific action on or against harmful aquatic organisms and pathogens” and the approval of BWMS using such substances is described in resolution MEPC.169(57) adopted in 2008. However, not only ‘Active Substances’ are evaluated by the WG 34. Also all other substances considered relevant are taken into account in the evaluation report. The Procedure for approval of ballast water management systems that make use of Active Substances (G9) contained in resolution MEPC.169(57) under the BWM Convention distinguishes also ‘Relevant Chemicals’ and ‘Other Chemicals’.

4.2.7 Therefore, the task of WG 34 is to evaluate the risks for the crew, the ships’ safety, the public at large and the environment from the operation of the BWMS. It is furthermore the intention of WG 34 to perform these evaluations in a consequent, consistent and transparent manner, which helps Administrations to prepare a concise dossier, containing all the necessary data. The Methodology, as developed by WG 34 in the course of its work process, serves as guidance in the evaluation.

4.2.8 WG 34 was convened twice since GESAMP 44 to evaluate proposed BWMS, both times for a regular meeting, the first from 8 to 10 November 2017, where one BWMS has been evaluated, and the second from 4 to 7 June 2018 with two BWMS to be evaluated. Of these three BWMS, one received a recommendation for Basic Approval, one was not recommended for Final Approval and one received a recommendation for Final Approval. During its meeting in April 2018, MEPC 72 agreed with the recommendation of WG 34 for the first Final Approval not to be granted. The agreement and endorsement of the Basic Approval and the second Final Approval are still pending until MEPC 73 in October 2018.

4.2.9 WG 34 was able to clear the stock of BWMS submitted for evaluation before the meeting of MEPC for which the evaluation was requested. The Group recognized that the number of BWMS presented to it had been less than in other reporting periods. Whether or not this trend will continue in the future has to be seen.

Similarity according to BWM.2/Circ.27

4.2.10 One of the BWMS evaluated had made use of the provisions of the Framework for determining when a Basic Approval granted to one ballast water management system may be applied to another system that uses the same Active Substance or Preparation (BWM.2/Circ.27), based on the Basic Approval granted to the specific BWMS under consideration at MEPC 71. In this regard, the Group had a thorough examination of whether these provisions were indeed applicable, which would allow it to proceed with the evaluation of this proposal for Final Approval without having previously reviewed a Basic Approval application for the same variation of this system.

4.2.11 Concerns were expressed with regard to certain provisions of BWM.2/Circ.27 not being fully satisfied, notably the criteria for assessing whether the Active Substance is identical and the manner of application of the Active Substance. In particular, it was noted that this variation of the system has on-board storage of the Active Substance, which appears to be in contrast with paragraph 4.3 of the circular, and it incorporates a fundamental change to the source of the Active Substance from electrolysis to chemical injection, which may be in contrast with paragraph 5.2 of the circular.

4.2.12 WG 34 noted that the fundamental concept of the system’s operation was substantially similar, ensuring continuity between the two evaluations, and

that, while the source of the Active Substance is different, the method of its application is substantially similar. In addition, the Group was of the view that a separate Basic Approval application for this variation would not have necessarily provided more information on the remaining issues, which may be addressed at Final Approval only in any case. In conclusion, recognizing also that the objective of the circular is to provide guidance that can be interpreted based on expert judgement, the Group agreed that the two variations of this BWMS were sufficiently substantially similar therefore allowing the use of this circular, and that the application for Final Approval could be evaluated on this basis.

Revision of Procedure (G9)

4.2.13 During the first meeting the revision of resolution MEPC.169(57) (commonly known as Procedure (G9)) was also discussed as a follow-up of the revision of resolution MEPC.174(58), commonly known as Guidelines (G8). Guidelines (G8) deals with the procedures to follow in order to determine the biological efficacy of the BWMS under consideration, while Procedure (G9) deals with the procedures for the evaluation of a BWMS with Active Substances in terms of the risks outlined in paragraph 4.2.6. As such the Procedure (G9) is the basis for the GESAMP-BWWG Methodology.

4.2.14 The consideration of the need for a revision of Procedure (G9) was a specific request of MEPC and was based on the revision of Guidelines (G8), which moreover became mandatory in the form of a Code, with the purpose to streamline the relation between the two. WG 34 reviewed the document from two different angles. On the one hand from the minimum changes necessary to streamline the interactions between the two, specifically in the area of mandatory wording, and on the other hand a more thorough revision based on the current status of the scientific knowledge. At MEPC 72, the Committee decided that Procedure (G9) should be revised as a consequence of the revision of Guidelines (G8), and that it was not necessary to make Procedure (G9) into a code under the Convention. Therefore, a more thorough revision of Procedure (G9) was not necessary.

Methodology for information gathering and the conduct of work of WG 34

4.2.15 The evaluation Methodology of WG 34 has been determined to be a living document based on increasing experience in the evaluation of BWMS. WG 34 added two more substances to the database of chemicals commonly associated with BWMS, based on the regularly occurring Active Substance sodium dichloroisocyanurate (NaDCC) that breaks down giving isocyanuric acid as the main metabolite, and chlorate that also often is occurring as a disinfection by-product (DBP). The current version of the database now contains 43 specific chemicals, including an AS and a neutralizer frequently used in BWMS. For these 43 substances the applicants do not have to submit the physico-chemical characteristics and the (eco-) toxicological data

anymore to IMO as the Group is of the opinion that sufficient relevant information is already available. If, however, new data becomes available, it has to be submitted to IMO in any application dossier.

Planning ahead

4.2.16 GESAMP noted that WG 34 had scheduled two meetings to accommodate potential applications, depending on the number of submissions: BWWG 37 (regular) from 26 to 30 November 2018 and BWWG 38 (additional) from 14 to 18 January 2019, if needed. Both meetings are foreseen to be held at IMO Headquarters in London.

Acknowledgement

4.2.17 WG 34 is very thankful to all the members of GESAMP that took the time to critically review the work of WG 34. The quality of the work has been improved as a result of this peer review process and the comments made were brought to the attention of the consultant involved in the drafting of the reports for future use.

4.2.18 In the discussion that followed, three topics were brought to the floor:

- .1 the publication of the WG 34 Methodology. After discussion, GESAMP decided that the current final draft should be distributed among GESAMP members for peer review, for the final publication to be available before the 50th anniversary of GESAMP in 2019.
- .2 the funding situation for the WG was discussed in relation to the possibility that insufficient applications were submitted to cover the costs of the meeting. Information was provided about the provision that an additional fee was requested in case when only one system was submitted.
- .3 GESAMP reconfirmed that since the methodology of WG 34 will be published as a document in the GESAMP R&S series, a full peer review by GESAMP Members would be required.
4. After discussion, GESAMP agreed that at present there was no need to have a yearly stock-taking workshop to advance the methodology.

Action by GESAMP

4.2.19 Following discussion, GESAMP noted that the manuscript for publication of the WG 34 methodology in the Reports & Studies series had been prepared by the WG, and was awaiting peer review by GESAMP and subsequent publication, as soon as possible.

4.3 Atmospheric input of chemicals to the ocean (WG 38)

4.3.1 Mr Robert Duce, Co-chair of Working Group 38, the atmospheric input of chemicals to the ocean,

reminded the group that GESAMP 39 asked WG 38 to address issues related to the impact of the atmospheric deposition of anthropogenic nitrogen to the ocean. A workshop was held on this topic at the University of East Anglia, United Kingdom in 2013. The results of the work during and following that workshop have now been almost completed, with 6 papers published in the peer reviewed literature and one final paper on nitrogen deposition submitted recently for publication. Following the completion of the results of these 7 papers, WG 38 prepared a synthesis report which was reviewed by GESAMP and published by WMO in early 2018 as GESAMP Reports and Studies No. 97, The Magnitude and Impacts of Anthropogenic Atmospheric Nitrogen Inputs to the Ocean.

4.3.2 At GESAMP 42 hosted by at IOC-UNESCO in Paris, GESAMP approved two new activities for WG 38 to; a) investigate the changing acid/base character of the global atmosphere and ocean and b) the impact of these changes on certain air/sea chemical exchange processes. The title of these activities are: "Changing Atmospheric Acidity and the Oceanic Solubility of Nutrients"; and "Impact of Ocean Acidification on Fluxes of non-CO2 Climate-Active Species". Two simultaneous workshops were held to address these activities at the University of East Anglia from 27 February to 2 March 2017. The workshops took the form of informal presentations from experts followed by lengthy discussion sessions exploring multiple issues and feedbacks evident in these complex air-sea interaction issues. The invited scientists were selected for their expertise and interest in these areas, and also to provide a wide spectrum of expertise from modelers to experimentalists. 34 scientists from 15 countries and from a wide range of career stages (from senior scientists through to graduate students) participated in the workshops. At the present time 9 papers have been published, are in press, have been (or shortly will be) submitted, or are still in preparation from the workshop discussions. Mr Duce and Mr Alex Baker, also a member of WG 38 and of GESAMP, presented some results from two of the recent papers.

4.3.3 For the fifth year in a row WG 38 organized a session on atmospheric input of chemicals to the ocean for the 2018 European Geosciences Union meeting, held in Vienna, Austria, in April – "Air-sea Exchanges: Impacts on Biogeochemistry and Climate". A number of oral and poster papers at this session were presented by a combination of WG 38 members and other scientists.

4.3.4 WG 38 Co-Chair, Mr Timothy Jickells, attended the INMS (International Nitrogen Management System) annual meeting in Edinburgh United Kingdom, from 16 to 19 April 2018, to represent WG 38. At the meeting he informally presented the work of WG 38 to relevant leaders of INMS activities, particularly those leading initiatives in Southeast Asia, and he presented them with details of our synthesis report. He made clear the enthusiasm of WG38 to work with the INMS initiatives if they felt that would be useful. One response has been the invitation to Mr Jickells to attend and

participate in the 2nd East Asia Nitrogen Conference in Tsukuba, Japan from 19 to 22 November 2018. He will be giving a keynote talk on the atmosphere/ocean aspects of the nitrogen cycle on behalf of WG 38, and he will participate in a subsequent workshop. We hope that this effort will increase our interactions with the INMS activity.

4.3.5 GESAMP noted that the goal of WG 38 for the next year would be to complete the submission and publication of all papers resulting from the 2017 workshop at the University of East Anglia.

4.3.6 Once again (for the sixth year in a row) WG 38 would be organizing a session on atmospheric input of chemicals to the ocean for the European Geosciences Union meeting, to be held in Vienna, Austria in April, 2019, on "Air-Sea Exchanges: Impacts on Biogeochemistry and Climate".

Action by GESAMP

4.3.7 GESAMP noted that WG 38 would begin discussions shortly on possible issues for WG 38 to consider in late 2019 and beyond. After consultations and discussions with WMO, the group will bring these possible issues to the attention of GESAMP next year. The WG had no request for funds for this coming year.

4.4 Establishment of trends in global pollution in coastal environments (WG 39)

4.4.1 A report of Working Group 39 was given by the Chair of the working group, Ms Ana Carolina Ruiz Fernandez.

4.4.2 Ms Ruiz Fernandez provided an overview of the history and work of WG 39, whose purpose is to contribute to the reduction of stress in coastal ecosystems by providing stakeholders, scientists and society with an objective and global assessment of pollution trends during the last century in sensitive coastal ecosystems. The task of WG 39 is to provide a retrospective analysis using dated environmental archives and time-series data from peer-reviewed published research. Contaminants assessed include both inorganic and organic pollutants, as well as miscellaneous pollutants such as nitrogen and phosphorus. Outputs defined in the Terms and Conditions of the WG are expected to include a bibliographic database, a methodology for the retrospective analysis, a global report including details on pollution trends in Large Marine Ecosystems (LMEs), a webpage, peer-reviewed papers and a final report.

4.4.3 A draft version of the final report of WG 39 was presented by the chair during the meeting. A summary was given about the method of data analysis, i.e. over 1 000 papers were initially screened. Finally, information was analyzed from 272 papers, which contained contaminant information from 667 and were included in the final database with data from 49 LMEs. Details were provided on the mathematical normalization of the data and the trend analysis by linear regression. The synthesis of six

selected LMEs are included in this report as case studies. The LMEs were selected on the basis of geographic distribution and information availability. They are California Current (LME03), South Brazil Shelf (LME15), Canadian Eastern Arctic - West Greenland (LME18), Baltic Sea (LME23), Arabian Sea (LME32), and East China Sea (LME47). The data is presented for various contaminants and for time periods reflecting pre-heavy industry, rapid heavy industry development, and the modern era of industrial regulation. In the report data is shown in tables, graphically and in form of a stoplight diagram for each contaminant and for contaminant families.

4.4.4 For the three different periods this 'stoplight' shows if the concentrations increased (red), were static (yellow) or decreased (green) throughout the different time periods. For all LMEs and worldwide data a summary 'trend' over the entire period, i.e. pre-heavy industry to 2015 is given, too using the same colours. All digitalized data is kept in a database (UNIMAR) housed by the chairs home Institution, UNAM, Mexico, as requested in the TOR for the WG. The report was circulated for peer review by GESAMP Members in June 2018, and additional, external reviewers in August 2018. The Chair of the WG was in the process of finalizing the revised version of the report.

4.4.5 Having reviewed the report of the Chair of the WG, GESAMP expressed appreciation for the work and noted the value of the working group's activities. Questions on the number of LMEs evaluated in detail were discussed and the lack of time to perform additional task was acknowledged.

4.4.6 Furthermore, the use of the graphical presentation using the stoplight approach was discussed and different views on how especially the colour 'red', which stands here for increasing trend within the time period would be understood, as it has no meaning with respect to toxicological effects, and it was agreed that alternative ways to display the data would be considered. GESAMP Members also expressed a concern when using the 'stoplight graphic' for the 'overall period' 1900-2015, as it only looks at the pre-heavy industry vs modern times and it is not reflecting contaminant decreases that result from regulatory measures. It was agreed that for the overall period instead, a note 'above', 'at' or 'below' pre-industrial concentrations would be more appropriate.

4.4.7 GESAMP agreed that the report would benefit from a review by a statistician, as pointed out by some reviewers. Two GESAMP Members (Alex Baker and Tracy Shimmield), volunteered to review the final product for language consistency. GESAMP agreed that after completion, the report will be published in GESAMP Reports and Studies report and GESAMP strongly encouraged a submission to a peer-reviewed journal too.

4.4.8 GESAMP noted that, overall the results presented in the report show that for most contaminants that have been regulated the concentration has gone down, which should be

highlighted better, since this would be particularly important, when interpreted in a policy context.

Actions by GESAMP

4.4.9 GESAMP agreed that with the submission of the final report to GESAMP this working group will have fulfilled its TOR and can be dissolved. However, it should be made sure, that the database will be maintained and publically accessible in the future. It is understood that the data from the other LMEs would also be evaluated and published at some point.

4.4.10 GESAMP thanked the Chair of the WG for all her hard work during several years, and expressed its appreciation to the past and present working group members for their considerable efforts in concluding this report.

4.5 Sources, fate and effects of plastics and microplastics in the marine environment (WG 40)

4.5.1 A report of the activities of WG 40 was given by Mr Peter Kershaw, Chair of the working group. It has been a productive year for WG 40 as it entered the third phase of its activities. WG40 has three Terms of Reference (ToRs) that were approved at G44 in Geneva. The 2017/18 period is dedicated to completing ToR 1: to produce guidelines for the monitoring and assessment of marine plastic litter, to encourage a more harmonised approach. The membership of WG 40 has been refreshed to reflect the specific needs for undertaking ToR 1. It was considered essential to achieve good regional coverage and have access to expertise on the practicalities of marine litter monitoring. The WG consists of 16 members representing 13 countries on six continents. It proved difficult to create an even gender balance, with just five of the members being female. In part, this was a reflection of the nominations of experts by sponsoring organisations and in part by a need to have people with close ties to national or regional marine litter monitoring activities. There is one (female) young career scientist in the WG.

4.5.2 The WG 40 Chair is supported by two co-chairs, to cover the macro- and micro-plastic elements in the development of the Guidelines adequately. The Chair wishes to express his gratitude to staff working for the two lead agencies, IOC and UN Environment for their help and support during the year, especially for the organisation of the workshops. Additional financial support is provided by NOWPAP (Northwest Pacific Action Plan), NOAA, the Ministry of Oceans and Fisheries of the Republic of Korea, the Ministry of Environment of Japan, the State Oceanic Administration of the P.R China, and from residual industry funds administrated by IMO, with additional in-kind support from FAO, particularly in relation to Abandoned Lost or otherwise Discarded Fishing Gear (ALDFG). The WG benefits from using the Basecamp file-sharing platform administered by IMO

4.5.3 Phase 3 was initiated by a four-day workshop of most of the membership in September 2017, in the week following the 44th session of GESAMP. It was hosted by IOC in Paris. By the end of the workshop a draft manuscript had been created and responsibilities agreed for further work. Progress was discussed at a 1.5 day workshop in San Diego, United States, in March 2018, at the conclusion of the 6th International Marine Debris Conference (6IMDC). This took advantage of the presence of many of the WG members at this conference, minimising the cost for the sponsoring organisations. The guidelines for the monitoring and assessment of plastic litter in the ocean will have chapters on:

- .1 Background;
- .2 Plastic litter – definitions & terminology;
- .3 Designing monitoring & assessment programmes;
- .4 Monitoring methods for shorelines;
- .5 Monitoring methods for the sea surface & water column;
- .6 Monitoring methods for the seafloor;
- .7 Biota;
- .8 Sample processing;
- .9 Characterisation methods; and
- .10 Recommendations.

4.5.4 A second 4-day workshop took place in June 2018, hosted by UN Environment at the UN Offices in Bangkok. This resulted in the completion of a full revised draft. A regional consultation meeting on marine litter was held immediately after the workshop, organised by UN Environment, with representatives of WESTPAC (IOC Sub-Commission for the West Pacific), COBSEA (Coordinating Body of the Seas of East Asia), Thailand, Cambodia, Vietnam and the Philippines, and several members of WG40 with an interest in the region. This was well received and of mutual benefit.

4.5.5 After editing by the co-chairs, the draft was sent to eight regional bodies that had agreed to provide an initial consultation on the scope, style and content of the report. These included Regional Seas (HELCOM, OSPAR, SPREP (Secretariat of the Pacific Regional Environment Programme), NOWPAP, Abidjan Convention, Caribbean Environment Programme), IOC/WESTPAC and the North Atlantic fisheries RFMO, together with a key institute in China closely associated with IOC/WESTPAC. The individual report chapters are due to be revised by the end of August to allow final compilation, followed by a GESAMP review by early October. It is intended to have a summary of the report made available as an information document for the 2nd workshop of the Open Ended Ad Hoc Expert Group on Marine Litter and Microplastics, which is due to meet before the end of 2018. It is intended to have a final version ready by the end of December. The Chair reported on the importance of making papers and final products available on Research Gate. There have been ca. 4 000 reads of the 2015 and 2016 WG 40 reports to date.

4.5.6 Initial discussions have been initiated about undertaking ToRs 2 and 3, in particular exploring the interest of potential sponsoring organisations:

- TOR 2 To assess the occurrence and effects of nano-sized plastics on marine organisms, and make research and policy-relevant recommendations
- TOR 3 To assess the significance of plastics and microplastics as a vector for indigenous and nonindigenous organisms, and make research and policy-relevant recommendations.

4.5.7 No firm proposals for addressing ToRs 2 and 3 have been made as of September 2018. The Co-chair concluded by outlining possible revised ToRs to be addressed by WG 40 on the human health impact of micro and nano plastic particles in seafood, including the role of possible pathogens on the particles and chemical additives and substances adhering as for example flame retardants, POX, heavy metals, etc.

Action by GESAMP

4.5.8 GESAMP welcomed the significant progress made by the WG and noted the continued strong interest in and commitment to the WG by lead agencies IOC and UN Environment as well as that of additional supporting organizations.

4.5.9 Further funding will be required to carry out the full, agreed work programme. The Chairpersons of WG 40 undertook to continue to explore funding possibilities in cooperation with the sponsoring agencies and, if the ToRs are amended, with relevant organizations including IAEA and FAO with interest in the subject.

4.5.10 As the full Guidelines will not be available in time, GESAMP agreed that a separate information document would be prepared for the UN Environment 2nd workshop of the Ad Hoc Open Ended Expert Group on Marine Litter and Microplastics. GESAMP also agreed to develop a Scientific Summary for Policymakers, with the full report being published in early 2019 in the GESAMP Reports and Studies series.

4.6 Marine geoengineering (WG 41)

4.6.1 A report of the activities of the working group on marine geoengineering (WG 41) was given by Mr Chris Vivian, Co-Chair of the working group.

4.6.2 GESAMP noted that since the last session, the main activity of WG 41 had been the production of the draft final report. Subsequently, the draft final report had been sent for review by GESAMP members and external peer-reviewers and these were received by the Co-Chairs in early August 2018. The Co-Chairs were currently revising the draft final report to take the reviewers comments into account. The Co-Chairs aimed to finalize the report by the end of October 2018.

4.6.3 Key points from the report were:

- .1 some 25 approaches had been assessed in 8 categories;
- .2 the information available varies widely from just concepts to many scientific papers;
- .3 there was generally insufficient information to assess to permit robust scientific assessment; and
- .4 consequently, WG focused on evaluating illustrative examples from each of the 8 categories.

4.6.4 For those 8 illustrative examples the WG had summarised:

- .1 sources of evidence-based knowledge;
- .2 nature of field studies;
- .3 knowledge gaps; and
- .4 applicability of ocean fertilization regulations.

4.6.5 It was noted that the key points from an analysis of the summary of the 8 illustrative examples were:

- .1 several of the techniques could potentially be considered for listing in London Protocol Annex 4, and thus be regulated once the amendments enter into force;
- .2 those with untested potential need knowledge gaps to be filled before more detailed evaluation;
- .3 based on the collective knowledge of the WG membership, and the information currently available, WG 41 could not make authoritative statements about the likelihood that individual geoengineering approaches could mitigate climate change, and with what risks;
- .4 several approaches e.g. artificial upwelling, share common features for implementation with ocean fertilization leading to similar issues and thus potential for a common governance framework;
- .5 in other cases, such as macroalgal cultivation or fisheries enhancement, amended or additional governance regulations may be required.

4.6.6 A coordinated framework for proposing marine geoengineering activities, submitting supporting evidence, and integrating independent expert assessment is still to be developed. This framework would be essential to begin to transition towards a more holistic assessment that includes social, political, economic, ecological, ethical etc., dimensions. This would make the outcome of the WG more relevant for policymakers. Consequently, there

is a need to broaden the disciplinary composition of the WG to cover the broader societal issues.

4.6.7 GESAMP noted that at present no further WG 41 meetings are scheduled, and that the decision on further activities was dependent on the finalization of the report, which would allow the lead agencies, stakeholders such as the Contracting Parties to the London Protocol, and other possible co-sponsors to consider their interest in the continuation of the WG.

4.6.8 GESAMP stressed that in a possible second phase, there was a need to make efforts to improve the geographical composition and gender balance of the WG, while noting that with such a specific topic it is sometimes very difficult to fulfil these criteria.

Action by GESAMP

4.6.9 GESAMP noted the progress made, and agreed that there was an interest to continue the work of the WG in a second phase, but that there would be a need to revisit the terms of reference once the WG report had been finalized, to determine which parts of the terms of reference that had not been fully addressed to date, or any additional work that would be needed.

4.6.10 GESAMP also agreed that the work of the WG warranted further promotion in several relevant forums, not least the UNFCCC later in the year.

4.7 Impacts of wastes and other matter in the marine environment from mining operations, including marine mineral mining (WG 42)

4.7.1 A report of the activities of the working group on impacts of wastes and other matter in the marine environment from mining operations, including deep-sea mining (WG 42) was given by Ms Tracy Shimmield, Chair of the working group.

4.7.2 The first formal meeting and main workshop of WG 42 took place from 20 to 22 September 2017 at IMO. Six members of the group attended (Ms Bronwen Currie, Mr Gi Hoon Hong, Ms Tracy Shimmield, Mr Stuart Simpson and Mr Andrew Sweetman), with two members being unable to attend (Mr James Hein and Ms Cindy Lee Van Dover). At this meeting, the group discussed and finalised the report structure, actions and dates for draft and final report delivery.

4.7.3 GESAMP noted several additions and changes to the membership of the WG (see Annex V), including the addition of Mr Michael Huber, as a corresponding WG member.

4.7.4 The Chair of the WG attended a "Workshop on the draft regulations for the exploitation of mineral resources in the Area: policy, legal and institutional considerations", February 2018 organised by the United Kingdom Foreign and Commonwealth Office and the ISA, held at The Royal Society, London.

4.7.5 In addition, GESAMP was informed that the WG Chair had been invited to join the United Kingdom Department for Business, Energy and Industrial Strategy (BEIS) “Deep Sea Mining Working Group”, which is looking at aspects of deep sea mining from a United Kingdom perspective. The first meeting considered the environmental sustainability of deep sea mining.

4.7.6 GESAMP welcomed the information that GEOTRACES (<http://www.geotraces.org/about-us/about-geotraces/mission>) has expressed an interest to interact with WG 42 and would bring valuable geochemical expertise to the group. A discussion is taking place between the Chair of WG 42 and the Co-Chair of the Scientific Steering Committee of GEOTRACES, regarding possible cooperation in a second phase of the WG.

4.7.7 GESAMP also noted that progress had been made towards the finalization of the report of the WG, with the draft report to be ready for initial review by group members in December 2018, and submitted to the Technical Secretary during January 2019.

4.7.8 The Terms of Reference of the group was discussed. The discussion centred around the inclusion of impacts of waste from diamond mining in the remit of the review. There was discussion around whether this industry should be included as it occurs in shallow water close to the coast. A question was asked, regarding the inclusion of diamond mining and whether or not gravel and sand offshore extraction should also be included? After discussion, it was agreed that impacts of waste from diamond mining should be included in the review.

4.7.9 A question was posed regarding the transparency of the information being used to inform the review. The Chair of the WG informed the meeting that the majority of the information that will be used will be in the public domain, predominantly peer reviewed scientific papers, any industry reports/data used will also be openly available. GESAMP therefore concluded that there was no issue of transparency/conflict of interest and that would be reflected in the reports bibliography.

4.7.10 A number of the meeting attendees highlighted relevant papers that were available to the Chair of the WG, who confirmed that these papers would be considered in the review.

Action by GESAMP

4.7.11 GESAMP welcomed the progress made by the WG, and noted the great interest in its work from several Sponsoring Organizations and observers.

5 CONTRIBUTION TO OTHER UN PROCESSES

The UN Regular Process

5.1 GESAMP recalled that the second phase of the World Oceans Assessment was launched in January 2016. In 2017, a series of capacity building workshops were held in the regions with the objective to raise awareness and get feedback from the regions, thus enabling participants to put forward their views on the scope and structure that should be adopted for the assessment (or assessments) to be prepared in the second cycle of the Regular Process. These workshops aimed at promoting capacity-building within the regions so as to assist in creating the abilities to contribute from the region to the production of the assessment.

5.2 The draft outline for the second world oceans assessment was approved by the tenth meeting of the Ad Hoc Working Group of the Whole on the Regular Process which met from 28 February to 1 March 2018. A second round of capacity building workshops (2018) have being organized by the secretariat as follows:

- .1 The North Pacific, Valletta, Malta, from 27 to 28 August 2018;
- .2 The South Pacific, Koror, Palau, from 8 to 9 August 2018;
- .3 The Indian Ocean (including the Arabian Sea and the Bay of Bengal), the Red Sea and Gulf of Aden and the ROPME/RECOFI area;
- .4 The North Atlantic, the Baltic Sea, the Mediterranean Sea and the Black Sea, Valletta, Malta, from 20 to 24 August 2018); and
- .5 The South Atlantic (between the African and American coasts) and the wider Caribbean-Accra, Ghana in December 2018.

5.3 These workshops are being used to draft the report, which is expected to be completed at the end of 2019. A mechanism for nominating experts to the pool of experts is being applied at two levels where Member Governments as well as Inter Governmental Organisations have been invited to nominate experts. A few GESAMP Members have as a result been nominated as members of the pool of experts. More information on the process is available at the website.

Action by GESAMP

5.4 GESAMP reconfirmed its willingness to contribute to the second cycle, WOA II, and decided to follow developments closely with a view to identify possibilities for contributing, at the request of the Sponsoring Organizations.

The 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs)

5.5 The follow up to the conference on the implementation of SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development held in New York, from 5 to 9 June 2017 has been related to achieving the commitments made during the conference. On the methodological development for collecting data to support the target 14.1 target indicator on nutrient pollution and marine plastics being led by UN Environment in collaboration with IOC-UNESCO and other partners under the guide of UN Environment's Science Division, a workshop was held from 12 to 15 September 2018 in Paris, France. At this workshop, it was agreed that the methodological scope should be greater than just looking at pollution in the water to include:

- .1 geospatial data which covers coastal water waters and open ocean;
- .2 indicators related to attribution -modelling of the source of pollution (plastic or nutrient);
- .3 indicators related to the amount of existing pollution (concentrations); and
- .4 some aspirational indicators for countries on marine and coastal health.

5.6 GESAMP also noted that, regarding engagement with policy makers and capacity building, there will be a need to build the capacity of countries to collect and use data.

5.7 GESAMP was informed that following the high-level 2017 UN Conference to Support the Implementation of Sustainable Development Goal 14, and in order to catalyze and generate new voluntary commitments and to facilitate collaboration and networking amongst different actors in support of SDG 14, the UN launched nine thematic multi-stakeholder Communities of Ocean Action (COA). IMO acts as one of the focal points for COA on marine pollution, together with the Ocean Conservancy. On 28 June 2018, the co-focal points organized a first webinar for COA on marine pollution, to follow up on the implementation of the voluntary commitments, and to promote further work and more voluntary commitments. A second webinar is tentatively scheduled for 27 September 2018, focusing on the issue of marine litter. More information about the COAs can be found at: <https://oceanconference.un.org/coa>.

Action by GESAMP

5.8 GESAMP noted the information provided and agreed to continue monitoring these developments and remain at the Sponsoring Organizations' disposal to contribute as and when requested.

The United Nations Decade of Ocean Science for Sustainable Development

5.9 An update on the United Nations Decade of Ocean Science for Sustainable Development was given by the IOC of UNESCO Technical Secretary for GESAMP. The United Nations General Assembly (UNGA) in December 2017 proclaimed a Decade of Ocean Science for Sustainable Development (2021-2030) to support efforts to reverse the cycle of decline in ocean health and gather ocean stakeholders worldwide behind a common framework that will ensure ocean science can fully support countries in creating improved conditions for sustainable development of the Ocean. The goals of the Decade are to provide ocean science, data and information to inform policy for a well functioning ocean in support of all sustainable development goals of the Agenda 2030, and to generate scientific knowledge and underpinning infrastructure and partnerships. The success of the Decade will rely on the contributions of many different stakeholders including scientists, policy-makers, civil society, funders and the private sector.

5.10 The IOC of UNESCO has been tasked by the UNGA to work with all interested stakeholders to design a Decade of ocean science that will help to deliver the ocean we need for the future we want, see <https://en.unesco.org/ocean-decade>. As decided at GESAMP 44, and in response to IOC Circular letter 2712: 'United Nations Decade of Ocean Science for Sustainable Development; 2021–2030 – Start-up Phase', GESAMP has expressed an interest to take part in the preparatory phase for the Decade. GESAMP did not directly nominate any experts for the Decade Executive Planning Group (EPG) in response to IOC Circular Letter 2723: 'United Nations Decade of Ocean Science for Sustainable Development (2021–2030) – Call for nomination to the Executive Planning Group (EPG)', but WG 40 Co-chair Alexander Turra has been nominated by Brazil.

5.11 In addition, the Chair of GESAMP has communicated GESAMP's willingness to contribute, by way of a letter to the Executive Secretary of IOC-UNESCO.

5.12 During the Planning Phase between 2018 and 2020, the UNGA has tasked the IOC with preparing and coordinating the development of i) an Implementation Plan for the Decade which includes a Science Plan to define key issues, priority scientific questions of high relevance to sustainable development (Agenda 2030) and propose scientific themes and outcomes to structure the implementation of the Decade; ii) a Capacity Development Plan to improve the scientific knowledge base, transfer of marine technology, and education in regions and for groups that are presently limited in capacity and capability, especially SIDS and LDCs. The Plan will provide details on the strategy and actions needed to significantly enhance the opportunities and equitable access to economic benefits arising from marine resources and technology, including from areas beyond national jurisdiction; iii) a Resource Mobilisation Plan to define

the specific financial mechanisms critical to the success of the Decade; and iv) a Communications & Engagement Plan to define the networking, engagement and communications tools required to involve key stakeholders and demonstrate the value the Decade will provide for society.

5.13 The overall formulation of the Decade's Implementation Plan will be supported through three interlinked mechanisms. There will be an Executive Planning Group (EPG) composed of appointed experts to serve as an expert advisory body to the IOC governing bodies to support the development of the Implementation Plan for the Decade. There will be a Stakeholder Forum composed of institutional members, representing various interest groups, acts as a consultative body to the IOC governing bodies, and aims to engage a wide range of relevant stakeholders. There will be regional workshops will communicate the purpose and expected results of the Decade to all stakeholders and will also be an opportunity to engage and consult with them, enriching EPG and Stakeholder Forum debates. Global Planning Meetings will aim to assess the status of ocean research vis-a-vis the 2030 Agenda requirements and to consolidate inputs from various consultations (including the regional workshops). Two physical meetings of the Stakeholder Forum will be organized, back to back with the global meetings in the preparatory phase. It will provide inputs through the expertise, knowledge, data, information and capacity-building experience of its members on the work carried out by the EPG. Member States, through IOC Governing Bodies, will review progress and endorse the Implementation Plan in 2020. It will then be submitted to the General Assembly for its consideration.

5.14 GESAMP will have an opportunity to actively engage in and contribute to the Decade development and implementation by taking part in the Stakeholder Fora, Regional Workshops and possibly the Global Planning Meetings.

Action by GESAMP

5.15 GESAMP reconfirmed its strong interest to actively engage in and contribute to the Decade development and implementation. GESAMP decided to identify 2-3 GESAMP Members to specifically follow the development of the Decade and identify opportunities and timing for engagement and report back to GESAMP and the Sponsoring Organizations on this by e-mail.

Presentations by Observers

5.16 Mr Kenny presented a summary of work being undertaken by the North Atlantic Fisheries Organization (NAFO) on new and emerging issues to achieve and maintain sustainable fisheries in the NAFO Regulatory Area. He highlighted the importance of UN GA Resolution 61/105 and the publication of the FAO guidelines in 2009 "for the management of deep-sea fisheries on the high seas" as a turning point for NAFO and other RFMOs in protecting deep sea Vulnerable Marine Ecosystems

from the impacts of bottom fishing activities. Specifically, since 2008, NAFO has identified and mapped the distribution of several types of VME, notably; sponge grounds, sea pens fields, populations of small and large gorgonians, and sea mounts – details of which can be found on the NAFO website (<https://www.nafo.int/>) which includes maps of the fishery closures established to protect these VMEs as part of NAFO Conservation and Enforcement Measures. Another important aspect of NAFOs work is the implementation of an ecosystem approach to fisheries management, to this end a 'roadmap' has been established which recognises the importance of assessing the influence of the environment in driving fisheries production potential at spatial scales which are meaningful for fisheries and ecosystem management. Ecosystem production units have been defined and used as a basis for developing multi-species assessment models which augment existing 'core' single species stock assessments. Finally, Dr Kenny offered some thoughts on where the work of NAFO could potentially add value to GESAMP (and *vice versa*) e.g. i. through assessing atmospheric and oceanographic sources of nutrients and their effects on primary production in areas important for fisheries, and through investigating the occurrence and accumulations of any litter (plastics) on the sea bed within the NAFO fishing footprint.

5.17 Ms Mengjiao (Melissa) Wang, senior scientist from Greenpeace Research Laboratories, presented some of the key Greenpeace Research Laboratories work and its relevance to the current working group and scoping activities of GESAMP, including the technical and science-policy interface work on plastics and microplastics in the marine environment (WG 40), geoengineering (WG41), seabed mining and sea disposal of mine tailings from land (WG 42), trends in global pollution in coastal environment (WG39), impacts of residues of chronic oil spill (CG 2), as well as emerging pollutants in pharmaceutical waste & other novel chemicals (CG 4).

5.18 Ms Javiera Calisto made a presentation on the work of Oceana, an international organization dedicated to achieving measurable change by conducting specific, science-based campaigns with fixed deadlines and articulated goals. The main areas of work are fisheries management, habitat protection and marine pollution. Currently, Chile has one mining facility that places mine tailings in the ocean, i.e. submarine tailings disposal (STD), and that this company had committed to replace this practice with a tailings dam. She also noted that STD is not regulated in Chile, and that any guidance produced by GESAMP in relation to STD, may have major consequences on policymaking in Chile and other countries.

5.19 Mr Murray Rudd from the World Maritime University spoke about the coastal population growth and land use, noting that human and agricultural chemical consumption are often increasing faster than environmental management systems. Given the importance of aquaculture to the emerging concept

of 'Blue Economy' and to SDG 14, the relative threats that chemical and nonchemical stressors pose to aquaculture production and product safety represents an important issue in many parts of the world.

5.20 Senior Advisor, Mrs. Natalia Martini, gave a presentation on the Advisory Committee for the Protection of the SEA (ACOPS). ACOPS, through its consultative and observer status, 'provides legal, policy and scientific inputs to several intergovernmental organizations including IMO, through MEPC and PPR, London Convention/Protocol, the OSPAR Convention, and to the Arctic Council. ACOPS expertise is in environmental impacts on the sea from international shipping, accident and operational pollution, land-based and sea-based sources marine debris and microplastic, Marine Protected Areas and PSSAs, ocean governance, and deep sea mining. ACOPS will continue to engage with the London Convention/Protocol on the international regulation of ocean fertilization, marine geo-engineering, sea-based sources of plastic and aspects related to the disposal of sediments, wastes and other effluents from deep-sea mining in particular and waste disposal at sea generally and continue following the work of the ISA. Finally, ACOPS will endeavour to actively contribute and participate in the work of the GEF-UNDP-IMO GloFouling Partnerships Project. ACOPS would be honoured to engage with the relevant GESAMP Working Groups and correspondence groups.

5.21 Mr Davide Fezzardi, General Fisheries Commission for the Mediterranean (GFCM) of FAO, informed GESAMP of the activities of this Regional Fisheries Management Organization (RFMO), especially in relation to the strategy for the sustainable development of Mediterranean and Black Sea aquaculture adopted in 2017. Following an introduction regarding transboundary issues and interactions between marine aquaculture and the environment, he highlighted the importance to assess and quantify any possible positive and negative influence of marine aquaculture on the ecological services provided by the environment. More information on the subject can be found at www.fao.org/gfcm.

6 IDENTIFICATION OF NEW AND EMERGING ISSUES

6.1 This GESAMP agenda item is intended to provide an opportunity for GESAMP Members to bring new topics related to the status of the marine environment to the attention of the Sponsoring Organizations, and to discuss issues arising during the course of the current annual session. Two topics were identified by the Members and discussed during this session, and one issue was suggested by FAO.

The Pacific Ocean Clean-up

6.2 During the informal meeting of the GESAMP Members on the morning of 17 September 2018, the issue of the Pacific Ocean clean-up (backed by major investment and some large-scale engineering) and its potential impact on the marine environment was discussed.

6.3 The Members discussed various aspects, including the availability of the feasibility study of the proposed clean-up activity keeping in mind GESAMP perspective. The Members noted that the proposed attempts to use specially designed booms and a dedicated ship or ships for a clean-up operation of the "Great Pacific Garbage Patch" would be very expensive and require significant logistics and energy. Also, the Members noted that several experts and media reports expressed the view/noted that such efforts may be distracting from the more pressing task of stopping plastic getting into the sea, and that the operation may cause harm to aquatic life. However, Members also felt that the awareness of the issue was important, and that GESAMP may wish to gather further information and remain abreast of the issue.

Action by GESAMP

6.4 GESAMP agreed that the system was currently being tested and would consider the outcome once information is available.

Impact of armed conflict on the marine environment

6.5 The issue of the Gulf War and impacts from other conflicts on the marine environment was discussed by Members, with particular concern for the region encompassing the south-eastern Mediterranean, Red Sea, Gulf of Oman, Arabian Sea and Arabian Gulf. Environmental concerns include the impact of untreated wastewater, disruption of solid waste managements, oil contamination, munitions and combustion products. It was noted that substantial survey and clean-up operations were mounted to locate and try to remove as much of the oil as possible while cataloguing the extent and the impacts. However, the group was not aware of the current status of this monitoring process and agreed that it would be of interest to investigate this further.

6.6 The group noted that much of the oil may have dispersed into the sediments. The Arabian Gulf tends to have large extents of shallow intertidal areas which are dominated by thick algal mats in many places. These algal mats form the basis of much of the primary productivity supporting the food chain in the ecosystem. Another concern is that the harmful effects from the hydrocarbons may linger for some time and that these harmful effects may continue to make their way up into the fish and shellfish being consumed by the human communities in the region.

6.7 GESAMP noted that an estimation of the amounts of oil entering the marine environment from the Gulf War had been done in GESAMP Reports and Studies No.75 (Estimations of oil entering the marine environment from sea-based activities).

Action by GESAMP

6.8 GESAMP agreed that, given its previous work on related issues, and the the relevance to several of the Sponsoring Organizations, it would appropriate for GESAMP to further scope out the issue in the intersessional period, under the lead of Mr Ahmed Abu-Hilal and Mr David Vousden. As part of this exercise, it would be important to contact regional bodies (UNEP-MAP, PERSGA, ROPME) as well as Sponsoring Organizations with relevant activities in the area and on the subject matter (e.g. UN Environment and IAEA).

Sea based sources of marine litter including fishing gear and other shipping related litter

6.9 The Technical Secretariat for FAO presented a proposal for a possible new GESAMP working group. In the last decade the world has gained increased knowledge on the levels, sources, negative effects of, and measures to reduce marine litter and microplastics. Political will and momentum to address marine litter has been increasing and the emphasis on marine litter within SDG14.1 on marine pollution within the 2030 Agenda for Sustainable Development has played a key role in driving increased action on this issue at both national and international level.

6.10 However, within this context of increased knowledge and political motivation, land-based sources of marine litter continue to dominate scientific outputs, public attention and political dialogue. Sea-based sources of marine litter, which include litter originating from the fishing and shipping industries, in particular abandoned, lost or otherwise discarded fishing gear (ALDFG) are several steps behind in all of these aspects. It is also acknowledged that in some contexts the impacts from sea-based sources, in particular ALDFG may be more harmful than other types and sources of marine debris, particularly with regards to 'ghost fishing', the entanglement of marine species and as a navigational hazard to safety at sea.

6.11 Recently, UN agencies, in particular FAO and IMO, have been stepping up their efforts to meet this challenge. Both organizations have adopted policy instruments that deal with sea-based sources of marine litter and both organizations have been mandated by their members to increase their efforts on this issue and to establish strategies and action plans.

6.12 FAO, therefore, proposed the establishment of a new GESAMP Working Group, focused specifically on programmes of work relating on sea-based sources of marine litter. It is envisioned that this Working Group would in particular support the mandates and programmes of work related to sea-

based programmes of work relating to marine litter within FAO and IMO, as well as other interested Sponsoring Organization.

6.13 The Technical Secretary for IMO expressed support for the proposal, and indicated that IMO would be interested to co-lead such a working group with FAO, and that funding had been identified for this purpose. He also noted that a detailed discussion of possible TOR would be contingent on the outcome of the 73rd session of MEPC, which would be held in October, where Member Governments would discuss an action plan to address marine plastic litter from ships.

6.14 In the ensuing discussion, GESAMP noted the potential for the proposed working group to contribute to several crucial processes, such as the UN Environment Ad hoc expert working group on marine litter to contribute to several crucial policy processes, as well as the support from several Sponsoring Organizations. The relevance to other GESAMP activities, such as WG 40 and the scoping exercise on the '80:20 conundrum' was also highlighted. It was also stressed that the working group would be relevant for other stakeholders and observers, such as the Global Ghost Gear Initiative, the Commonwealth Litter Programme, CBD, the IWC, and interagency activities such as the Joint FAO/IMO Ad Hoc Working Group on IUU Fishing and Related Matters.

Action by GESAMP

6.15 Following discussion, GESAMP agreed in principle to the establishment of an Ad hoc working group on sea-based sources of marine litter and related matter, under the co-lead of FAO and IMO, pending the development of a full working group proposal, including detailed terms of reference, in the intersessional period.

7 SCOPING ACTIVITIES

Relevance of inputs of disinfection byproducts (DBPs) into the marine environment

7.1 Based on document GESAMP 44/7 and the presentation of the status of the scoping exercise, GESAMP decided to convene an international workshop in 2018. This workshop will take place on 22-23 November 2018 in Berlin, Germany. The GESAMP workshop is fully financed by the German Federal Institute for Risk Assessment (BfR) which is highly appreciated. Attendance will be by invitation only to keep the number of participants appropriate for a round table discussion and the development of a status report on this issue.

7.2 Twenty-one selected scientific experts covering all relevant aspects for a comprehensive review of the issue had been invited. These scientists from Europe, Asia, Australia and the USA will present the following issues:

- .1 Natural production of halocarbons
- .2 Generation of disinfection byproducts in marine waters (oxidant chemistry in marine waters, identity of the chemicals)
- .3 Ballast water treatment
- .4 Cooling waters
- .5 Desalination
- .6 Sea water toilets
- .7 Aquacultures and sea water aquaria

7.3 They will discuss the overall situation in the marine environment covering:

- .1 Environmental concentration (input)
- .2 Impact on marine life
- .3 Impact on human health
- .4 Impact on the atmosphere

7.4 A revised and amended scoping paper had been drafted by Matthias Grote (BfR) and Thomas Höfer (GESAMP) as requested by GESAMP 44 as a background document for the invited scientists. It may also form the basis for a GESAMP report based on the outcome of the deliberations which should be ready for review in mid 2019. A discussion of the relevance of these chemicals for the marine environment at GESAMP 46 may offer further perspectives for the work of GESAMP and the Sponsoring Organisations.

Impacts of residues of chronic oil spills

7.5 Following a brief discussion, GESAMP noted that the issue, although a concern at the national level in some countries, would not currently have the support by the Sponsoring Organizations for any further work. Therefore, it was agreed to not continue the activities under this scoping exercise.

Causes and impacts of massive accumulations of the brown macro-algae *Sargassum* in the nearshore environment of the Caribbean and West Africa

7.6 GESAMP noted the interest in the issue by several Sponsoring Organizations, including IAEA, IOC-UNESCO and FAO, who all had ongoing activities on related matters. It was therefore agreed to keep the correspondence group active since there may be opportunities for further work, but that GESAMP would await input from interested Sponsoring Organizations on the possible contribution by the group.

Issue of emerging pollutants in pharmaceutical waste and other novelty chemicals

7.7 GESAMP noted the interest in this scoping activity, in particular from UN Environment, and it was agreed to keep the correspondence group active, with the view to revising the scoping document in the intersessional period.

Sand and gravel mining

7.8 Since GESAMP 44, the correspondence group had been collecting information, and was

working towards the preparation of an updated report. GESAMP, therefore, agreed to keep the correspondence group active, with a view to submitting a report to the next session of GESAMP in 2019.

Update the Information on Sources of the Main Pollutants Impacting the Global Marine Environment (The 80:20 Conundrum)

7.9 The 44th Meeting of GESAMP in Geneva in 2017 agreed to develop a Scoping Paper to address what has been referred to as the '80:20 Conundrum'. GESAMP had noted that there is a frequently quoted figure within the popular media and science publications stating that 80% of marine pollution derives from land-based sources and 20% from maritime sources. There is almost no evidence or justification to support these figures. Furthermore, they were 'estimated' some 30 years ago and would almost certainly be out-of-date now.

7.10 The terms of reference for the correspondence group was:

- .1 to identify the origin of the 80:20 percent figure and to review its basis and authenticity;
- .2 to consider the relevant existing literature to assess whether there is sufficient information available to revise this figure at the global level; and
- .3 to advise GESAMP as to whether this is feasible within a GESAMP working group or requires a more comprehensive and detailed study, possibly with its own source of funding.

7.11 The lead for the correspondence group (Mr David Vousden) provided a presentation to update the members. The potential sources for the 80:20 figure were presented as were examples of its frequent quotation in global literature but without any reference or citations to the origins. The presentation then reviewed some of the current knowledge on sources of marine pollution. These included data provided by the International Maritime Organisation, National Research Council (NRC) of U.S. National Academy of Sciences, the Australian Petroleum Production and Exploration Association (APPEA). Two issues were identified relating to the data, i) That comparison is very difficult in the context of the wide range of different pollutants and their burdens to the ocean (e.g. mercury vs. nutrients vs. plastics) and ii) There are more recently emerging and significant inputs that had not previously been considered (e.g. plastics).

7.12 It was also acknowledged that pollution from shipping has almost certainly been reduced as a result of more stringent and formal waste management requirements coupled with massive penalties for violators. The likelihood of maritime sources of pollution being less than the originally quoted 20% was further reinforced by comparing the number of seafarers at sea at any one moment (approx. 1.2 million) versus the 7+ billion people on

land, many in countries with virtually non-existent solid waste management infrastructures. A further problem with the 80:20 balance was noted in relation to the fact that, technically, the vast bulk of atmospheric pollution sources to the ocean are also 'land-based'. In view of these current understanding of sources of marine pollution it is more likely that, for many pollutants, the land-based percentage would be significantly higher and the marine/maritime based sources equivalently lower.

7.13 It was concluded that there are no clear and reliable figures gathered in any one report or even easily accessible through search engines which quantify the inputs of all pollutants into various marine waterbodies and identify the sources. There are, however, some good sources for land-based sources of several pollutants such as nutrients and plastics, which are both reliable and up-to-date.

7.14 Probably one of the most important points arising from this scoping exercise is the need for caution in even using an overall percentage-based assessment for global pollution which groups all the pollutants together under single percentage figures. This makes little sense when comparing widely varying pollutant burdens (from kilograms per year to millions of metric tonnes per year), especially when considering the enormous variation in impact from the different types of pollutants) e.g. trace metals vs nutrients vs plastics.

7.15 It was established that this was a complex undertaking with inevitable discrepancies and that the scoping paper was, by nature, 'provocative' in order to initiate useful discussion and to map a way forward. The issue of what constitutes a pollutant and what constitutes a contaminant was re-visited. The main difference between Pollutant and Contaminant appears to be that a Contaminant is anthropogenic in origin and is always a harmful substance (such as persistent organic pollutants) whereas a Pollutant is not always harmful (but can be in excess quantities, e.g. reactive nitrogen) and may be natural in origin. One source of pollution that was not really covered in the literature, but which could be having a significant impact is from dredging and subsequent de-watering from holding basins and land reclamation. It was generally noted that the overall topic of sources of pollutants and contaminants is far too complex to be captured in any sort of single table or diagram and amalgamated into percentages. Also, GESAMP was of the view that identifying regional variations would be a valuable exercise rather than just global figures as this would help to identify hotspots and areas of concern. Several other members asked to join the on-going process to improve the knowledge base on this topic.

7.16 Finally, it was concluded that a more valuable exercise would be to strengthen information on land and sea-based sources for each individual type of contaminant and pollutant at both the global and the regional level. This would help to identify gaps and emerging concerns regarding marine contaminants and pollutants as well as estimating trends such as increases or decreases of such contaminants and

pollutants and helping to identify what the sources and causes of these changes. It was agreed that the group should continue to consider the best way forward and should specifically systematically reach out (draw involvement from) other recognized science groups and programmes. GESAMP would thereby play an integrating role in helping to fill a more clearly defined need. In the meantime, it was agreed that GESAMP should identify an appropriate and diplomatic means to more formally disclose the inaccuracy and irrelevance of the original rough estimate of 80:20 which have been fairly well entrenched in the popular scientific literature.

8 GESAMP SIDE EVENT

GESAMP Side event: 'Harmful algal blooms and food security and safety in the context of climate change'

8.1 In the afternoon of Wednesday 19 September 2018, FAO and GESAMP held a special side event titled "Harmful algal blooms and food security and safety in the context of climate change". The side event was introduced by Mr Manuel Barange, Director of the Fisheries and Aquaculture Department, and was open to others outside of GESAMP 45. The moderator was Mr David Vousden, GESAMP member. The invited speakers were Ms Esther Garrido Gamarro, Food Safety Officer of the Fisheries and Aquaculture Department of FAO, Mr Henrik Enevoldsen Head of the IOC Science and Communication Centre on Harmful Algae, Ms Marie-Yasmine Dechraoui Bottein, Research Scientist and Environmental Toxicologist of the Radioecology Laboratory of the IAEA Environment Laboratories, Mr Jorge Diogenes, Senior Research Scientist and Director of the Marine Monitoring Subprogram at the Institute of Agrifood Research and Technology (IRTA), Ms Adriana Zingone, Coordinator for Monitoring and Environmental Data of the Laboratory of Ecology and Evolution of Plankton of Naples, and Ms Vera Trainer, Supervisory Oceanographer at the Marine Biotoxins Program, NOAA Northwest Fisheries Science Center. There were approximately 40 people in attendance.

8.2 Phytoplankton blooms, micro-algal blooms, toxic algae, red tides, or harmful algae, are all terms for naturally occurring phenomena that have occurred throughout recorded history. About 300 hundred species of micro algae are reported at times to form mass occurrence, so called blooms. Nearly one fourth of these species are known to produce toxins. Even non-toxic algal blooms can have devastating impacts when they lead to kills of fish and invertebrates by generating anoxic conditions. Some algal species, although non-toxic to humans, can produce exudates that can cause damage to the delicate gill tissues of fish (raphidophytes *Chattonella*, *Heterosigma*, and dinoflagellates

Karenia, *Karlodinium*)¹. Aquaculture stocks (caged fish, mollusk and crustaceans) are trapped and, thus, can suffer devastating mortalities, which could lead economical and food losses, and eventually become a food security problem.

8.3 Of greatest concern to humans are algal species that produce potent neurotoxins that can find their way through shellfish and fish to human consumers where they evoke a variety of gastrointestinal and neurological illnesses (paralytic shellfish poisoning (PSP), amnesic shellfish poisoning (ASP), diarrhoeic shellfish poisoning (DSP), neurotoxic shellfish poisoning (NSP), azaspiracid shellfish poisoning (AZP) and ciguatera fish poisoning (CFP)). Worldwide, ciguatoxins are estimated to cause around 50 000 cases of ciguatera fish poisoning annually; neurological effects may last for weeks or even years and one percent of these cases are fatal².

8.4 Climate change and coastal water over enrichment create an enabling environment for harmful algal blooms, which seem to have become more frequent, more intense and more widespread in the past decades. In response to this, important progress limiting adverse impacts of planktonic harmful algal blooms (HABs) has been achieved by implementing rigorous monitoring programs addressing HABs species in the environment, marine toxins in seafood, and associated human diseases. However, the situation is very different for benthic HABs (BHABs) happening at the bottom of coastal waters, especially for *Gambierdiscus* species responsible of ciguatera poisoning, the most common non-bacterial seafood poisoning globally. Small island states in tropical regions are particularly vulnerable to the consequences of ciguatera poisoning, and global changes in climate may exacerbate the incidence rates, and impacts on natural and economic resources of endemic populations. To mitigate or prevent the adverse effects of ciguatera, experimental research and development, and capacity building efforts are being made by international organisations such as the IAEA to better define and address the gaps in risk assessment and needs for effective management of ciguatera. These achievements include the development of an experimental model of ciguatera biotoxins dietary exposure in reef fish, demonstrating continued toxin bioaccumulation and somatic growth dilution. Such observations open promising research prospects aiming at the identification of potential ciguatera disease markers in fish and for the development of predictive models of tissue-specific toxin accumulation for food safety risk assessment; the development of an optimized method of analysis of ciguatera toxin in seafood. The radioligand receptor binding assay is an easily transferable high throughput technology and shows strong potential as a routine screening method; an improved knowledge and reporting of global occurrence, diversity and toxicity of toxic HAB species and reef fish through

capacity building in more than forty countries for algal monitoring in the environment and/or biotoxin analysis in seafood; and the development of an Interagency Global Ciguatera Strategy built on the strength and complementarity of four International Organizations and their respective mandates, the IAEA aiming at assisting Member States meet their development needs through nuclear science, technology and innovation, the World Health Organization (WHO) for improving public health through reduction and/or treatment of food poisoning, the FAO to promote food safety and security, and the IOC-UNESCO to promote ocean research and education. Further efforts are essential to expand the coverage of HAB monitoring to all coastal countries, to establish regulatory monitoring programmes for ciguatoxins and to better understand key environmental variables that control HABs.

8.5 Ciguatera, originally restricted to inter-tropical areas, has been recently reported in higher latitudes. For instance, in 2004 the first cases of ciguatera were reported in Macaronesia, first in the Canary Islands and later in Madeira. Several species of *Gambierdiscus*, a ciguatoxin (CTX) producer, and CTXs in fish, have been described in Madeira and the Canary Islands. *Gambierdiscus* spp. have also been identified in the Mediterranean, although there is no confirmation of presence of CTX in this area. These findings can lead us to think about the possible link between climate change and the expansion of CTX-producing microalgae.

8.6 In Macaronesia and in the Mediterranean, studies on *Gambierdiscus* (and *Fukuyoa*) species identification and space-temporal distribution are ongoing, and increasing. The relation between ocean water warming and presence of *Gambierdiscus* in Macaronesia is possible, but the high diversity of *Gambierdiscus* species found in the Canary Islands may be indicative that potential invasion of *Gambierdiscus* may not have been so recent. However influence of climate change may not be discarded. To link climate change and *Gambierdiscus* space-temporal distribution relevant climatic data and follow-up of populations and possibly toxins in the food webs is needed. Additionally, factors associated with global change such as translocation of water and shellfish through human activities, increase of nutrients in coastal waters or erosion of coastal systems may not be discarded as having also an influence on ciguatera. In the Western Mediterranean, recent identification of only one species of *Gambierdiscus* (*G. australes*) and one of *Fukuyoa* (*F. paulensis*), also a CTX-producer, provides evidence that the spatial distribution is wider than described before (three species of *Gambierdiscus* have been described in the Eastern Mediterranean) and that this may be the result of recent settling (Rodríguez, F. et al 2017).

8.7 The economic impact of harmful algal blooms depends on their location, duration, and

¹ http://hab.ioc-unesco.org/index.php?option=com_content&view=article&id=5&Itemid=16

² <http://www.fao.org/3/a-i3215e.pdf>

toxicity. Over the past decade, record-setting HABs on both coasts and the Great Lakes have had severe impacts to the seafood industry, tourism, drinking water, and property values. For instance, in 2015, the largest HAB in at least 15 years stretched from central California to British Columbia and the Alaska Peninsula, caused by the marine diatom, *Pseudo-nitzschia australis* that produces the toxin, domoic acid. Record-setting concentrations of domoic acid in California, Oregon, and Washington caused marine mammal deaths and devastated commercial and recreational fisheries. The commercial Dungeness crab fishery experienced a USD97.5 million decrease in revenue from 2014 to 2015 (NMFS FUS, 2015). This generated an economic shock for fishery-dependent communities along the West Coast - the Dungeness crab fishery generates the highest revenues and has the highest vessel participation of any fishery on the West Coast. The 2015 domoic acid event also resulted in the recreational, commercial and subsistence razor clam fisheries to be closed to harvest in Washington, Oregon and California (McCabe et al., 2016; McKibben et al., 2017). The recreational razor clam fishery generates significant tourism-related income associated with clam digger visits to coastal communities, particularly in Washington and northern Oregon. The fishery takes place primarily during the winter when other outdoor recreation activities are unavailable, and many coastal businesses depend on commerce associated with clamming activities for a significant portion of their annual income. A season-long closure of the recreational razor clam fishery is estimated to result in USD24.4 million in lost expenditures (2008 dollars).

8.8 Data compilation on frequency and distribution patterns of harmful algal blooms is necessary to be able to answer questions such as if HABs are having increasing health/wellbeing, economic, and other impacts on human and ecosystem health; if HABs are increasing in incidence or geographic spread and is it possibly related to climate change and other anthropogenic impacts, as well as for risk assessment where it is a resource for scientists, managers of regulatory monitoring programmes and policy administrators. Furthermore it is documentation that a given area, region, country is well monitored and thus deliver safe seafood products. If the aim is frequency, distribution patterns of harmful algal blooms, it implies global monitoring of phytoplankton which is not feasible except at very large scale (remote sensing for instance). If the aim is frequency, distribution patterns of potentially harmful algal species (that may bloom), it implies global representative sampling. Such data is partly available from the literature, research and regulatory monitoring. Finally, if the aim is the frequency, distribution patterns of harmful algal events, it implies data from areas where the occurrence of HABs may have an impact. Such data is available where regulatory monitoring exists.

³ <http://haedat.iode.org/>

8.9 International instruments to compile all the available data are key to get to further conclusions about the global impact of HABs. Currently, harmful algal event data is compiled in the IODE/HAEDAT³ system by the IOC UNESCO in cooperation with the IAEA, the International Council for the Exploration of the Sea (ICES), the North Pacific Marine Science Organization (PICES) and others. The data sources are regulatory monitoring, grey literature, press, medical community, research data, etc.

8.10 Frequent analysis of the data compiled are vital to provide policy advice and guide future monitoring and research. For this reason, the IOC Intergovernmental Panel initiated a periodic Global HAB Status Report to provide a global status and overview of HAB events and their societal impacts, to provide a global overview of the occurrence of toxin producing microalgae, and to assess the status and probability of change in HAB frequencies, intensities, and range expansions resulting from global change. HAEDAT data is one important data source being used to for the Global HAB Status Report. A Global HAB Status Report will be a service to scientists, managers of regulatory monitoring programmes and policy administrators to access to high quality data occurrence of harmful algal events worldwide, the biogeography of harmful species and on current taxonomic names of harmful algae. It will also provide a condensed and synthesized data available to society and as a contribution to larger assessments and platforms such as the World Ocean Assessment (WOA), the Global Environment Outlook (GEO), the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES), The Intergovernmental Panel on Climate Change (IPCC).

8.11 The side event was intended to provide an overview of existing scientific knowledge and databases on harmful algal blooms and its impact on food security and food safety, as well as bring some clarity on how climate change can exacerbate this problem; and to discuss how this ties in with GESAMP's existing and/or future work.

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9 DATE AND PLACE OF GESAMP 46

9.1 GESAMP noted that it had been agreed last year that to accept the generous offer by DOALOS and UNDP to co-host the 46th session of in 2019, which would coincide with the 50th anniversary of GESAMP. The exact dates would be confirmed by the ExCom as soon as possible.

9.2 GESAMP also noted the generous offer by IAEA to host the 47th session in 2020, at their Environment Laboratories in Monaco.

10 FUTURE WORK PROGRAMME

10.1 GESAMP discussed the work programme for the intersessional period including imminent tasks for each working group. The currently active GESAMP working groups, correspondence groups and task teams are listed, with their current terms of reference are set out at Annex V.

11 ANY OTHER BUSINESS

11.1 GESAMP considered document GESAMP 45/11 on the anniversary to commemorate 50 years of GESAMP. Several suggestions for this event were made, including:

- .1 Bringing previous Chairs of GESAMP to the event;
- .2 Preparing a publication on the achievements of GESAMP during its first 50 years;
- .3 Emphasizing the role of women in science, and in the work of GESAMP;
- .4 Preparing a photo gallery of all those who have been involved as Members or Secretariat of the years;
- .5 Posters by Working Groups, to present their outputs and achievements; and
- .6 Inviting the UN Special Envoy for the Ocean, and the wider UN system.

Action by GESAMP

11.2 Following discussion, GESAMP agreed that the GESAMP Office, in collaboration with the anniversary task team, would prepare a full proposal for the anniversary celebration, including an action plan with timelines and responsibilities for consideration by the ExCom at its intersessional meeting in early 2019.

12 ELECTION OF CHAIRPERSONS

12.1 GESAMP unanimously re-elected Mr Peter Kershaw as Chair and Mr Manmohan Sarin as Vice-Chair for the intersessional period and the forty-sixth session of GESAMP.

13 CONSIDERATIONS AND ADOPTION OF THE REPORT OF GESAMP 45

13.1 The report of the forty-fifth session of GESAMP was considered and approved.

14 CLOSURE OF THE SESSION

14.1 The Chair of GESAMP, Mr Peter Kershaw, closed the forty-fifth session of GESAMP on Thursday, 20 September 2018 at 16:00 hrs.

ANNEX I - Agenda

AGENDA

45th session of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) to be held at the Food and Agriculture Organization (FAO), Rome, Italy, from 17 to 20 September 2018

Monday, 17 September

Morning session (closed session)

Informal meeting of the Members of GESAMP

Initial meeting of the Executive Committee of GESAMP (ExCom)

Afternoon session

Opening of the 45th session of GESAMP

- 1 Adoption of the agenda
- 2 Report of the Chair of GESAMP
- 3 Report of the Administrative Secretary of GESAMP
- 4 Planning of GESAMP activities:
 - .1 Evaluation of the hazards of harmful substances carried by ships (WG 1: IMO leading)
 - .2 Review of applications for 'active substances' to be used in ballast water management systems (WG 34: IMO leading)

Tuesday, 18 September

Morning session

- .3 Atmospheric input of chemicals to the ocean (WG 38: WMO leading)
- .4 Establishment of trends in global pollution in coastal environments (WG 39: IAEA leading)
- .5 Sources, fate and effects of plastics and micro-plastics in the marine environment – a global assessment (WG 40: IOC-UNESCO and UN Environment co-leading)
- .6 Marine geoengineering (WG 41: IMO leading)

Afternoon Session

- .7 Impacts of wastes and other matter in the marine environment from mining operations, including marine mineral mining (WG42: IMO and UN Environment co-leading)
- 5 Contributions to other UN processes

Wednesday, 19 September

Morning session

6 Identification of new and emerging issues regarding the degradation of the marine environment of relevance to governments and sponsoring organizations

7 Scoping activities

CG 1: Relevance of inputs of disinfection byproducts (DBPs) into the marine environment

CG 2: Impacts of residues of chronic oil spills

CG 3: Causes and impacts of massive accumulations of the brown macro-algae *Sargassum* in the nearshore environment of the Caribbean and West Africa

CG 4: Issue of emerging pollutants in pharmaceutical waste and other novelty chemicals

CG 5: Sand and gravel mining

CG 6: Updating the information on sources and levels of the main pollutants impacting the global marine environment

Afternoon session

8 GESAMP side event: 'Harmful algal blooms and food security and safety in the context of climate change'

Thursday, 20 September

Morning Session

Presentations by observers

9 Date and place of GESAMP 46

10 Future work programme

Afternoon session

11 Any other business

12 Election of chairs

13 Consideration and adoption of the report of GESAMP 45

14 Closure of the session (at 5:30 p.m.)

Friday 21 September (closed session)

Morning session

Concluding meeting of the ExCom

ANNEX II - List of documents

Agenda item 1

- 45/1/Rev.1 Provisional agenda (Revised)
- 45/1/1 Annotations to the provisional agenda
- 45/INF.1 List of participants

Agenda item 2

- 45/2 Report of the Chair of GESAMP

Agenda item 3

- 45/3 Report of the Administrative Secretary of GESAMP

Agenda item 4

- 45/4 Report of the co-Chairs of Working Group 38: Atmospheric input of chemicals to the oceans
- 45/4/1 Report of the Chair of Working Group 1: Evaluation of the Hazards of Harmful Substances Carried by Ships
- 45/4/2 Report of the Ballast Water Working Group 34: Review of applications for 'Active Substances' to be used in ballast water management systems
- 45/4/3 Report of the Chair of Working Group 39: Global trends in pollution in coastal ecosystems
- 45/4/4 Report of the Chair of Working Group 40: Sources, fate and effects of plastics and micro-plastics in the marine environment
- 45/4/5 Report of the co-Chairs of Working Group 41: Marine geoengineering
- 45/4/6 Report of the Chair of Working Group 42: Impacts of wastes and other matter in the marine environment from mining operations, including marine mineral mining

Agenda item 11

- 45/11 Anniversary to commemorate 50 years of GESAMP

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ANNEX 4 – ACTIVITIES AND ACHIEVEMENTS BY THE SPONSORING ORGANIZATIONS OF GESAMP DURING THE INTERSESSIONAL PERIOD

This document provides a summary of the Sponsoring Organizations' achievements since GESAMP 44 (4 to 7 September 2017) from IMO, IAEA, UNESCO-IOC, UNDP, FAO, DOALOS, WMO, and UN Environment.

INTERNATIONAL MARITIME ORGANIZATION (IMO)

Implementation of the Ballast Water Management Convention

1 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 BWM Convention entered into force on 8 September 2017. The number of Contracting Governments is currently 76, representing 77.08% of the world's merchant fleet tonnage as at 21 August 2018.

Matters directly related to the GESAMP-BWWG

2 In total there are approximately 70 type-approved ballast water management systems (BWMS) available. IMO's Marine Environment Protection Committee (MEPC), at its 72nd session, did not grant Basic or Final Approval to any BWMS that make use of Active Substances, based on the recommendations of the 35th meeting of the GESAMP Ballast Water Working Group (BWWG).

3 Having considered the recommendations of the GESAMP-BWWG, MEPC 72 agreed that the *Procedure for approval of ballast water management systems that make use of Active Substances* (G9) should be revised as a consequence of the revision of the *Guidelines for approval of ballast water management systems* (G8), and that it is not necessary to make Procedure (G9) into a code under the Convention.

4 The 36th meeting of the GESAMP-BWWG was held at IMO Headquarters from 4 to 7 June 2018 to review two proposals for approval of BWMS that make use of Active Substances, one for Basic Approval and one for Final Approval. The Group recommended that approval be granted to both BWMS and the report of this meeting will be considered by MEPC 73.

Other matters

5 A summary of the most important outcomes from MEPC 72 and the 5th session of the Sub-Committee on Pollution Prevention and Response (PPR 5) is provided in this section.

Amendments to regulation B-3 of the BWM Convention

6 MEPC 72 adopted amendments to regulation B-3 of the BWM Convention (resolution MEPC.297(72)), to provide an appropriate timeline for ships to comply with the ballast water performance standard described in regulation D-2 of the Convention, along with a draft MEPC resolution on *Determination of the date referred to in regulation B-3, as amended, of the BWM Convention* (resolution MEPC.298(72)). The amendments to regulation B-3 of the BWM Convention will enter into force

in October 2019; however, MEPC 71 had adopted resolution MEPC.287(71) on *Implementation of the BWM Convention* calling for early implementation of these amendments ahead of their formal entry into force, with a view to facilitating their smooth and uniform implementation.

Code for approval of ballast water management systems

7 MEPC 72 adopted the *Code for approval of ballast water management systems* (BWMS Code) (resolution MEPC.300(72)), which will supersede the *2016 Guidelines for approval of ballast water management systems* (G8) (resolution MEPC.279(70)) from October 2019.

8 In addition, MEPC 72 adopted consequential amendments to regulations A-1 and D-3 of the BWM Convention to make the BWMS Code mandatory (resolution MEPC.296(72)). The amendments will enter into force in October 2019 along with the Code.

9 In conjunction with the adoption of the BWMS Code, MEPC 72 also approved consequential amendments (revisions) to the following circulars:

- .1 BWM.2/Circ.33/Rev.1 on revised *Guidance on scaling of ballast water management systems*; and
- .2 BWM.2/Circ.43/Rev.1 on revised *Guidance for Administrations on the type approval process for ballast water management systems in accordance with Guidelines* (G8).

10 Finally, MEPC 72 approved a *Unified Interpretation of Appendix I (Form of the International Ballast Water Management Certificate) of the BWM Convention* (BWM.2/Circ.66) to provide appropriate clarity on what is meant by the word "installed" with reference to BWMS with applicability to the original Guidelines (G8) (resolution MEPC.174(58)), the 2016 Guidelines (G8) and the BWMS Code.

Survey and certification

11 As instructed by MEPC 71, the Sub-Committee on Implementation of IMO Instruments at its 4th session (III 4) incorporated the *Interim Survey Guidelines for the purpose of the BWM Convention under the Harmonized System of Survey and Certification* (BWM.2/Circ.7) in the latest amendment of the HSSC Guidelines, which was adopted by the IMO Assembly's thirtieth meeting (A 30), including provisions for validating the compliance of individual BWMS with regulation D-2 of the BWM Convention in conjunction with their commissioning. MEPC 72 also agreed that detailed aspects of this validation needed to be addressed and invited interested Member Governments and international organizations to submit comments with a view to the finalization, at MEPC 73, of guidance on this matter. MEPC 72 further invited interested Parties to submit proposals for a relevant amendment to regulation E-1.1.1 of the BWM Convention.

12 Recognizing the complications arising from the fact that there are three different versions of Guidelines (G8) that may be applicable to BWMS installed on board existing and new ships, and different requirements among these versions, MEPC 72 instructed the III Sub-Committee to review the Survey Guidelines under the HSSC in light of the 2016 Guidelines (G8) and BWMS Code.

13 MEPC 72 also adopted amendments to regulations E-1 and E-5 of the BWM Convention, concerning endorsements of additional surveys on the International Ballast Water Management Certificate (resolution MEPC.299(72)). The amendments will come into force in October 2019.

Experience-building phase

14 MEPC 72 approved the *Data gathering and analysis plan for the experience-building phase* (BWM.2/Circ.67). The experience-building phase was established through resolution MEPC.290(71) to enable port States, flag States and other stakeholders to gather, prepare and submit data on various aspects of the implementation of the BWM Convention. Analysis of this data will allow a systematic and evidence-based review of the text of the Convention and the development of a package of amendments to the Convention as appropriate.

15 MEPC 72 also agreed that further consideration on the procedures for collection of treated ballast water samples, as well as on the analytical procedures for sampling and analysis for the experience-building phase, is required at PPR 6.

16 As requested by MEPC 72, the IMO Secretariat has initiated the necessary actions for the implementation of the experience-building phase. This includes the development of a new module under the Global Integrated Shipping Information System (GISIS) to accommodate the reporting requirements of the data gathering and analysis plan.

System Design Limitations of BWMS

17 Having recognized the need to develop separate guidance on System Design Limitations (SDL) for use in conjunction with the 2016 Guidelines (G8), PPR 5 agreed to the draft *Guidance on System Design Limitations of ballast water management systems and their monitoring*, which is expected to be approved by MEPC 73 for dissemination as a BWM.2 circular.

Future work

18 MEPC 73 (scheduled from 22 to 26 October 2018) is expected to consider issues related to ballast water management, including the following:

- .1 implementation and financial support of the experience-building phase;
- .2 draft guidance on the validation of the compliance of individual BWMS with regulation D-2 of the BWM Convention in conjunction with their commissioning and possible consequential amendment of regulation E-1.1.1; and
- .3 inclusion of contingency measures in the ballast water management plan.

19 MEPC 73 is also expected to approve the *Guidance on System Design Limitations of ballast water management systems and their monitoring* mentioned above, as well as deal with other issues related to ballast water management, including possible proposals for new outputs and the outcome of GESAMP-BWWG 36.

20 PPR 6 (scheduled from 18 to 22 February 2019) is expected to consider issues including guidance on contingency measures and on ports with challenging water quality, as well as procedures for collection of treated ballast water samples and analytical procedures for sampling and analysis, mentioned above.

Amendment of the Anti-fouling Systems Convention

21 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 80, representing 94.30% of the world's merchant fleet tonnage as at 21 August 2018. The Convention has not been amended since its entry into force.

22 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 the Convention has a mechanism to prevent the potential future use of other harmful substances in anti-fouling systems. In this context, MEPC 71 and PPR 5 considered an initial proposal to amend Annex 1 to the Convention to include controls on cybutryne, and agreed that cybutryne warrants a more in-depth review. The outcome of the deliberations of PPR 5 will be considered by MEPC 73, which is expected to approve the extension of this output to amend Annex 1 to the AFS Convention to include controls on cybutryne.

Review of the 2011 Biofouling Guidelines

23 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.

24 As scientific and technological advances are made, the Biofouling Guidelines may be refined to enable the risk to be more adequately addressed. In support of this review process, IMO has prepared guidance for evaluating the Guidelines (MEPC.1/Circ.811). MEPC 72 considered a proposal to conduct a review of the Guidelines and agreed to a new output for the PPR Sub-Committee to review the Biofouling Guidelines, which will be based on the principles of the above-mentioned guidance.

25 The IMO Secretariat is also embarking on a new major project titled "Building Partnerships to Assist Developing Countries Minimize the Impacts from Aquatic Biofouling" (GloFouling Partnerships), which was approved by the Global Environment Facility (GEF) through UNDP. The full project document was recently approved by the GEF and project implementation is planned from September 2018 for a period of five years. This project aims to build capacity in developing countries to implement the Biofouling Guidelines and will also inform the review of the Guidelines.

Protecting the Arctic from heavy fuel oil

26 MEPC 72 considered the development of measures to reduce risks of use and carriage of heavy fuel oil as fuel by ships in Arctic waters and agreed the scope of work for the Sub-committee on Pollution Prevention and Response (PPR), which would meet for 6th session PPR 6 in February 2019.

27 PPR 6 was tasked to develop a definition of HFO; prepare a set of guidelines on mitigation measures to reduce risks of use and carriage of heavy fuel oil as fuel by ships in Arctic waters; and on the basis of an assessment of the impacts, develop a ban on HFO for use and carriage as fuel by ships in Arctic waters, on an appropriate timescale.

28 The Committee requested countries to submit proposals on an appropriate impact assessment methodology process for consideration at MEPC 73 in October, with a view to facilitating the work to be undertaken by PPR Sub-Committee.

29 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.

Marine litter and microplastics

30 MEPC 72 agreed to include a new output on its agenda, to address the issue of marine plastic litter from shipping in the context of 2030 Sustainable Development Goal 14 (SDG 14).

31 Member Governments and international organizations were invited to submit concrete proposals to MEPC 73 on the development of an action plan. The Food and Agriculture Organization (FAO) and other international organizations were invited to keep the Committee updated on their work related to addressing marine plastic litter. MEPC noted that the FAO Voluntary Guidelines on the Marking of Fishing Gear would be submitted to the 33rd session of FAO's Committee on Fisheries (COFI) 9-13 July 2018, for approval.

Hull scrapings and marine coatings as a source of microplastics in the ocean

32 Recent studies have indicated that hull scrapings and marine coatings are possible pathways contributing to the presence of microplastics in the ocean, through activities such as hull cleaning, replacement of hull coatings, and the normal wear of anti-fouling coatings during ship operations. However, there is insufficient knowledge concerning both the qualitative and quantitative contributions of plastic pollution from these sources, especially from the perspective of IMO's mandate (including the AFS Convention and Biofouling Guidelines, as well as the London Convention and Protocol).

33 Under the Global Partnership on Marine Litter (GPML), IMO, using funding from the UN Environment, conducted a scoping study on the contribution of hull scrapings and marine coatings to ocean microplastics. The study, which was completed in July 2018, provided useful information on the current international state of knowledge on microplastic release from hull scrapings and marine coatings, identified key data gaps and recommended areas of research to close these gaps.

Ship recycling

34 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 20.32% 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)

35 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.

36 MEPC 70 adopted further amendments to MARPOL Annex V (resolution MEPC.277(70)) related to substances that are harmful to the marine environment (HME) and Form of Garbage Record Book, which entered into force on 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 classified and declared by the shipper as to whether or not they are harmful to the marine environment, and, if they are classified as HME substances, they shall not be discharged into the sea.

37 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

Revision of the IBC Code – Chapters 17, 18, 19 and 21

38 PPR 5 approved draft amendments to the IBC Code, comprising of the full text of draft revised chapters 17 (Summary of minimum requirements), 18 (List of products to which the Code does not apply), 19 (Index of Products Carried in Bulk) and 21 (Criteria for assigning carriage requirements for products subject to the IBC Code), as well as draft new paragraph 15.15 (Hydrogen sulphide (H₂S) detection equipment for bulk liquids), for submission to MEPC 73 and MSC 100 for approval, with a view to subsequent adoption.

Review of MARPOL Annex II requirements that have an impact on cargo residues and tank washings of high-viscosity and persistent floating products

39 The Sub-Committee also approved draft amendments to MARPOL Annex II and consequential draft amendments to the IBC and BCH Codes, to address issues related to the discharge of persistent floating substances with a high viscosity (equal to or greater than 50 mPa·s at 20°C) and/or a high melting point (equal to or greater than 0°C), with a view to approval and subsequent adoption by MEPC and MSC, as appropriate.

Guidance and amendments relating to the certificates of fitness under the gas and chemical codes

40 MEPC 71 and MSC 98 approved MSC-MEPC.5/Circ.14 on *Guidance on completing the Certificate of Fitness under the IBC, BCH, IGC, GC and EGC Codes*, which addresses how Certificates of Fitness should be completed for ships that do not yet have to comply with the requirements for an approved stability instrument. Subsequently, MEPC 72 adopted amendments to the IBC and BCH Codes concerning the Model form of the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk (resolutions MEPC.302(72) and MEPC.303(72), respectively).

OSV Chemical Code

41 The IMO Assembly adopted the *Code for the Transport and Handling of Hazardous and Noxious Liquid Substances in Bulk on Offshore Support Vessels* (OSV Chemical Code) (resolution A.1122(30)), which entered into force on 1 July 2018. The OSV Chemical Code aims to provide a consistent regulatory framework for the transport and handling of hazardous and noxious liquid substances in bulk on offshore support vessels with a single certification scheme, taking into account the complex and continued evolution of the offshore industry as well as the unique design features and service characteristics of these vessels. The Code covers the design, construction and operation of offshore support vessels which transport hazardous and noxious liquid substances in bulk for the servicing and resupplying of offshore platforms, mobile offshore drilling units and other offshore installations, including those employed in the search for and recovery of hydrocarbons from the seabed.

MARPOL Annex VI (Prevention of air pollution from ships)

Consistent implementation of regulation 14.1.3 of MARPOL Annex VI

42 MEPC 70 decided that the 0.50% limit on sulphur content limit for fuel oil in regulation 14.1.3 of MARPOL Annex VI shall become effective on 1 January 2020.

43 MEPC 72 approved, with a view to adoption at MEPC 73 for entry into force on 1 March 2020, draft amendments to MARPOL Annex VI to prohibit the carriage of non-compliant fuel oil for combustion purposes for propulsion or operation on board a ship without an approved equivalent arrangement.

44 An intersessional meeting under the PPR Sub-Committee will meet from 9 to 13 July to develop guidelines to support consistent implementation of regulation 14.1.3 of MARPOL

Annex VI. These guidelines include guidance on ship implementation planning for 2020.

Fuel oil quality

45 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 72 approved *Guidance on best practice for fuel oil purchasers/users for assuring the quality of fuel oil used on board ships*.

46 The correspondence group established by MEPC is also further developing draft best practice for Member States/coastal States and has been instructed to submit a report to MEPC 73.

EEDI review

47 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.

48 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.

49 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. In this respect, the correspondence group on review of the EEDI beyond phase 2 established at MEPC 71 is expected to make an interim report to MEPC 73 with a final report to MEPC 74 (Spring 2019). Currently, phase 3 requirements provide that new ships be built to be 30% more energy efficient compared to the baseline.

50 Finally, MEPC 72 adopted amendments to regulation 21 of MARPOL Annex VI regarding EEDI requirements for ro-ro cargo and ro-ro passenger ships.

Further technical and operational measures to enhance energy efficiency

51 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.

52 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, by 1 January 2019, 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 Secretariat will be required to produce an annual report to the MEPC, summarizing the data collected.

53 MEPC 72 was updated on the status of the development of the IMO Ship Fuel Oil Consumption Database which was launched in March 2018. The Committee also approved the *Sample format for the Confirmation of compliance, early submission of the SEEMP part II on the ship fuel oil consumption data collection plan and its timely verification pursuant to regulation 5.4.5 of MARPOL Annex VI*. The confirmation of compliance should confirm that the methodology and processes are in place for the ship to report the data required under the regulations.

Reduction of GHG emissions from ships

54 MEPC 70 approved a Roadmap for developing a Comprehensive IMO strategy on reduction of GHG emissions from ships, which foresaw an initial GHG reduction strategy to be adopted in 2018.

55 In April 2018, following three intersessional meetings, MEPC 72 adopted resolution MEPC.304(72) on *Initial IMO Strategy on reduction of GHG emissions from ships*. The Initial Strategy represents a framework for Member States, setting out the future vision for international shipping, the levels of ambition to reduce GHG emissions and guiding principles; and includes candidate short-, mid- and long-term further measures with possible timelines and their impacts on States. The strategy also identifies barriers and supportive measures including capacity building, technical cooperation and research and development (R&D).

56 The Vision set out in the Initial Strategy confirms that IMO remains committed to reducing GHG emissions from international shipping and, as a matter of urgency, aims to phase them out as soon as possible in this century.

57 More specifically, under the identified “levels of ambition”, the Initial Strategy envisages for the first time a reduction in total GHG emissions from international shipping which, it says, should peak as soon as possible and to reduce the total annual GHG emissions by at least 50% by 2050 compared to 2008, while, at the same time, pursuing efforts towards phasing them out as called for in the Vision. The strategy includes a specific reference to “a pathway of CO₂ emissions reduction consistent with the Paris Agreement temperature goals”.

58 Continuing the momentum of work on this important issue, MEPC 72 agreed to hold a fourth meeting of the Intersessional Working Group on Reduction of GHG emissions from ships (ISWG-GHG 4) later in 2018, subject to the endorsement of Council 120. This working group has been tasked with developing a programme of follow-up actions to the Initial Strategy; further consider how to progress reduction of GHG emissions from ships; and report to the next session of the MEPC (MEPC 73), which will meet in London, 22-26 October 2018.

Oil pollution preparedness and response

59 The final part of the revised IMO Dispersant Guidelines dealing specifically with Sub-Sea dispersant application was considered by the PPR 5 Sub-Committee in February 2018. It was subsequently agreed for submission to MEPC 73 in October 2018, when it is expected to be approved for publication along with the revised parts of the Guidelines dealing with the surface application of dispersants, which have been already approved by MEPC. These Guidelines take into account the experience gained from the Deepwater Horizon incident and others, as well as the subsequent scientific studies and technical developments initiated by the public sector and the industry.

60 PPR 5 also considered the development of a “Guide on practical methods for the implementation of the OPRC Convention and OPRC-HNS Protocol”, significant progress was made in the development of this Guide due to the submission by Norway of a draft Guide to use as a basis. A Correspondence Group, led by Norway, was established to further progress this work and a finalized draft of the Guide is expected to be submitted to PPR 6 for its consideration.

London Convention and Protocol (LC/LP)

61 Since its 44th session, the following developments may be of interest to the Group. The Scientific Groups of the LC/LP met for their joint annual session (LC 41/LP 13) from 30 April to 4 May 2018 at the Maritime Training and Education Centre (CIMAR) of the Chilean Maritime Authority (DIRECTEMAR), in Valparaiso, Chile.

Disposal of fibreglass vessels

62 The Scientific Groups considered a draft report on the current state of knowledge regarding the end of life management of fibre-reinforced plastic (e.g. fibreglass) vessels, and on alternatives to disposal at sea, commissioned by the Secretariat. The Groups adopted a statement of concern on the disposal of fibre-reinforced plastic (fibreglass) vessels and noted that knowledge gaps exist in relation to the scale of the issue, its impacts in the marine environment, and alternatives to disposal at sea. There is currently not enough information to make a determination as to what are the most appropriate options

for the end-of-life management of fibre-reinforced plastic vessels.

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

63 The Groups noted the progress of the Correspondence Group on the revision of the Specific guidelines for assessment of platforms or other man-made structures at sea, under the lead of Norway, with assistance from Canada and established a working group to resolve issues highlighted for further discussion in the first draft of the revised Guidelines. The target dated for completion of the revision is 2019.

Disposal of wastes and other matter in the marine environment from mining operations, including marine mineral mining

64 The Scientific Groups noted the progress made by GESAMP Working Group on the disposal of wastes and other matter in the marine environment from mining operations, including marine mineral mining (WG 42) under the co-lead of IMO and UN Environment. The target completion date for this activity had been changed to 2019 and a draft working group report had been circulated to members in March 2018 for comment and review.

Marine litter and microplastics

65 The Scientific Groups held further discussions, considered several informative submissions on marine litter and microplastics, and established a Correspondence Group on the topic, under the lead of Nigeria, and with the support of Chile, to: establish an inventory of the work carried out by the LC/LP bodies on the issue of marine litter and microplastics; identify the relevant aspects of the LC/LP regulatory framework in relation to marine litter and microplastics and: provide an overview of possible source control options to reduce the presence of marine litter in LC/LP waste streams.

Science Day 2018

66 As part of the joint session, Science Day 2018 was held as one-day symposium devoted to the topic of "Plastics and microplastics in the marine environment, including impacts on aquaculture activities". The aim of the symposium was to improve the understanding of plastics and microplastics in the marine environment, in particular in relation to the waste streams under the LC/LP, and to identify possible further solutions and actions to address this problem. The Groups noted the interest in this topic from stakeholders outside the LC/LP community and requested the proceedings to be published, as had been done for the 2015 Science Day on marine geoengineering.

Deposition of materials jettisoned during the launch of space vehicles

67 In 2017 the governing bodies of the LC/LP noted that the deposition of materials jettisoned during the launch of space vehicles was an issue that may gain more interest due to the proliferation of space vehicle launch facilities around the world. The governing bodies, therefore requested the Scientific Groups to prepare an overview, with a view to identifying those with the potential for deposition of jettisoned components at sea during routine launches.

68 In 2018, the Scientific Groups, following an initial review, established an intersessional correspondence group under the lead of the United Kingdom, to collect further information on the issue, with a view to assessing the impacts of these activities in the marine environment, and provide a report to the next joint session of the Scientific Groups in 2019.

Joint session of the Scientific Groups

69 The next meeting of the governing bodies of the LC/LP will be held from 5 to 9 November, at IMO Headquarters. The next joint session of the LC/LP Scientific Groups is tentatively scheduled for late March/early April 2019.

INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)

70 IAEA Environment Laboratories (NAEL) report on activities at its three 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

71 IAEA's CRMs are produced to assist Member States improving the 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. One Certified Reference Material (CRM) for trace elements and methyl mercury in fish was produced - CRM IAEA-476. Two new sediment CRMs i) IAEA-475 for trace elements and ii) IAEA-477 for polycyclic aromatic hydrocarbons is under the production process. The production of both CRMs is financed by a donation of the Australian Government. Two publications, describing the certification processes for trace elements in marine biota sample and organic contaminants in sediment sample were published in peer reviewed journals.

72 NAEL participated in the proficiency tests for trace elements and organic pollutants in marine samples organised by 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 and in the 12th Round Robin test organised by the Bonn OSINet Group for the identification of oil spill within the Bonn-OSINet expert group (Round Robin oil spill 2017-2018).

73 A worldwide interlaboratory comparison on determination of trace elements and methyl mercury in marine biota sample IAEA-MESL-ILC-TE-BIOTA-2017 was finalised. In total 49 laboratories from 32 countries reported results back to the organizers.

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

74 NAEL provided technical support for strengthening the capability of Mediterranean laboratories to accurately analyse contaminants in marine samples in the framework of the MEDPOL programme. MEDPOL is the Programme for the Assessment and Control of Pollution in the Mediterranean Region of the 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 the marine environment.

75 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: 21 laboratories from 11 Mediterranean Member States (Croatia, France, Greece, Israel, Italy, Lebanon, Montenegro, Morocco, Slovenia, Tunisia, Turkey); and
2. Analytical Performance Study for MEDPOL: Determination of chlorinated pesticides, PCBs and petroleum hydrocarbon in marine biota sample: 31 laboratories from 14 Mediterranean Member States (Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Italy, Lebanon, Montenegro, Morocco, Slovenia, Spain, Tunisia, Turkey).

76 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, 30/10-10/11/2017 (4 trainees from 4 Mediterranean Member States: Croatia, Morocco, Tunisia, Turkey); and
2. Training workshop on the analysis of Organic Contaminants in marine samples for laboratory practitioners in MEDPOL countries, 30/10-10/11/2017 (5 trainees from 4 Mediterranean Member States: Croatia, Morocco, Tunisia, Turkey).

77 One scientist from the University of Belize visited NAEL and was trained on the analysis of chlorinated pesticides and PCBs in marine samples. The training was provided in the framework of the IAEA's Technical Cooperation Project BZE70002 (Strengthening National Capacity for Measuring and Monitoring Marine Pollution and Studying the Effects of Ocean Acidification on Marine Ecosystems). Within the IAEA TC project SRL7005 "Establishment of National Center for Marine Pollution Control in Sri Lanka", NAEL analyzed stable isotopes and chemical markers in sediment cores to understand the history of Negombo Lagoon, in Sri Lanka. One scientist from the National Institute of Metrology, LNE France made

scientific visits to NAEL in the frame of EU project "Traceability of mercury measurements". One scientist from Polish Geological Institute visited NAEL to take part in the latest developments related to the analysis of trace elements and rare earth elements in the marine environment, using ICP-MS and GC-AFS techniques respectively.

78 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 2018.

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 uranium isotopic ratios in seawater samples; iii) method for lead isotope ratios in marine samples; ii) reference method for toxic elements in biota samples, based on isotope dilution inductively coupled plasma mass spectrometry.

80 Analytical methodologies developed in NAEL for emerging and regulated contaminants and for the determination of isotope ratios in the marine environment were promoted via 8 publications in peer review journals/books and 18 presentations at scientific conferences.

81 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. NAEL participated in the collaborative study on mercury and methylmercury quantification in fish samples from the German Environmental Specimen Bank, conducted in the frame of EU project "Traceability of mercury measurements".

Radioecology Laboratory (REL) activities

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

82 The receptor binding assay (RBA) for harmful algal blooms (HABs) toxin detection continues 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 has been optimized for application to the emerging ciguatera toxins and its verification and validation is being processed for regulatory application. The RBA method put in operation in 2017 in Morocco and tested on a large set of samples and was identified in 2018 as a potential replacement of the mouse bioassay currently in use for regulatory purposes.

83 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 11 individuals over the last 3 years from Indonesia, Philippines, Morocco, Tunisia, Cuba, and France, for periods varying between one to 6 months). NAEL is joining efforts with other national and international organisations (IOC-UNESCO, FAO, WHO, 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.

84 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.

85 IAEA led an international workshop on Monitoring and Management Strategies for Benthic HABs. Organized in the framework of joint activity involving Asia-Pacific, Africa and Latin America and the Caribbean, the workshop was attended by 60 participants from 30 countries, 15 international experts and representative of 3 other UN agencies, FAO, WHO, and IOC-UNESCO.

86 The Philippine Nuclear Research Institute, re-designated in 2016 as an IAEA collaborating centre to work on HABs in the context of environmental and global change, continues to collaborate with the IAEA to expand use of nuclear techniques for HAB management, in particular PNRI assessed the performance of the CTX-RBA using a brevetoxin as standard and assess performance and uncertainty budget of the PSP-RBA.

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 was organized in 2018 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 NAEL held a Technical Meeting for the development of an Inter-Agency Global Ciguatera Strategy (occurred during April, 2018).

89 Research findings and IAEA activities on HABs were communicated in scientific journals, international conference proceedings, technical reports or online news articles and student theses.

90 NAEL is in an ongoing partnership with the Collaborative Research Centre, SPB 754, at the University of Kiel, Germany. 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 be highly impacted by the oxygen decline.

91 After three intensive field work campaigns in upwelling areas off the coast of Peru and Mauritania, NAEL participated in February 2018 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 applications for studying contaminants and essential elements in marine biota

92 NAEL continued to use radiotracers to investigate bioaccumulation of contaminants and essential elements in diverse marine organisms and to assess seafood safety concerns of IAEA Member States. The focus for this period was on (1) factors affecting accumulation of trace metals in select marine organisms, (2) effects of multiple stressors (ocean acidification, hypoxia, temperature in parallel with metals, toxins and radionuclides contamination) on fish and marine invertebrates, (3) the calcification rate of corals under changing environmental conditions (e.g. pH or hypoxia) and (4) effect of microplastics on physiology of marine organisms or their role as vector of contaminants to fish and shellfish. NAEL has also been investigating for the last 5 years the exposure of different marine species through various exposure pathways to better understand the fate of accidental releases of radiocaesium into the marine environment, and to be able to address the following key questions: How is caesium bioaccumulated? 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.

93 Additionally, through a collaboration with the Oceanographic Observatory of Villefranche-sur-Mer (part of the Université Pierre et Marie Curie, Paris VI) and with support from CNRS and the National Commission of the Coastal Fleet, NAEL collects monthly and seasonal seawater samples from the time-series site DYFAMED in the Mediterranean Sea. Using nuclear techniques, these samples are analysed to investigate aspects of the marine carbon cycle including carbon flux, remineralization, and microbial carbon uptake under changing climate conditions.

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

94 Through a vigorous program of support and collaboration, the IAEA NAEL OA-ICC continues to advance international activities in ocean acidification science, capacity building and communication. The OA-ICC works with international partners to foster a strong ocean acidification research community across the globe, providing access to data, training, standardized methodology, resources and opportunities for regional and international networking and collaboration. Activities continued to ramp up in 2017, in particular in response to a heightened demand from Member States to build capacity to report on Target 3 of the UN Sustainable Development Goal 14, that specifically addresses Ocean Acidification. The coordination work, activities and resources offered by the OA-ICC are directly relevant to helping Member States address this target.

95 The impacts of ocean acidification on marine ecosystems take place in the context of other concurrent perturbations (e.g. ocean warming, loss of nutrients and loss of oxygen). New research methodologies and recommendations on how to best study the effects of ocean acidification in a multiple stressor context are much needed, and is the task of the trans-disciplinary SCOR Working Group 149. The OA-ICC co-organized a Technical Meeting of this Working Group at the IAEA in Monaco, 12-14 June 2017, which focused on the development of best practices for complex multiple-stressor experiments. The group took a three-tiered approach to develop a web-based resource which will be made available to the global community and which includes: (1) a decision support tool to navigate this complex research topic via flow charts and questionnaires; (2) a «Virtual Marine Scientist» experimental design tutorial to assist researchers with the selection and refinement of the most suitable design for their research questions; and (3) a series of webinars to assist researchers to further develop their experimental designs and reply to frequently asked questions. A course book that provides links between each of these three strands, along with other information, will also be available. These resources are planned to be available online by summer 2018, and a training course based on them is planned for October 2018 in Monaco.

96 The OA-ICC also facilitated the second meeting of the "Ocean Solutions Initiative", Monaco, 18–20 April 2017. The goal of this initiative is to assess 13 ocean-based measures to reduce the risks of climate change and ocean acidification on key marine ecosystems and ecosystem services. A review article entitled "Ocean solutions to address climate change and its effects on marine ecosystems" is now in preparation.

97 As part of OA-ICC's intercomparison activities, a pilot study looking at methods to assess calcification in corals was initiated over the past few months at the IAEA Environment Laboratories in Monaco. Designed by researchers from the IAEA, the Villefranche Oceanography Laboratory in France, the Scientific Centre of Monaco, the Centro de Estudios Ambientales de Cienfuegos in Cuba, and Xiamen University in China, the study measured rates of calcification in the tropical coral *Stylophora pistillata* using four different techniques: the alkalinity anomaly method, the calcium anomaly method, the Ca-45 incorporation technique and the C-13 incorporation technique. Preliminary results indicate solid

agreement between methods, and this laboratory exercise may be extended to include other coral species; other methods, and pelagic systems in collaboration with other institutes and partners.

98 Another key effort of the OA-ICC is to ensure the sustained archival and quality control of data on the biological response to ocean acidification, and to promote easy access to the data for all users. To this end, a portal to improve the search experience of data sets included in the OA-ICC Data Compilation, maintained in cooperation with Xiamen University and hosted at the Germany-based data centre Pangaea, is in development. Building on community input that was received during the 2016 Ocean in a High-CO2 World Symposium in Hobart, Australia, where a demonstration of the draft portal was shown, a set of keywords was established in collaboration with experts in the field. The keywords were designed to ensure that users would be able to search and extract the datasets they are interested in, ultimately facilitating data comparison and synthesis. The data portal is expected to be ready in the fall of 2018.

99 An IAEA consultancy was initiated by the OA-ICC to implement use of the new oceanographic standards (TEOS-10) for temperature and salinity (conservative temperature and absolute salinity) in four public software packages that are used widely by the community to compute carbonate chemistry. These packages (seacarb, mocsy, CO2SYS-Matlab, and CO2SYS-Excel) have now been extended to optionally use the new TEOS-10 standard. The former standard (EOS-80: practical salinity and in situ temperature) remains as the default.

100 The OA-ICC co-organized the Fourth Edition in a series of International Workshops on the Socio-Economic Impacts of Ocean Acidification launched by the Scientific Centre of Monaco (CSM) and the IAEA in 2010. This 4th workshop, organized from 15-17 October 2017, focused on the impact of ocean acidification on ecosystem services and coral reefs. With sixty participants from twenty-two countries including HSH Prince Albert II of Monaco it aimed to bring the global discussion from sciences to solutions. More information can be found at: <https://www.iaea.org/newscenter/news/high-level-workshop-discusses-ocean-acidification-and-coral-reefs>.

101 The OA-ICC continued to work closely with partners throughout the year to provide state-of-the-art ocean acidification training to several Member States and to support the development and needs of emerging regional ocean acidification networks in Latin America and Africa. For example, the OA-ICC worked with Future Earth Coasts and other partners to organize a regional training and networking workshop on ocean acidification in support of the OA-Africa network in Dakar, Senegal, 13-16 February 2017. The OA-ICC supported 21 young scientists from 13 IAEA Member States (Algeria, Benin, Cameroon, Cote d'Ivoire, Egypt, Gabon, Ghana, Madagascar, Morocco, Nigeria, Togo, Tunisia and the United Republic of Tanzania) to attend the event, which was looking to provide the participants with the skills required to set up coherent and relevant ocean acidification experiments and monitoring in the context of socio-economic impacts, and provide a forum to discuss future collaboration and coordination for the OA-Africa network.

102 The OA-ICC supported the First International Science Symposium of the Latin American Ocean Acidification Network LAOCA, held in Buenos Aires, Argentina, 24-26 October 2017. The participation of 19 LAOCA members from 5 Member States (Brazil, Chile, Colombia, Mexico and Peru) was hereby facilitated by the OA-ICC. The OA-ICC also collaborated and financially supported a training course in Suva, Fiji, 30 October to 10 November, organized by The Ocean Foundation, the US Department of State, The Swedish International Development Agency, and other partners. The OA-ICC supported the participation of five participants from Fiji, Papua New Guinea, Palau and Vanuatu to attend this basic-to-intermediate-level training course focused on observing ocean acidification in the coastal waters of the Pacific Small Islands Developing States (SIDS).

103 The OA-ICC also supported a capacity building workshop of the Western Indian Ocean Marine Science Association (WIOMSA) and the Nairobi Convention Secretariat in Dar Es Salaam, Tanzania, 24-25 October 2017. The goal of the workshop, organized with support from the OA-ICC, Future Earth Coasts, IOC-UNESCO the Global Ocean Acidification Observing Network (GOA-ON), the University of Washington, and the Institut de Ciència i Tecnologia Ambientals of the Universitat Autònoma de Barcelona (ICTA-UAB), was to develop regional capacity for ocean acidification observations in the Western Indian Ocean in support of the Sustainable Development Goal 14.

104 The OA-ICC continued to inform stakeholders about ocean acidification at several high-level international conferences in 2017, such as the UN Conference to Support the Implementation of Sustainable Development Goal 14, New York, 5-9 June 2017, the Our Ocean conference in Malta, 5-6 October 2017, and the UNFCCC COP23 in Bonn, November 2017.

105 Finally, work on the news stream and the other online OA-ICC resources (web site, bibliography, and data base) continued on a day-to-day basis, with the Bibliographic database now containing more than 4 500 references, and the OA-ICC Data Compilation on the Biological Response to Ocean Acidification offering access to data sets from 870 scientific articles. The Ocean Acidification News Stream passed the 1 000 000 hits mark in July 2017. Overall, it has welcomed more than 160 000 visitors from nearly 180 countries and published over 10 000 posts, since its launch in 2006 (39 000 visitors from 185 countries in 2017).

Radiometrics Laboratory (RML) activities

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

106 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. One sampling mission and ILC and one PT were organized during the first year (2017) of the extended project. As before, both exercises demonstrated a high level of accuracy and competence on the part of the Japanese laboratories.

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"

107 This IAEA Regional Technical Cooperation Project is 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, extending 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"

108 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. Twenty-one 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. A proposal for the continuation of the project in the cycle 2020-2023 has been submitted to the IAEA. (Project supported jointly by Radioecology and Radiometrics Laboratories)

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

109 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”

110 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. Fellowship training of key RMI scientists and an expert mission focussing on sampling and pre-treatment techniques and basic gamma-ray spectrometry were undertaken in 2017 and early 2108. A national training course in radiation protection and environmental radioactivity has also been provided. Provision of required radiometric equipment is continuing. The initial project was completed in December 2017 and a follow-up project, which will run from 2018 to 2021 and aims to continue to develop this capacity, is currently being implemented.

Analytical quality services

111 Production of Certified Reference Materials for radionuclides in marine samples: A new IAEA reference material is in the final phases of the certification process and will be available late 2018 or early 2019: IAEA-465 Radionuclides in Baltic Sea sediment. Other candidate reference materials are currently being considered for certification in 2019.

112 Proficiency Testing: After finalising 6 PTs between 2012 and 2017, the IAEA will organise in 2018 a seventh PT exercise with seawater samples spiked with H-3, Sr-90, Co-60, Ba-133, Cs-134 and Cs-137. Approximately eighty participants will take part in the 2018 proficiency test.

MARIS database

113 The IAEA’s MARine information System (MARiS) is an open-access global database for marine radioactivity measurements that is accessible online at maris.iaea.org. The last 12 months have seen the laying of groundwork for the development and update of the database and website. MARiS is forming 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”. To meet the requirements of CRP K41017, the templates, tools, and workflow for capturing and parsing data into the MARiS database have been reviewed and updated. Developments include new data submission templates, the use of new software for data handling, and a review with the Agency’s IT department regarding the underlying computing infrastructure in view of its upgrade. In response to the increasing need to educate the wider general audience on the topic of marine radioactivity and the issues surrounding marine radioactivity, a new FAQ page will soon be published to the MARiS website. MARiS outreach activities include engagement with the RiO5 working group (Radioactivity in the Oceans, 5 Decades Later) which is supported by SCOR (Scientific Committee on Oceanic Research); a poster presentation at the Goldschmidt 2017 conference in Paris; and an article in the March 2018 edition of the Access to Infrastructures for Radiation Protection Research (AIR²) newsletter.

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

114 This 4 years CRP was initiated in 2017, following the recommendations of an experts’ meeting held in 2016 at the 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 (RCM) was held at the Environment Laboratories in Monaco in March 2017, and the second RCM is planned to be held in Sri Lanka and will be supplemented with an effort to collect samples to study the monsoonal pattern in the Indian Ocean.

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

115 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. A mid-term research coordination meeting was organised back to back with technical meeting and hosted 35 participants from 27 Member States. The main objective of the technical meeting was to complement and expand on the work currently being performed within the framework of the CRP.

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

116 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. A comprehensive data compilation of global marine radioactivity measurements covering approximately the last decade is currently being developed as part of the CRP. This is due for completion in early 2019 and will

provide the data required for the assessment phase of the CRP. It will also be made publicly available and will constitute a comprehensive and reliable baseline against which any future changes can be compared.

Collaboration with regional conventions

117 The IAEA collaborates with HELCOM (Helsinki Commission), being part of the HELCOM MORS EG, the Group of Experts for Monitoring Radioactive Substances in the Baltic Sea, on database development and analytical quality support. In the same area of expertise the IAEA also collaborates with OSPAR (Oslo Paris Convention), through RSC, its Radioactive Substances Committee.

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

Global Ocean Science Report (GOSR)

118 The first Global Ocean Science report (GOSR-I), was launched on 8 June 2017, and assessed for the first time the status and trends in ocean science capacity around the world. The GOSR-I offered a global record of how, where, and by whom ocean science is conducted. The GOSR-I is about generating knowledge, helping to protect ocean health, and empowering society to support sustainable ocean management in the framework of the United Nations 2030 Agenda.

119 The GOSR-I identified and quantified the key elements of ocean science at the national, regional and global scales, including workforce, infrastructure and publications. It represents the first collective attempt to systematically highlight opportunities as well as capacity gaps to advance international collaboration in ocean science and technology. The GOSR-I is a resource for policy-makers, academics and other stakeholders seeking to harness the potential of ocean science to address global challenges.

120 As acknowledged by the Inter-agency Expert Group on SDG Indicators of the UN Statistical Commission (IAEG-SDG), part of the information provided in the GOSR contains the data needed to report towards SDG Target 14.A (14.A.1 indicator: Proportion of total research budget allocated to research in the field of marine technology), which deals with increasing scientific knowledge, developing research capacity and the transfer of marine technology. The IAEG-SDG at its sixth session in November 2017 further approved that the related indicator 14.A.1 methodology is tested and upgraded it from Tier III¹ to Tier II² (see also [IOC/EC-LI/2 Annex 6](#)).

121 In Decision IOC-XXIX/5.1, the IOC Assembly requested the IOC Executive Secretary to present a proposed implementation plan for conducting the second edition of the GOSR to the Executive Council at the 51st session (Paris 3–6 July 2018) and to invite Member States through a Circular Letter to convey their views on lessons learnt from the implementation of the first GOSR, including areas where the process could be improved.

¹ Tier III: No internationally established methodology or standards are yet available for the indicator, but methodology/standards are being (or will be) developed or tested.

² Tier II: Indicator is conceptually clear, has an internationally established methodology and standards are available, but data are not regularly produced by countries.

122 The GOSR-II will be published in concomitance with the second United Nations Ocean Conference in 2020. The IOC Secretariat aims to expand the national and regional information assessed, analysed and supported by an online questionnaire and data portal.

123 Moreover, the GOSR-II should be part of a transformative process to provide the needed capacity in ocean science. It is expected to be framed around and to feed into the United Nations Decade of Ocean Science for Sustainable Development (2021-2030), the 2030 Agenda at large, and the Sustainable Development Goal (SDG) 14 in particular.

UN Decade of Ocean Science for Sustainable Development

124 Building on the efforts of IOC Member States and the IOC Secretariat, the UN General Assembly proclaimed in December 2017 the UN Decade of Ocean Science for Sustainable Development from 2021 to 2030. The period 2018–2020 will focus on the preparation of the Implementation Plan for the Decade, which will encompass both a *Science Plan* as well as an *Engagement Plan*. The IOC was tasked by UNGA at its 72nd session with the preparation of the Implementation Plan in “*consultation with Member States, specialized agencies, funds, programmes and bodies of the United Nations, as well as other intergovernmental organizations, non-governmental organizations and relevant stakeholders.*” The strategic approach to the Decade will be transformative. The ocean science community should be willing to think beyond “business as usual” and to aspire for real change, whether in relation to the depth of knowledge related to the ocean, or in the way cooperation and partnerships are leveraged in support of sustainable development and healthy ocean. The IOC Secretariat, supported by the IOC Officers, developed the first draft ‘Roadmap’ document (IOC-INF-1353 prov.) which provides an initial guide for the steps and processes needed to develop an *Implementation Plan* for the Decade. It also proposed governance and structural arrangements in the form of a *Planning Group* to be established by the IOC Executive Council at its 51st session. The roadmap was circulated to IOC Member States in February 2018 and was widely disseminated to institutional partners of the Commission. In this context, IOC also invited relevant UN bodies with a focus on the ocean to contribute to the development of the implementation plan. IOC hosted the meeting of UN-Oceans, the UN inter-agency mechanism on ocean affairs, at UNESCO Headquarters on 26–28 March 2018 to discuss contributions of the UN wide-system to the Decade. The *Planning Group* foreseen in the Roadmap, once formally established by IOC, will take over the overall responsibility of preparing the *Implementation Plan*.

Main activities foreseen for the period 2018-2020

125 Support governance arrangements and specifically the activities and meetings of the Planning Group; The establishment of a Planning Group with the delegated responsibility for developing the Implementation Plan is expected. The Terms of Reference of the Planning Group will be adopted by the 51st IOC Executive Council in July 2018. The Secretariat will guide the work of the planning group which will meet twice in the course of the preparation phase. A Stakeholder Forum consisting of institutional members will be established following a call for expressions of interest and subsequent

invitation from the IOC Executive Secretary. It is expected that UN bodies, non-UN bodies, NGOs, science focused organisations, donors/foundation and representatives from industry will be included. Membership will be open ended. It is expected that the Stakeholder Forum will meet twice in the course of the preparation phase and will also work through electronic communication.

126 Support engagement and consultation with the ocean community, including targeted regional and global topical workshops and participation in selected other fora and meetings that are aligned with the Decade strategy.

127 Several regional workshops are foreseen to take place from the second half of 2018 to the second half of 2019. These meetings will be an integral part of the Decade design process. The Executive Planning Group will provide guidance in the organisation and structure of these workshops, and the IOC Secretariat will lead the organisation of each workshops. Ideally, as a minimum, five regional workshops would be needed to cover the main ocean basins. Two Global Planning Meetings are envisioned to be organised in early 2019 and early 2020. The first meeting will aim to assess the status of ocean research vis-a vis the 2030 Agenda requirements and scope the development of an outline of research programme(s) to be conducted under the Decade. The second meeting would aim at consolidating inputs from various consultations, including regional workshops referred to above, into a draft Implementation Plan.

128 Preparation of the Resource, Science, Capacity Development, Communication/Engagement and overarching Implementation Plan; The preparation of the implementation plan will be a complex exercise, requiring the integration of several inputs from the regional and global consultation workshops, it will also require the development of specific components, for example on capacity development where a longer-term strategy to facilitate improved scientific knowledge transfer to wider segments of society and regional/national governments, will be required. External assistance and expertise will be required, as well as the possible formation of targeted expert groups.

129 Engagement and consultation within the UN system and, in particular, reporting to the UNGA; During the next two years, IOC will need to actively engage with several UN constituencies that may benefit and contribute to the Decade. These will include, FAO on fisheries aspects, IMO on shipping and related environmental issues, the ISA in relation to seabed mining, UN Environment with regards to marine policies, and regional governance, amongst others. To do so, a number of information sessions, events, workshops will be organised in various UN fora (for eg FAO, IMO, Ocean Obs Conference, ‘Our Ocean Conferences, etc.). In addition, information sessions are foreseen to brief UN Member States on the progress with the Decade, on a regular basis.

130 Support communication activities such as the website, networking with scientists and production of outreach materials. Digital marketing activities will also be initiated to communicate about the Decade using digital supports (Facebook, Twitter); A Dedicated Decade website will be established to inform the different stakeholders about the Decade and its preparatory process. This communication campaign will be organised to inform member states, potential partners and other stakeholders of the preparatory phase underway, with the

aim of inviting contributions, as well as to communicate the purpose and expected results of the Decade.

131 Finally, the IOC Executive Secretary formally wrote to the Chair of GESAMP to invite GESAMP to join forces with many partners and contribute to the UN Decade planning. GESAMP may contribute by:

- .1 identifying suitable candidates for possible nomination to the **Planning Group** keeping in mind that these will serve in their personal capacity, capitalizing on their professional experience and knowledge;
- .2 contributing through the planned **Regional Consultation Workshops** to be organised in all major ocean basins, these will communicate the purpose and expected results of the Decade to all stakeholders but also engage and consult with the ocean community concerning the implementation plan for the Decade, and the design of transformative projects;
- .3 contributing to the 2 **Global planning meetings** foreseen in 2019 and 2020; these meetings will assess the status of ocean research vis-a-vis the requirements of 2030 Agenda, scope and eventually validate the research plan of the Decade, building on thematic and regional workshops inputs; and
- .4 participating in the **Stakeholder forum** which is expected to be established as a mechanism to capture institutional inputs from providers and end-beneficiaries of the Decade.

132 Link to UN Decade Roadmap

http://ioc-unesco.org/index.php?option=com_oe&task=viewDocumentRecord&docID=21944

Ocean acidification

133 In view of the growing urgency and recognition of ocean acidification as one of the major stressors for the marine environment, improved observation and research are needed to help scientists and governments in implementing related mitigation and adaptation measures. Leading experts from the Global Ocean Acidification Observing Network (GOA-ON) Executive Council met in Sopot, Poland for their 5th Annual Meeting from 28 to 30 May 2018, supported by the UNESCO's Intergovernmental Oceanographic Commission (IOC).

134 During the meeting, the methodology for the Sustainable Development Goal (SDG) target indicator 14.3.1, "average marine acidity measured at an agreed suite of representative sampling stations" – of which IOC is the custodian agency – was discussed and finalised. An expert group meeting, hosted by IOC, 16-18 January 2018, provided the required background documentation for this.

135 This methodology entails detailed guidance to scientists and countries in terms of how to carry out measurements following the best practices established by the ocean acidification community, as well as how to report the collected information in a manner that ensures it is transparent, traceable and can be utilised in a global

comparison of pH measurements. In this way, GOA-ON expertise directly contributes to the achievement of SDG Target 14.3, which calls to "minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels".

136 Additionally, the GOA-ON Executive Council discussed capacity building workshops – which are being held worldwide as part of its UN Ocean Conference voluntary commitment (#OceanAction16542) to increase global ocean acidification observing capacity – received updates from the regional hubs and their activities and welcomed the new GOA-ON Secretariat. 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 is highly involved and partners in several voluntary commitments related to ocean acidification –e.g., #OceanAction15274; #OceanAction16542, #OceanAction15798.

137 GOA-ON has now more than 430 members, from over 70 countries (2015: 150 scientists, 31 countries) and is constantly growing. New members, especially from Africa, joined the network.

138 IOC further contributed and co-organized an ocean acidification workshop in Tanzania (October 2017), hosted by WIOMSA. For the first time African countries from the Western Indian Ocean region had the possibility to discuss and ocean acidification projects in that region.

139 IOC also supported several side events during the UNFCCC COP23, in November 2017, focussing on the impacts of ocean acidification for environmental and human health and how to address these.

140 IOC is also the part and co-organizing the UN Community of Ocean Action on Ocean Acidification, a newly established reporting mechanism to measure the progress made by countries and organizations, which submitted Voluntary Commitment to the UN Oceans Conference in June 2017.

141 The IOC-WESTPAC Ocean Acidification Observing Working Group in the Western Pacific also met again in December 2017, in order to improve and adapt guidelines for measuring the chemical and biological impacts of ocean acidification. Chemical and biological observation to observe the impacts of ocean acidification on coral reefs in this region are now in place.

142 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

143 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. The Scientific Working Group research priorities are closely aligned with the Initiative's Policy Working Group.

144 IOC is also one of the coordinating members of the International Blue Carbon Partnership, a unique body which brings together governments, NGOs, IGOs and UN-Agencies. The 2016 annual workshop of the scientific working group of the Blue Carbon Initiative with the support of IOC-UNESCO, took place in Ibiza, Spain in October 2017. The main objective of this meeting was to advance the science in particular with respect to carbon storage of seagrass meadows. IOC co-organized this meeting. In addition, IOC supported the organization of various side events at the UNFCCC COP23 in November 2017. In collaboration with the Blue Carbon Partnership these events gave the opportunity to connect high level representatives and scientists to raise awareness on the central role of these ecosystems for carbon sequestration.

De-oxygenation

145 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 as well as 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 technical brief 'The ocean is losing its breath' was published in July 2018. The annual meeting in 2017 was hosted by MBARI, USA. IOC is currently organizing the annual meeting of the group, which will take place just before the international conference 'Ocean Deoxygenation: Drivers and Consequences – past – present – future, in Kiel, Germany, 3-7 September 2018. This meeting will provide the opportunity to discuss new products and the GO2NE deoxygenation summer school, to be hosted in Xiamen, China in September 2019. Further the group finalized a review paper, which was published in January 2018 in the journal Science.

Time Series

146 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. The collected information addresses new scientific questions and serves a well-established community of practice related to ship-based time series. The IGMETS report (IOC Technical Series 129) was published in July 2017. The group is currently outlining the upcoming second report, updating the online compartments.

147 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

148 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.

149 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).

150 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 2017 its science and implementation plan (www.globalhab.info). Furthermore in late 2017 the IOC launched the first ever guidance manual for operators of desalination plants for managing harmful algal events.

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

151 The ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors (WGBOSV) 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 consideration of appropriate discharge standards of organisms in ballast water, as well as hull fouling regulations and treatment options to reduce the risk of introducing non-native species. 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.

152 WGBOSV submits documents to and participates in meetings at the IMO to ensure that international guidelines are based on accurate scientific information, thereby helping to achieve consensus on difficult and technical issues. The group meets annually and functions through extensive collaboration with expert scientists from all over the world, representing leading knowledge and expertise on this topic.

158 Full reports can be found at <http://www.ices.dk/community/groups/Pages/WGBOSV.aspx>

Nutrient's coastal Impacts research

153 Nutrient over-enrichment of coastal ecosystems is a major global environmental problem, 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 has been a Global Environment Facility (GEF) Project 'Global foundations for reducing nutrient enrichment and oxygen depletion from land-based pollution' which was launched in March 2012 and completed in April 2018. The project was implemented by UN Environment with the IOC as leading the project research component, this has delivered global and local models for impact of nutrient 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

154 IOC continues to provide scientific and technical support to the World Ocean Assessment process established under the UNGA. A second cycle of assessment (2017–2020) was initiated under the UN Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects, starting with the holding of five regional workshops in 2017 to build capacity, support the development of assessment(s) and facilitate outreach and awareness-raising. Two of these workshops were organised by IOC. The regional workshop covering the North Pacific, was hosted by WESTPAC in partnership with the Government of Thailand (29–30 November 2017), whilst IOCARIBE and the Government of Brazil hosted the workshop for the Wider Caribbean and South Atlantic. These considered: a) how assessments produced by the Regular Process can be structured to help policy-makers most effectively with their tasks and; b) how to improve arrangements for networking among various group of experts and organizations involved in the Regular Process. Both workshops further emphasized the

importance of capacity building to achieve the integrated assessment of marine environment. This is possibly an element to pursue as part of the IOC Capacity Development Strategy. Both workshops fed regional inputs to the UNGA Ad Hoc Working Group which is acting as the governing body of the Regular Process, while contributing to the overall outline of the next report to be completed in 2020. IOC will continue to support the work of the WOA Group of Expert through the provision of science outputs, data, reports, and will continue to engage its Regional Subsidiary Bodies in the next round of regional workshops to be held during 2018.

OBIS

155 Since May 2017 (until 9 April 2018), the Ocean Biogeographic Information System (OBIS) grew with 269 new datasets, adding 7,700 new species and 3.1 million observations resulting in a total of 50.9 million records of 118,000 marine species. Two new national OBIS nodes were established, one in Colombia (hosted by INVEMAR) and one in the UK (hosted by the MBA). The OBIS secretariat is supporting the implementation of the OBIS-ENV-DATA standard through the development of new QC tools, available as webservices and as an R package (<https://github.com/iobis/iobistools>).

156 OBIS is undergoing a major reengineering of its platform (OBIS2.0) which is urgently needed to drive new innovations in science and technology, and to meet the increasing demands for services from global drivers (such as GOOS, GEO-BON, CBD, ISA, WOA and IPBES), as well as support the regional focus of several OBIS Nodes (e.g. USA/OBIS, Europe/EMODnet).

157 Through the DIPS-4-Ocean Assessments project (a Flanders' UNESCO Science Trust-Fund project) OBIS supports the development of indicators and data products. During the intersessional period, OBIS has provided biodiversity statistics and maps for the IPBES global and several regional assessments (<http://iobis.org/data/maps/>). Based on data from sources such as OBIS, 9 areas in the Baltic Sea have been described as Ecologically or Biologically Significant Marine Areas (EBSAs) according to the criteria of the Convention on Biological Diversity (CBD workshop, 20–24 February 2018, Helsinki, Finland). An SDG 14 exploration portal, released at the GEO XIV Plenary in October 2017 in Washington DC, uses data from OBIS, and is developed by the Marine Biodiversity Observation Network (MBON) of GEO-BON.

UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP)

158 During the 2017-18 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.

159 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); SAPPHIRE project (www.thegef.org/project/western-indian-ocean-large-marine-ecosystems-strategic-action-programme-policy-harmonization); Global Maritime Energy Efficiency Project (GloMEEP, with IMO, <http://glomeep.imo.org>); Realizing the inclusive and sustainable development in the BCLME region through the improved ocean governance and the integrated management of ocean use and marine resources (www.benguelacc.org); LME:LEARN (www.marine.iwlearn.net), with IOC/UNESCO); IW:LEARN (www.iwlearn.net); Yellow Sea Large Marine Ecosystem project (<http://yslme.iwlearn.org>).

160 In addition, over the last 12 months, UNDP continued preparation of three GEF-financed ocean and coastal projects of relevance to the work of GESAMP; these include:

- .1 [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);
- .2 Building Partnerships to Assist Developing Countries Minimize the Impacts from Biofouling - [GloFouling Partnerships](#) (in cooperation with IMO);
- .3 [Catalysing implementation of a Strategic Action Programme for the Sustainable Management of Shared Living Marine Resources in the Humboldt Current System \(HCS\)](#).

161 UNDP also participated in and contributed to a number of global ocean conferences and related meetings and symposia, including: HLPF July 2018 Partnership Exchange & Special Event; Friends of Ocean Action (March & June 2018); UN Oceans Annual meeting (March 2018); 2017 UN High Level Political Forum (oceans/SDG14 side events); World Economic Forum Sustainable Development Impact Summit, Sept 2017; Singapore Future Ready Shipping, Sept 2017; 2017 & 2018 Stockholm World Water Week (SDG6/14 Source-to-Sea sessions); Conference on [Building International Partnerships to Enhance Science-Based Ecosystem Approaches in Support of Regional Ocean Governance](#), Capetown, Dec 2017);

162 UNDP also contributed the following publications and media outputs:

- .1 29 June 2017 [GEF-UNDP-IMO GloMEEP Project launches Global Industry Alliance for Low Carbon Shipping](#);

- .2 15 Aug 2017 SDG Knowledge Hub [GloBallast Concludes as GEF, UNDP and IMO Continue Tackling IAS](#);
- .3 20 April 2018 [Celebrating Optimism on Earth Day](#); and
- .4 7 June 2018 [Container Deposit Laws](#): A Winner for Preventing Ocean Plastic Pollution.

163 UNDP joined FAO in support of the Fisheries track of the Communities of Ocean Action launched by SG SE Thomson and DESA in 2018, aimed at catalyzing delivery of 2017 Ocean Conference Voluntary Commitments. In further support of follow-up to the 2017 Ocean Conference, UNDP continued to manage the Ocean Action Hub (www.oceanactionhub.org) which serves 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. Most recently, on World Oceans Day 8 June 2018, UNDP launched its [Ocean Action Campaign](#), including a call for Ocean Action Volunteers, in further support of growing the number of Voluntary Commitments, at all levels.

FOOD AND AGRICULTURE ORGANIZATION (FAO)

Marine Litter and Microplastics

164 FAO considers the issue of marine litter and microplastics from the perspectives of i) reducing marine litter that originates from the fishing industry, in particular abandoned, lost or otherwise discarded fishing gear (ALDFG); ii) assessing the ecological impact of microplastics on fisheries resources; iii) assessing the implications of microplastics for aquaculture products, and; iv) assessing food safety risks from marine litter, in particular microplastics, on human health.

165 FAO collaborates with many organisations, including relevant UN Agencies and Programmes, NGOs and academic institutions in addressing and building knowledge on marine litter and microplastics, including; UNEP and the Global Partnership on Marine Litter (GPML), the International Maritime Organization (IMO), the International Council for the Exploration of the Seas (ICES), the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) and the Global Ghost Gear Initiative (GGGI). FAO contributed to the discussions of the UN Environment Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics, held during 29-31 May 2018 in Nairobi, Kenya.

FAO progress in addressing abandoned, lost or otherwise discarded fishing gear (ALDFG)

166 FAO Members have recognised abandoned, lost or otherwise discarded fishing gear (ALDFG) as a significant component of marine litter and have raised concerns about its impacts on habitats fish stocks and marine wildlife, particularly through 'ghost fishing', and as a navigational hazard and risk to safety at sea.

167 FAO convened a Technical Consultation on the Marking of Fishing Gear (5-9 February 2018). The Technical Consultation resulted in Voluntary Guidelines for the Marking of Fishing Gear.

168 The Voluntary Guidelines for the Marking of Fishing Gear were recently endorsed by the Thirty-third Session of FAO's Committee on Fisheries (COFI33), held 9-13 July 2018 in Rome. The Voluntary Guidelines are considered an important tool in minimizing the impact of ALDFG and ghost fishing, and in combatting Illegal, Unreported and Unregulated (IUU) fishing.

169 COFI 33 encouraged FAO to conduct further work on quantifying the impacts of ALDFG and developing and documenting best practices for addressing ALDFG, including the recovery and recycling of gear, the use of biodegradable gear to minimize its contribution to marine plastic pollution, as well as the reduction of ghost fishing.

170 COFI 33 further supported the development of a comprehensive global strategy to address ALDFG, and encouraged the involvement of small-scale and artisanal fisheries and relevant RFMO, regional fisheries management arrangements and relevant international bodies.

171 FAO is now planning for the development of a global 'umbrella' programme to support the implementation of the Voluntary Guidelines on the Marking of Fishing Gear and other actions that are required to address ALDFG at a global scale. The programme will comprise a partnership framework with projects tailored to meet the specific needs of countries requiring support. It is expected that the programme will increase the opportunity for FAO to collaborate with partners on the issue of ALDFG and that its implementation will need to be supported by ongoing scientific advice.

Microplastics

172 FAO has organized, with the support from UN Environment and the Government of Norway, a study and an expert workshop on microplastics in fisheries and aquaculture. This workshop built upon the work of the GESAMP Working Group 40 on microplastics and resulted in the publication of a FAO Technical Paper on that reviewed the status of knowledge on microplastics in fisheries and aquaculture, and implications for aquatic organisms and food safety:

Microplastics in fisheries and aquaculture: status of knowledge on their occurrence and implications for aquatic organisms and food safety. FAO Fisheries and Aquaculture Technical Paper. No. 615. Rome, Italy

173 Moreover, the FAO EAF-Nansen Programme that is supported by a research vessel, the R/V Dr. Fridtjof Nansen, includes a dedicated research theme in its science plan with the objective of assessing the occurrence of microplastics in the surface and in the water column in the areas where the research vessel operates, identify hotspots and study composition and presence of chemicals associated with them. Systematic sampling of microplastics in surface waters has been done off the whole of West Africa and in the Indian Ocean since 2017 and resulting samples/data will be analysed later this year with partner institutions.

174 Other steps for FAO on microplastics include building upon the information compiled in the Technical Paper and using this data to develop appropriate risk profiling tools to assess food safety impacts of microplastic pollution in collaboration with interested partners. FAO

would also welcome collaboration on microplastics and aquaculture, as well as on ecological impacts on fisheries resources.

175 FAO hopes that the Ad Hoc Open-Ended Expert Group on Marine Litter and Microplastics will carefully consider sea based sources of marine litter, in particular ALDFG, within the framework of a holistic global response to the overall marine litter issue. FAO also hopes that the work of the ad hoc Expert Group will be able to support efforts to fill knowledge gaps relating to the impacts of microplastics on fisheries resources and aquaculture.

176 COFI33 expressed concern about the effects of pollution, including microplastics, on aquatic resources, and encouraged FAO to continue collecting information on its impacts on aquaculture and fishery resources, and implications for food safety, both in marine and freshwater systems, building on the work of the EAF-Nansen Programme.

Recent developments on methylmercury

177 FAO has been providing scientific advice on mercury related matters based on a risk-benefit exercise carried out during the Joint FAO/WHO Expert Consultation on the Risks and Benefits of Fish Consumption since 2010. Since then, FAO has supported Codex Alimentarius on mercury related issues and has provided scientific advice to the Codex Committee on Fish and Fishery Products and the Codex Committee on Contaminants in Foods (CCCF). The Codex Alimentarius Commission has recently adopted new maximum limits (MLs) for methylmercury in fish, with reservations from several countries that expressed their disagreement with the change from 1 mg/kg for predatory fish to 1.2 mg/kg for all tuna, 1.5 mg/kg for Alfonsino, 1.7 mg/kg for all marlin and 1.6 mg/kg for shark. CCCF had previously agreed to discontinue work on the ML for amberjack and swordfish and to establish an EWG chaired by New Zealand and co-chaired by Canada to prepare a discussion paper on the establishment of MLs for additional fish species. A footnote on the importance on consumer advice was made in the document. CCCF could consider revising the ML for tuna in the light of additional data after three years.

Recent developments on HABs

178 FAO together with IOC-UNESCO, IAEA and WHO will start working together on food safety early warning systems for toxic Harmful Algal Blooms (HABs) and toxins. In the coming months a joint FAO/IAEA/IOC-UNESCO route map will be developed for this purpose.

179 In addition, the FAO collaboration with IAEA, IOC-UNESCO and WHO that started with the interagency meeting on Ciguatera Fish Poisoning (CFP) in December 2015 will continue. After the technical meeting for the development of an Inter-Agency Global Ciguatera Strategy that took place at the IAEA Environment Laboratories in Monaco in April 2018, the four agencies have developed a coordinated strategy to address CFP. The strategy will cover the following elements: (a) improving the detection and monitoring of organisms contaminated with ciguatoxins, as well as risk forecasting; (b) improving the detection of toxins in dinoflagellate cells and fish tissue; and (c) improving epidemiological data collection, reporting and assessments.

Climate change and other environmental matters

180 The 33rd Session of the FAO Committee on Fisheries (COFI33), held 9-13 July 2018 in Rome, acknowledged the work of FAO and its resource partners in promoting the Ecosystem Approach to Fisheries (EAF), the EAF Nansen Programme, the Common Oceans Programme and the Areas Beyond National Jurisdiction Programme.

181 COFI33 commended the comprehensive review of FAO on the impacts of climate change in fisheries and aquaculture and adaptation options, noting that it will be an essential support to Members for the strengthening of their Nationally Determined Contributions and National Adaptation Plans.

182 COFI33 emphasized the vulnerability of fisheries and aquaculture communities to climate change and extreme events, and expressed particular concern for the impacts on small-scale fisheries and SIDS in this regard.

183 COFI33 also recognized that underwater anthropogenic noise is a form of pollution and encouraged FAO to conduct a review of its impact on marine resources, and its socioeconomic consequences.

184 COFI33 had been invited to discuss a document on [Climate change and other environment related matters](#). This document provides an overview of work carried out by FAO on climate change in relation to fisheries and aquaculture, as well as work on a number of environmental issues, such as biodiversity conservation, bycatch reduction and aquatic pollution. A number of actions are described, in particular the work carried out in relation to the assessment of impacts of climate change globally and regionally, with the Convention on Biological Diversity (CBD) on threatened species in trade, the international negotiations held to agree on standards and best practices on bycatch and on abandoned, lost or otherwise discarded fishing gears (ALDFG), and actions dealing with pollutants.

185 Several related documents might be of interest:

Barange, M., Bahri, T., Beveridge, M., Cochrane, K., Funge-Smith, S. & Poulain, F. eds. 2018. [Impacts of Climate Change on fisheries and aquaculture](#) - Synthesis of current knowledge, adaptation and mitigation options. *Fisheries and Aquaculture Technical Paper*. No. 627. Rome, FAO. 628 pp;

Climate Change and its impact on the work and activities of FAO in fisheries and aquaculture (Biennial Theme);

[Addressing environmental issues during fishing operations: Progressing towards the 2025 reduction of ALDFG](#);

Report of the Technical Consultation on the Marking of Fishing Gear;

[Voluntary Guidelines for the Marking of Fishing Gear](#);

[Microplastics in fisheries and aquaculture: status of knowledge on their occurrence and implications for aquatic organisms and food safety. FAO Fisheries and Aquaculture Technical Paper. No. 615. Rome, Italy](#);

Microplastics in fisheries and aquaculture: A summary of FAO's study;

Biodiversity Mainstreaming in Capture Fisheries and Aquaculture; and

[Bycatch and discards: Global and regional updates](#).

The State of World Fisheries and Aquaculture 2018

186 FAO's flagship publication on fisheries and aquaculture [SOFIA 2018](#) was presented to COFI33 and includes a discussion on ALDFGs and microplastics, see section on selected ocean pollution concerns on pages 154-157. See also [SOFIA in brief booklet](#) and [SOFIA 2018 Flyer](#).

WORLD METEOROLOGICAL ORGANIZATION (WMO)

187 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 of the oceans, the climate and the composition of the atmosphere; Earth and climate system research; development and delivery of services for disaster risk reduction, including marine hazards; and provision of science-based information and tools for policy makers and the general public, as well as for the assessment of effects on ecosystems, at regional and global levels. Position paper "The ocean and WMO: ocean issues, opportunities and priorities that contribute to the WMO Strategic Plan" articulates the detailed WMO contribution to the global ocean agenda ([EC-70/INF. 12.3](#)).

Marine observations and applications

188 WMO contributes to strengthened observational networks by the implementation of the WMO Integrated Global Observing System (WIGOS) and the WMO Information System (WIS), and observing networks in collaboration 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 situ* marine meteorological and oceanographic observing networks. These *in situ* observations, complemented by satellite and remote sensing technology, are required for applications such as weather forecasting and operational meteorology, monitoring, understanding and prediction of climate variability and climate change on various time scales, ocean forecasting and marine services activities

189 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) whose fifth session was held in Geneva (from 25–29 October 2017)³, 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 the sustainable management of natural resources, with due focus on Polar Regions. JCOMM-5 endorsed a draft education and outreach Strategy to Reduce Damage to Ocean Data Buoys from Vandalism, provided by the Data Buoy Cooperation Panel (DBCP) (DBCP Technical Document No. 58).⁴ This recommends that the WMO Executive Council and the IOC Assembly: a) adopt the draft Strategy; b) requests the DBCP to continue to seek further input from relevant national and regional organizations to promote the Strategy; c) raise awareness about the issue of data buoy vandalism and its impacts on forecasting climate, weather, and tsunamis; and d) urges Members to actively engage, support and collaborate in the efforts of the DBCP and its Working Group on Data Buoy Vandalism to collect existing education and outreach materials related to national or regional mitigation of data buoy vandalism efforts.

190 The WMO-IOC JCOMM *in situ* Observing Platform Support Centre (JCOMMOPS)⁵ continued to assist in: a) the implementation and deployment of the observing networks; b) establishing, maintaining and verifying mechanisms for the timely exchange of data and metadata, including the facilitation of quality control and archival functions; and c) developing the consistent set of tools needed to monitor the status of the observing system and data and metadata distribution, with the aim to identify action areas and improve the overall effectiveness and development of the system. The Global Climate Observing System (GCOS)⁶ has made progress in several areas, in particular through the delivery of the latest version of the report describing GCOS Implementation Needs.⁷ A list of seven global climate indicators has been agreed and

promoted to be used to communicate to the widest community the scope and rate of changes to the climate: global surface temperature, ocean heat, atmospheric carbon dioxide, sea level, ocean acidification, sea ice extent in the Arctic and Antarctic, and glacier change.⁸

191 GCOS and GOOS are taking a strong role in organizing the 3rd Decadal Ocean Observing Conference, OceanObs'19, to shape priorities for sustained observations for the next decade.⁹ They are also establishing a review of the observing system for tracking ocean heat and freshwater content, a forward strategy for air-sea fluxes observations, embracing new technologies; and a project to guide the development of sustained observing systems for boundary currents and their interaction with the shelf.¹⁰ WMO continued providing assistance to Members to improve marine meteorological and coastal area service provision. This is, in part, fulfilling the WMO requirements under the International Convention for the Safety of Life at Sea (SOLAS), including the regular provision of meteorological warnings and forecasts to ships at sea, also for the Polar regions and links to the Polar Code. In this regard, two technical documents have been updated: Manual on Marine Meteorological Services (WMO. No-558) and Guide to Marine Meteorological Services (WMO. No-471).

192 To support the implementation of target (g) of the Sendai Framework for Disaster Risk Reduction 2015-2030, namely to “substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030”, WMO adopted the vision of a Global Multi-hazard Alert System (GMAS),¹¹ as the central aggregator, disseminator and resource for authoritative warnings and information related to high-impact weather, water, ocean and climate events. The system aims to enable global availability and easy access to authoritative information and provision of expert advice to WMO Members as well as to the United Nations and other humanitarian agencies to respond to their immediate needs and requests in anticipation of, during or after hydrometeorological hazard situations. GMAS will use standards such as the Common Alerting Protocol (CAP) and will comprise existing and future regional warning mechanisms including the World Weather Information Service (WWIS),¹² the Severe

³ For the full report of JCOMM-5 see

https://www.jcomm.info/components/com_oe/oe.php?task=download&id=38243&version=1.0&lang=1&format=1.

⁴ See <http://www.jcomm.info/DBCP-TD-58>.

⁵ See <http://www.jcommops.org/board>.

⁶ Co-sponsored by WMO, IOC, the International Council for Science (ICSU) and the United Nations Environment Programme (UN Environment).

⁷ See <https://bit.ly/2siqYHf>.

⁸ GOOS is now finalizing its Strategy for 2030 in the view to have it adopted in mid-2018. Strategy includes 11 Strategic Objectives in the following areas: (a) engagement and impact, (b) integration and delivery, and (c) building for the future.

⁹ See www.oceanobs19.net.

¹⁰ In addition, OOPC is strengthening its relationship with the ocean forecasting programme OceanPredict (GODAE OceanView), noting the developments in Earth system approaches and seamless prediction systems, including coupled numerical weather prediction, will place new demands on the ocean observing system.

¹¹ Decision 3 (EC-69).

¹² See <http://worldweather.wmo.int/en/home.html>.

Weather Information Centre (SWIC),¹³ the MeteoAlarm system of EUMETNET, the MeteoAlert system of Roshydromet, and others, building on the alert hub technology.¹⁴

193 Substantial progress has been made in strengthening climate services in the Arctic. A new Pan-Arctic Climate Outlook Forum (PARCOF) has been launched, which met for the first time in Ottawa, Canada, on 15 and 16 May 2018.¹⁵ The Forum provided a seasonal outlook for the forthcoming summer ice-break up season, in support of climate risk management and climate change adaptation and inform policy and decision-making in climate-sensitive sectors operating in the Arctic environment. The PARCOF predicts that average surface temperatures will continue to be above average for June, July and August, while the sea-ice conditions will be below average for most of the Arctic. Furthermore, a new Arctic Regional Climate Centre Network (ArcRCC-Network)¹⁶ launched its demonstration phase during PARCOF-1 to seek WMO designation. ArcRCC-Network also coordinates the PARCOF sessions on a regular basis.¹⁷

Climate science and the oceans

194 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 for society and the environment in which we live – such as predictive experiments for the future state of the climate system and project how it will evolve under different emission scenarios. The implementation of the Coupled Model Intercomparison Project phase 6¹⁸ (CMIP6) is now well underway with a dedicated Carbon Dioxide Removal Model Intercomparison Project (CDRMIP) which could address ocean fertilization studies in the future.

195 Development of scientific methods for treatment of uncertainty in climate-related decision-making is one of the key subjects of research conducted by WCRP. A WCRP Grand Science Challenge on “Regional Sea Level Change and Coastal Impacts”¹⁹ 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”²⁰ is investigating land and ocean biogeochemical cycles and feedbacks on CO₂ concentrations and climate in order to better understand its sources and sinks.

Monitoring and mitigating climate change

196 WMO released its *Statement on the state of the global climate in 2017*.²¹ The *Statement* confirmed that 2017 was one of the three warmest years on record and the warmest that was not influenced by an El Niño event. It also examined other long-term indicators of climate change such as increasing CO₂ concentrations, sea level rise, shrinking sea ice, ocean heat content and ocean acidification. Global mean temperatures in 2017 were about 1.1 °C above pre-industrial temperatures.²²

197 Global sea surface temperatures in 2017 were somewhat below the levels of 2015 and 2016, but still ranked as the third warmest on record. Ocean heat content – a measure of the heat in the oceans through their upper layers down to 2,000 meters – reached new record highs in 2017. The *Statement* indicated that the magnitude of almost all individual components of sea level rise has increased in recent years, in particular melting of the polar ice sheets, mostly in Greenland and, to a lesser extent, also Antarctica. The April average Arctic sea ice extent was the second smallest (after 2016) in 39 years.

198 For the second successive year, above-average sea surface temperatures off the east coast of Australia resulted in a strong coral bleaching of the Great Barrier Reef. The *Statement* contains a special section on ocean acidification from the IOC of UNESCO.²³

¹³ See <http://severe.worldweather.org/>.

¹⁴ WMO is also working on the standardized characterization of weather, water, climate, space weather and other related environmental hazard and risk information and on the development of identifiers for systematically cataloguing extreme and high-impact weather, water and climate events.

¹⁵ The meeting was attended by Representatives from Arctic Council Member countries, including experts from National Meteorological and Hydrological Services, major stakeholders and user groups. PARCOF-1 placed a special focus on Arctic commercial shipping users (tourism, re-supply, resource extraction and fishing) and circumpolar indigenous organizations.

¹⁶ See <https://arctic-rcc.org/>

¹⁷ WMO co-sponsored PARCOF-1 along with a meeting of the node leads of ArcRCC-Network through the funds provided by Environment and Climate Change Canada (ECCC) for a new project entitled “Polar Observations, Predictions and Climate Services”.

¹⁸ See <https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6>

¹⁹ See <http://www.wcrp-climate.org/grand-challenges/gc-sea-level>.

²⁰ See <https://www.wcrp-climate.org/gc-carbon-feedbacks>.

²¹ See https://library.wmo.int/opac/doc_num.php?explnum_id=4453 (March 2018). A provisional release was presented at UNFCCC/COP23 (Bonn, 6–17 November 2017).

²² The five-year average 2013–2017 global temperature is the highest five-year average on record. The world’s nine warmest years have all occurred since 2005, and the five warmest since 2010.

²³ The Global Climate Observing System (GCOS) has identified ocean acidification as one of 7 global climate indicators, to assist in communicating the rounded picture of our changing climate. The Global Climate Indicators form the basis of the WMO Statement on the state of the global climate. In addition, Ocean Ecosystem Variables, Plankton and Marine Habitat Properties (including Coral Reefs) have been identified as Essential Climate Variables.

199 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 Greenhouse Gas (GHG) Bulletins. WMO released its *Greenhouse Gas Bulletin 2016*²⁴ in October 2017. The latest analysis of observations from the WMO/GAW network shows that globally averaged concentrations calculated from this in situ network for carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) reached new highs in 2016, with CO₂ at 403.3 ± 0.1 parts per million (ppm), CH₄ at 1 853 ± 2 parts per billion (ppb) and N₂O at 28.9 ± 0.1 ppb, which corresponds to respectively 145%, 257% and 122% of pre-industrial (before 1750) levels. The record increase in the annual mean CO₂ content from 2015 to 2016 (3.3 ppm) is larger than the previous record increase from 2012 to 2013 and 50% above the average growth rate for the past decade (~2.2 ppm yr⁻¹). The higher growth rate in 2016 and 2015, in comparison with previous years, is partly due to the increased natural emissions of CO₂ related to the most recent El Niño event.

200 In partnership with academic institutions, WMO developed and submitted a proposal related to coordinated observations between atmospheric and ocean greenhouse gas communities to the Prince Albert Foundation.

201 At the 17th World Meteorological Congress, WMO adopted a resolution on the implementation of the Integrated Global Greenhouse Gas Information System (IG³IS)²⁵ with the aim to expand the observational capacity for GHGs, extend it to the regional and urban domains, and develop the information systems and modelling frameworks to provide information about GHG emissions to society. One of the objectives of IG³IS 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 IG³IS 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. The WMO Executive Council approved IG³IS Science Implementation Plan at its 70th Session in June 2018.

202 At the 17th meeting of UN-Oceans, WMO expressed its support to the idea of the United Nations Decade of Ocean Science and confirmed its commitment to contribute to the goals related to ocean knowledge, ocean-related hazards and ocean observation. WMO also presented an Ocean Position Paper as its initial reflection on its priorities in weather services for maritime safety and coastal protection, sub-seasonal to seasonal forecasting and long-term predictions. The paper builds on the WMO contribution to the Ocean Conference 2017, where it presented four voluntary commitments: 1) Weather and

climate services for African, Caribbean and Pacific SIDS;²⁶ 2) Responding to El Niño: improving international coordination for improved early warning;²⁷ 3) The Year of Polar Prediction;²⁸ and 4) International Network of Multi-Hazard Early Warning System and Global Multi-hazard Alert System²⁹ – updates are provided on the respective website of the Ocean Conference. WMO further proposed an intensified period spanning 4 years of ocean observations to support research and marine services. It also offered to co-lead activities related to the goal on ocean-related hazards and host a technical event as a contribution to the Decade.

Atmospheric composition information in support of marine ecosystem research and assessment

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

204 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. Following the publication of the papers resulting from the 2013 workshop on the impacts of atmospheric nitrogen deposition to the ocean, WG 38 prepared a synthesis of the results from the scientific papers derived from that workshop. That report was reviewed by GESAMP and published by WMO in early 2018 as GESAMP Reports and Studies No. 97, *The Magnitude and Impacts of Anthropogenic Atmospheric Nitrogen Inputs to the Ocean*. WG 38 is now focusing on two new activities approved by GESAMP at its 42nd session an investigation: 1) of the changing atmospheric acidity and the oceanic solubility of nutrients; and 2) of the impact of ocean acidification on fluxes of non-CO₂ 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 45 for details.

Prediction and monitoring on shorter time scales

205 The Polar Prediction Project (PPP³⁰), a joint initiative of the WMO World Weather Research Programme (WWRP) and WCRP aims to improve

²⁴ See https://library.wmo.int/opac/doc_num.php?explnum_id=4022.

²⁵ WMO, 2016. "Integrated Global Greenhouse Gas Information System (IG³IS)". <http://www.wmo.int/pages/prog/arep/gaw/ghg/IG3IS-info.html>

²⁶ See <https://oceanconference.un.org/commitments/?id=15752>.

²⁷ See <https://oceanconference.un.org/commitments/?id=15659>.

²⁸ See <https://oceanconference.un.org/commitments/?id=14082>.

²⁹ See <https://oceanconference.un.org/commitments/?id=23965>.

³⁰ See <http://www.polarprediction.net>

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. Under the umbrella of the Polar Prediction Project (2013–2022) and the Year of Polar Prediction (mid-2017 – mid-2019),³¹ WMO is promoting cooperative international research enabling the development of improved weather and environmental prediction services for the polar regions, on time scales from hours to seasonal, and aims to enable a significant improvement in environmental prediction capabilities for the Polar regions and beyond, by coordinating a period of intensive observing, modelling, verification, user-engagement and education activities.³²

206 In order to improve services to society, e.g. support to maritime transportation and safety, WMO is also promoting observations of the cryosphere and the weather by ships sailing in polar regions.³³

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

Introduction

207 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 September 2017.

Informal Consultative Process

208 The United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea (the Informal Consultative Process) held its 19th meeting from 18 to 22 June 2018 and, pursuant to General Assembly resolutions 71/257 and 72/73, focused its discussions on the topic entitled “Anthropogenic underwater noise”. 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.

³¹ See <http://www.polarprediction.net/>.

³² The first special observing period, February to March 2018 in the Arctic, featured the contribution of several countries with several additional radio sounds launched in the Arctic. The second Arctic special observing period, July to September, will see also the deployment of several sea-ice buoys from the Russian sector. On longer time scales WCRP carries out a number of activities in the polar oceans, including its Polar Climate Predictability Initiative (closely linked to the Polar Prediction Project of WWRP) and its Climate and Cryosphere (CliC) (see www.climate-cryosphere.org) core project.

³³ In particular, the WMO Executive Council Panel of Experts on Polar and High-mountain Observations, Research and Services (EC-PHORS), at its 7th meeting (Ushuaia, March 2017) requested its Observations Task Team to collaborate with IMO to effect changes in Polar Code to make cryosphere and weather observations mandatory.

209 Prior to the 19th 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/73/68). The report of the Secretary-General, as well as panel presentations and other documents relevant to the nineteenth meeting are available on DOALOS' website at:

http://www.un.org/depts/los/consultative_process/consultative_process.htm.

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

210 Building on the recommendations of the Preparatory Committee established by General Assembly resolution 69/292, in its [resolution 72/249](#) of 24 December 2017, entitled “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 General Assembly decided to convene 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 Convention on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, with a view to developing the instrument as soon as possible.

211 In accordance with resolution 72/249, the Conference will address the topics identified in the package agreed in 2011, namely the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, in particular, together and as a whole, marine genetic resources, including questions on the sharing of benefits, measures such as area-based management tools, including marine protected areas, environmental impact assessments and capacity-building and the transfer of marine technology.

212 The Conference held a three-day organizational meeting in New York, from 16 to 18 April 2018. It will meet for four sessions, with the first session to be convened from 4 to 17 September 2018. The second and third sessions will take place in 2019, and the fourth session in the first half of 2020.

213 Documents relevant to the work of the Conference are available at its website <https://www.un.org/bbnj/>.

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

214 The Ad Hoc Working Group of the Whole on the Regular Process held its 10th meeting from 28 February to 1 March 2018, and pursuant to paragraph 330 of General

Assembly resolution 72/73, considered, for approval, the outline of the second world ocean assessment. The Working Group also had before it: a) the draft timetable and plan of implementation for the preparation of the second world ocean assessment; b) the draft guidance for contributors, Part II; and c) elements for discussion on guidelines for the second round of regional workshops in 2018.

215 The Working Group took note of the presentations on the outcome of the first round of regional workshops in support of the second cycle of the Regular Process which took place in 2017 in Brazil, New Zealand, Portugal, Thailand and the United Republic of Tanzania, respectively. The aim of these workshops was to raise awareness about and receive feedback on the first World Ocean Assessment, and to inform the scoping and preparation phases of the second World Ocean Assessment.

216 A second round of regional workshops, scheduled to begin in the second half of 2018, is meant to inform the preparation of the Second World Ocean Assessment, and to, inter alia, inform the collection of regional-level information and data for the preparation of that assessment. The first workshop will be held in Koror, Palau from 8 to 9 August 2018.

217 A Multi-stakeholder Dialogue/Capacity-building Partnership Event on the Regular Process will take place in January 2019 at United Nations Headquarters in New York. The event is expected to provide an opportunity to build awareness and collaboration with respect to capacity-building in support of the Regular Process, including building capacity to participate in, and make use of, assessments.

218 Documents relevant to the Regular Process can be found on the website of the Division at http://www.un.org/depts/los/global_reporting/global_reporting.htm.

World Oceans Day

219 Pursuant to General Assembly resolution 63/111, the United Nations celebrated World Oceans Day 2018 with a discussion panel, entitled “Clean our ocean: innovation and youth”, held at United Nations Headquarters on 8 June 2018. This interactive event brought forward examples of visions, innovative approaches and partnerships that support a clean ocean for sustainable development. The panel discussion was opened by the Secretary-General's Envoy on Youth. The event also provided an opportunity for youth mobilization, including their direct participation in the event as panellists and highlighted the important roles of youth and innovation in addressing solutions towards cleaning our oceans. Particular focus was given to innovation across the spectrum of relevant stakeholders represented by the six panellists. Additional information, including on World Oceans Day more broadly, can be found on the United Nations World Oceans Day website www.unworldoceansday.org.

Sustainable fisheries

220 In 2016, the resumed Review Conference on the 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 (the “Agreement”) in 2016 recommended that the Informal Consultations of States Parties to the Agreement be dedicated, on an annual basis, to the consideration of specific issues arising from the implementation of the Agreement, with a view to improving understanding, sharing experiences and identifying best practices for the consideration of States parties, as well as the General Assembly and the Review Conference (A/CONF.210/2016/5, annex, para. 15).

221 The thirteenth round of Informal Consultations of States Parties to the Agreement, held in New York from 22 to 23 May 2018, focused on the topic “Science-policy interface.” The report of the thirteenth round, prepared by the Chair, as well as the presentations made during the discussion panel and other relevant information, are available on the website of the Informal Consultations at: www.un.org/depts/los/convention_agreements/fish_stock_s_agreement_states_parties.htm

UN ENVIRONMENT (United Nations Environment Programme-UNEP)

***Marine and Coastal Strategy*³⁴**

222 The work on the marine and coastal ecosystems at UN Environment is conducted based on the marine and coastal strategy. The work focuses on using sound science to apply ecosystem management to the factors that cause decline of ecosystem services in marine and coastal areas. The strategy covers four major areas: the land-ocean connection, ecosystem services, balancing use and conservation, and vulnerable people and places. The outcomes are achieved by scientific assessment, policy, planning and communications, providing objective science-based information and enhancing users’ capacities. A new strategy is being prepared to replace the previous one after an assessment and need for updates through the United Nations Environment Assembly (UNEA).

223 UN Environment collaborates with UN Agencies such as United Nations Educational Scientific and Cultural Organization – Intergovernmental Oceanographic Commission (UNESCO/IOC), United Nations Development Programme (UNDP), International Maritime Organization (IMO), United Nations Food and Agriculture Organisation (FAO), United Nations Division for Ocean Affairs and the Law of the Sea (UN DOALOS), United Nations Department of Economic and Social Affairs (UN DESA), United Nations Human Settlements Programme (UN-Habitat) and the World Bank. The programme continues to provide technical support and capacity development for integrated management of marine and coastal ecosystems within the framework of its marine and coastal strategy. Support is given to Member States through the platforms of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) and the Regional Seas programmes and action plans such as the Abidjan Convention, Barcelona Convention, Cartagena

³⁴ http://www.unep.org/esm/Portals/50159/docs/em_water/UNEPs_Marine_Coastal_Strategy_Executive_Summary.pdf

Convention, East Asian Seas Action Plan, Nairobi Convention, and Northwest Pacific Action Plan.

Regional Seas Programme³⁵

224 UN Environment has been coordinating the Regional Seas Programme since 1974. The Regional Seas programmes are among the most important regional mechanisms for the conservation and sustainable use of the marine and coastal environment. There are currently eighteen Regional Seas programmes around the world and more than 143 countries participate in the programmes. UN Environment currently administers seven Regional Seas programmes³⁶.

225 Member States have reiterated the importance of the UN Environment Regional Seas Programme for the sustainable management of the oceans through the resolution 2/10 Oceans and Seas of the Second Session of the United Nations Environment Assembly. The contributions of the Regional Seas programmes in assisting Member States with implementing the ocean-related Sustainable Development Goals (SDGs) were stressed. The 18th Regional Seas meeting held in October 2017 in Korea emphasized the need for regionally coordinated national actions and reporting for the sustainable development goals, particularly Goal 14.

Activities in the regions:

Nairobi Convention³⁷

226 The Nairobi Convention participated in the 4th International Marine Protected Areas Congress (IMPAC4) held on 04-08 September 2017 in Chile. The conference themed 'Marine Protected Areas: Bringing People and Oceans together' discussed the complex nature of relationship between people and oceans as well as the benefits derived by the people from marine protected areas and oceans in general. Nairobi Convention delivered a presentation on the status and progress of marine protected areas in the Western Indian Ocean region and the proposed development of a Transboundary Conservation area between Kenya and Tanzania.

227 The Nairobi Convention in collaboration with the Western Indian Ocean Marine Science Association (WIOMSA) conducted National Leadership training on management of the coastal and marine environment. The training was held on 04-06 October 2017 in Tanzania and brought together senior policy makers from the Government of Tanzania to equip them with skills for better advocacy on the use of integrated approaches to the management of the coastal and marine ecosystems within government, and in partnerships with regional and global stakeholders. The training also equipped the policy makers with skills necessary for the development of informed policies and decision making for ocean management. The training was organized pursuant to Decision CP8/6c of the Eighth Conference of Parties to the Nairobi Convention on support and partnership for implementation of the Strategic Action Programme for the protection of the Western Indian Ocean from land-based sources and activities. The leadership training was part of

the process of strengthening governance and awareness in the Western Indian Ocean, which is a key component of the strategic action programme.

228 The Nairobi Convention participated at Fourth Edition of Our Oceans held 05-06 October 2017 in Malta. The meeting held discussions on global commitment to sustainable action and investment in innovative solutions to deal with aspects such as marine pollution, marine protected areas and maritime security. During the meeting, some member states of the Nairobi Convention made commitments on the themes marine pollution, marine protected areas and maritime security.

229 The Nairobi Convention in collaboration with World Wide Fund for Nature – Madagascar, Coastal Oceans Research and Development in the Indian Ocean and the Government of Mozambique organized a regional workshop for the Northern Mozambique Channel from 9-13 October 2018 in Mozambique. The workshop discussed options for delivering on the regional voluntary commitment to attain of Sustainable Development Goal 14 on Ocean, which was made during the Oceans Conference held in June 2017 in New York.

230 A regional training workshop was held 17-20 October 2018 in Tanzania, by the Nairobi Convention in collaboration with United Nations Environment Programme's Post Conflict and Disaster Management Branch, and Oil for Development Programme of the Government of Norway on managing emergency preparedness and response in the oil and gas sector. The training brought together various technical experts from the ministries on environment, energy and maritime transport to strengthen national and regional capacities on oil spill contingency planning. The workshop was a follow up to Decision CP8/7 of the Eighth Conference of Parties to the Nairobi Convention on Environmental Management of the oil and gas sector was part of the implementation of the Regional Oil and Gas Capacity building programme for the Nairobi Convention.

231 The Nairobi Convention participated in the 10th Symposium of the Western Indian Ocean Marine Science Association (WIOMSA) held on 30th October to 04 November 2017 in Tanzania. The symposium aimed at fostering enhancement of networks and collaboration with Western Indian Ocean Marine Science Association and other partners in bridging the gap between Science and Policy. The Nairobi Convention participated in a Pre-Symposium Workshop on Ocean Acidification for the Western Indian Ocean region. The workshop aimed at developing regional capacity on ocean observations in support of Sustainable Development Goal target 14.3. The Nairobi Convention supported the organizing of a side session 'Bridging the gap between marine research, policy and management-developing new ideas for collaboration'. The session was organized in collaboration with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and The Federal Ministry of Economic Cooperation and Development (BMZ) of Germany. The session discussed mechanisms for support to capacity building in science-policy, science-management interactions at both national and regional level and opportunities for strengthening of

³⁵ <http://www.unep.org/regionalseas/>

³⁶ Abidjan Convention, Barcelona Convention, Cartagena Convention, East Asian Seas Action, Nairobi Convention, Plan, Northwest Pacific Action Plan, and Tehran Convention

³⁷ <http://www.unep.org/nairobiconvention/>

forums between researchers and decisions makers on topical issues at the regional level.

232 The Nairobi Convention partnered with United Nations Environment Programme- World Conservation and Monitoring Centre, Western Indian Ocean Marine Science Association, International Union for Conservation of Nature and intergovernmental Oceanographic Commission of the United Nations Educational Scientific and Cultural Organization to organize a training on Marine Spatial Planning held back to back with a meeting on Area Based Planning Tools for Areas Beyond National Jurisdiction and a meeting on Seamounts and Marine Spatial Atlas for the Western Indian Ocean region. The meetings were held on 13-15 November 2017 and were organized pursuant to Decision CP8/4c of the Eight Conference of Parties to the Nairobi Convention of support and partnership in the implementation of the strategic action programme for the protection of the Western Indian Ocean from land-based sources and activities.

233 The Nairobi Convention in collaboration with United Nations Development Programme organized the first Project Steering Committee meeting for the project on 'Implementation of the Strategic Action Programme for the Western Indian Ocean from land-based sources and activities (WIOSAP) and the inception workshop for the project on 'Western Indian Ocean Large Marine Ecosystems Strategic Action Programme Policy Harmonization and Institutional Reforms (SAPPHIRE). The two meetings were held on 16-17 November in Seychelles. The Project Steering Committee meeting discussed the workplan and budget for the WIOSAP project while the inception meeting discussed the roles and responsibilities of various partners in implementing SAPPHIRE project.

234 The Nairobi Convention is developing regional outlooks on *Marine Protected Areas and Critical Habitats* for the Western Indian Ocean region as part of implementing the project on 'Implementation of the Strategic Action Programme for the Western Indian Ocean from land-based sources and activities' (WIOSAP). The first meeting for Authors of the outlooks was organized by the Nairobi Convention in collaboration with Western Indian Ocean Marine Science Association on 29 January 2018 to 02 February 2018 in Mombasa Kenya. The meeting discussed the structure and content of the outlooks to be developed. A second meeting for authors of the outlook on Marine Protected Areas was organized from 4-5 April 2018 in Madagascar to further develop the chapters of the outlook on Marine Protected Areas.

235 The Nairobi Convention Secretariat supported in the organization of the meeting for Regional Seas Programmes and Large Marine Ecosystems held on 27-30 November 2017 in South Africa. The meeting brought together regional seas conventions and action plans, regional fisheries agreement and regional fisheries management organizations to discuss the existing collaboration among the bodies and explore how regional institutions and projects could support the 2030 Agenda and the Sustainable Development Goals.

236 A meeting for the Forum for Academic and Research Institutions (FARI) was held on 12-13 December 2017 in Zanzibar. The meeting was organized by Nairobi Convention in collaboration with Western Indian Ocean Marine Science Association and discussed the terms of reference for FARI, proposed activities for FARI for 2018

in line with implementation of the project on 'Implementation of the Strategic Action Programme for the Western Indian Ocean from land-based sources and activities' (WIOSAP) and mechanisms for strengthening the contribution of FARI to the Science-Policy Dialogue of the Western Indian Ocean region. The FARI meeting was held back to back with the Regional Workshop in support of the second cycle of the Regular Process for Global Reporting and Assessment of the Marine Environment, including Socioeconomic Aspects ('The Regular Process') held 14-15 December in Zanzibar. Nairobi Convention supported in the Regular Process workshop organized by United Nations Division Ocean Affairs and Law of the Sea which discussed the necessary steps that could be taken by the region in the period 2017-2020 to support contribution to the Global Oceans Assessment and the state of the coast reporting in the Western Indian Ocean region.

237 A meeting for Focal Points to the Nairobi Convention was organized on 06-07 April 2018 in Madagascar. The meeting was organized pursuant to the Eighth Conference of Parties to the Nairobi Convention Decision CP8/6 on support to implementation of projects and CP8/14 on strengthening the operational functioning of the secretariat. The meeting discussed the progress in implementation of the Decisions of the Eight Conference of Parties to the Nairobi Convention which was held in June 2015 in Seychelles and key lessons learnt, preparation for the Ninth Conference of Parties to the Nairobi Convention to be held in August in Kenya, and progress in implementation of project executed by Nairobi Convention.

238 In an effort to enhance capacity on marine and coastal management in the Western Indian Ocean region, the Nairobi Convention in collaboration with the Western Indian Ocean Marine Science Association organized a senior leaders' renewal workshop on marine and coastal management in the Western Indian Ocean region. The workshop was held in Seychelles on 11-13 April 2018. The workshop targeted senior government officials from relevant ministries and parastatals in the Western Indian Ocean region. The workshop prepared the way for national activities to further reduce impacts of land-based sources and activities into the coastal and marine environment. The workshop equipped the senior policy makers with leadership skills for better advocacy on use of integrated approaches in management of oceans. The workshop was organized pursuant to Decision CP8/6c of the Eight Conference of Parties to the Nairobi Convention on support and partnership for implementations of the Strategic Action Programme for the protection of the Western Indian Ocean from land-based sources and activities.

239 The Nairobi Convention Secretariat in collaboration with Western Indian Ocean Marine Science Association (WIOMSA) and Indian Ocean Commission (IOC) organized a Science to Policy meeting on 09-11 July 2018 in South Africa. The meeting was held as part of the implementation of the project on 'Implementation of the Strategic Action Programme for the Western Indian Ocean from land-based sources and activities' (WIOSAP) and also in support of the Eighth Conference of Parties to the Nairobi Convention on establishment of a platform for Science to Policy Dialogue. The meeting discussed the role of Forum for Academic and Research Institutions in the Science to Policy platform, policy relevant scientific themes aligned to the Nairobi Convention priorities as

identifies in the various Strategic Actions Programmes (SAPs), Convention Work Programme and Climate Change Strategy and recommend proposed policy decisions to the Ninth Conference of Parties to be held in Kenya in August 2018.

Northwest Pacific Action Plan (NOWPAP)³⁸

240 NOWPAP activities are structured around six major thematic areas: regular assessments, integrated coastal and river basin management, pollution prevention and reduction, biodiversity conservation, climate change impacts, and information management. NOWPAP Regional Coordinating Unit and four Regional Activity Centres (RAC) continued to address marine and coastal environmental issues such the development of Ecological Quality Objectives (EQOs), prevention and reduction of pollution from harmful substances and marine litter, and strengthening regional cooperation to prepare and respond to oil and NHS spills among key priorities. NOWPAP experts are also implementing projects focusing on major threats to marine and coastal biodiversity: eutrophication, destruction of coastal habitats and introduction of alien invasive species. Other projects are related to sea grass and seaweed habitat mapping and assessment of the status of threatened and endangered marine and coastal species in the region. "Assessment of major pressures on marine biodiversity in the NOWPAP region" and "Feasibility Study Towards Assessment of Seagrass Distribution in the NOWPAP Region" will be published in 2018.

241 In May 2016, NOWPAP focal points agreed on the list of EQOs common to the four NOWPAP countries, including: (1) Biological and habitat diversity have not changed significantly due to anthropogenic pressure; (2) Alien species are at levels that do not adversely alter the ecosystem; (3) Eutrophication adverse effects are absent; (4) Contaminants cause no significant impact on coastal and marine ecosystems and human health; and (5) Marine litter does not adversely affect coastal and marine environments. NOWPAP has published the Regional overview of possible Ecological Quality Objective indicators for the NOWPAP region in 2017. The indicators and targets for each EQO will become a basis for the next NOWPAP Medium Term Strategy 2018-2023.

242 The NOWPAP Regional Action Plan on Marine Litter is also being implemented in cooperation with central and local governments in the NOWPAP member states as well as non-governmental organizations (NGOs) including the organization of highly successful International Coastal Clean-up campaigns in all participating countries. The "Review and analysis of existing prediction models for floating marine litter" and "Oiled wildlife response in the NOWPAP region" have been published in 2018. The Expert Meeting of the NOWPAP special project: "Monitoring and Assessment Methods for Microplastics pollution" was organized in Busan, Korea on 3 June 2018. Participants agreed that the Special Project would use existing microplastics monitoring criteria in NOWPAP countries. Existing eco-toxicological studies of the impact of microplastics on the environment would be used as part of a harmonized regional approach to microplastics ecological risk assessment. NOWPAP is a member of the Global Partnership on Waste Management (GPWM) and has been hosting the NW Pacific regional node of the Global Partnership on Marine Litter (GPML) since 2014.

243 NOWPAP continues developing and strengthening partnerships with the relevant organizations and programmes in the region, including North-East Asian Subregional Programme for Environmental Corporation (NEASPEC), North Pacific Marine Science Organization (PICES), Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), and UNESCO/IOC Sub-Commission for the Western Pacific (WESTPAC), Yellow Sea Large Marine Ecosystem (YSLME) Phase II Project to name a few. NOWPAP contributes to the implementation of the Sustainable Development Strategy for the Seas of East Asia and provides technical expertise to the Convention on Biological Diversity on relevant issues such as description of ecologically or biologically significant marine areas (EBSAs) in the region.

244 NOWPAP member states have adopted a new Medium-term Strategy (MTS) for the period 2018-2023 and the implementation plan to tackle multiple regional challenges and ways to revitalize and expand the NOWPAP partnership in June 2018. The Strategy intends to align future NOWPAP activities with the delivery of Sustainable Development Goals (SDGs). The focus areas of the MTS include: supporting integrated coastal and river basin planning and management, assessing status of the marine and coastal environment, preventing and reducing land- and sea-based pollution and conserving marine and coastal biodiversity.

Coordinating Body on the Seas of East Asia (COBSEA)

245 The Coordinating Body on the Seas of East Asia (COBSEA) is a regional intergovernmental policy forum, recognized as the sole decision-making body for the East Asian Seas Action Plan, supporting participating countries (Cambodia, People's Republic of China, Indonesia, Republic of Korea, Malaysia, the Philippines, Thailand, Singapore and Vietnam) in the development and protection of the marine environment and coastal areas of East Asian Seas. The COBSEA Secretariat is hosted by Thailand and administered by UN Environment, located at the UN Environment Asia and the Pacific Office in Bangkok, Thailand.

246 COBSEA Strategic Directions 2018-2022 were adopted at the Second Extraordinary IGM of COBSEA 25-26 April 2018 in Bangkok, Thailand. Under these Strategic Directions COBSEA will focus on regional governance; addressing land-based marine pollution with a focus on nutrients, sediment, wastewater and marine litter; and marine and coastal planning and management, with a focus on ecosystem-based management approaches, including MPAs and MSP, towards achievement of relevant SDGs and Aichi Targets.

247 COBSEA adopted a Regional Action Plan on Marine Litter in 2008. This remains the only intergovernmentally adopted framework for marine litter in the region. A process to update this is underway. A revised draft has been prepared based on consultation with participating countries, other stakeholders and desk review. Steps towards finalization of the revision were agreed at the Second Extraordinary IGM of COBSEA, 25-26 April 2018. A regional workshop will be convened in the second half of 2018. A regional seminar was also held in association with the GESAMP WG 40 meeting in Bangkok in June 2018.

³⁸ <http://www.nowpap.org/>

248 A regional project on reducing marine litter through management of the plastic value chain (US\$ 6.5M) has been developed in collaboration with UN Environment. The project, funded by Sweden, will start with an inception phase in 2018 followed by 4 years of project implementation. COBSEA leads components focusing on the science basis for decision-making including monitoring and reporting, as well as on regional networking, cooperation and sharing. This will support countries implement key provisions of the Regional Action Plan on Marine Litter, and in doing so also facilitate development, planning and implementation of national commitments made towards SDG 14.1 as well as in the context of the global Clean Seas campaign.

249 The US\$ 15M GEF project 'Implementing the Strategic Action Programme for the South China Sea', which addresses the habitat, land-based pollution and regional coordination components of the Strategic Action Programme, is starting in 2018. The US\$ 3M GEF project 'Establishment and Operation of a Regional System of Fisheries Refugia in the South China Sea and Gulf of Thailand', which implements the fisheries component of the Strategic Action Programme, started in 2016, executed by SEAFDEC. COBSEA has an umbrella coordinating role for these projects. Project progress and other matters will be reviewed and shared through COBSEA, and COBSEA will execute activities under component 3 of the project 'Implementing the Strategic Action Programme for the South China Sea' relating to regional policy development.

Caribbean Region (Cartagena Convention Secretariat)

250 Capacity of Marine Protected Areas (MPAs) was strengthened through local training (under the SPAW *Training of Trainers* (ToT) course), regional symposia, and through grants (under the SPAW/Caribbean Marine Protected Areas Managers Network and Forum (CaMPAM) Small Grants Program) for MPAs in 6 Eastern Caribbean countries via the recently concluded collaborative project with support from the Government of Germany entitled "*Climate Resilient Eastern Caribbean Marine Managed Areas Network*" (ECMMAN). The application of Ecosystem Based Management (EBM) approaches and tools continues to be facilitated through the extended project "*Biodiversity for Sustainable Development in the Caribbean through Ecosystem Based Management*" (Caribbean EBM Project) focusing on the Dominican Republic and funded by the Directorate for the Environment within the Ministry of Foreign Affairs of Italy with participation of regional partners, it will be extended to Colombia.

251 For coral reef conservation there was a focus on continued support through the development of a coral reef partnership within the UN Environment, Regional Seas Programme including coordination with the International Coral Reef Initiative towards the reactivation of the Caribbean Coral Reef Monitoring Network. The use of bio-physical and socio-economic data for coastal management decision-making, and for improved standardized and strategic reporting at the regional level is now being actively promoted to increase capacity for effective integrated coral reef monitoring among Global Coral Reef Monitoring Network-Caribbean countries.

252 Following collaboration between the Cartagena and Abidjan Conventions to raise awareness and share information on the issue of the *Sargassum* influx, the development and dissemination of educational material throughout the respective regions remains a priority. There was the presentation of a draft paper to the Fifth Meeting of the Council of Ministers for Environmental Sustainability (OECS) in July 2018, and a technical session at the 70th Annual Gulf and Caribbean Fisheries Institute (GCFI) Conference at the end of 2017. The sharing of regional data in partnership with GCFI, the University of the West Indies' Centre for Resource Management and Environmental Studies (CERMES) and other relevant institutions is on-going.

253 Collaboration with Regional (and sub-regional) Fisheries Organisations (RFOs) and other partners is underway to enhance governance and sustainable management of living marine resources in the Wider Caribbean, under the framework of the "Catalysing Implementation of the Strategic Action Programme for the Sustainable Management of Shared Living Marine Resources in the Caribbean and North Brazil Shelf Large Marine Ecosystems" (CLME+) project in coordination with IOCARIBE/IOC, FAO/WECAFC, University of the West Indies and member governments. A MoU was recently signed with the Caribbean Regional Fisheries Mechanism (CRFM) (May 2018) to facilitate various elements pertaining to identification and evaluation of marine species for listing on the SPAW Protocol, monitoring and mitigation of marine invasive species in the region including management of *Sargassum* seaweed influx, coral reefs, mangroves and other coastal and marine ecosystems, and capacity building to name a few.

254 The management of sewage was improved through the support to the Global Wastewater Initiative, one of the three partnerships of UNEP's Global Programme of Action (GPA). This has taken place primarily through capacity building activities of the GEF funded Caribbean Regional Fund for Wastewater Management (CRew), implemented by the Inter-American Development Bank and UNEP. The results achieved from the CRew project have enabled the countries - both at regional and national levels - to more effectively manage wastewater discharges into the Caribbean Sea. The main achievements of the CRew have been the establishment of Pilot Financing Mechanisms (PFMs); improved understanding of the need to for innovative financing; increased awareness amongst decision makers, the media and the wider public; policy institutional and legislative reforms for reducing impacts of sewage on the marine environment; training of more than 600 technicians, government officials, and other stakeholders in various aspects of wastewater management; and enhanced regional and national level partnerships including the private sector, UN agencies and development banks. Costa Rica became the 13th country to ratify the Protocol on the Control of Pollution from Land Based Sources and Activities (LBS Protocol) in May 2016. The GEF CRew Project officially closed in 2017.

255 Work has begun on the design of a full-sized project proposal to build upon the outputs of the GEF CRew. The GEF CRew+ Project to be implemented by UN Environment and the Inter-American Development Bank will build on a baseline of technical understanding of wastewater treatment and practical examples of success following the implementation of activities in 13 countries of

the region under the GEF CRew project. The new project is expected to identify and implement new innovative funding mechanisms and technological solutions that are replicable and sustainable. The project duration will be 36 months.

256 The full proposal for the GEF funded CRew+ Project entitled '*Upscaling and enhancing the experience of the Caribbean Regional Fund for Wastewater Management to the wider Caribbean promoting through an integrated approach of innovative technical solutions and financing mechanisms (CRew+)*' is being developed for finalization and submission to the GEF Secretariat by March 2019. The project was approved in November 2017 for US\$14,943,938 by the Global Environment Facility (GEF) Trust Fund. Close liaison has begun with all countries to secure their input, endorsement/validation and co-financing for all proposed activities at national and regional levels.

257 In the area of marine litter, the Secretariat in collaboration with the US Environmental Protection Agency (EPA) launched the *Trash Free Waters Partnership* in Panama and Jamaica in 2016. This partnership focuses on community based activities in collaboration with the US Peace Corps to reduce impacts of marine litter on coastal and marine ecosystems, human health and livelihoods. This serves to assist in the implementation of the Regional Action Plan for Marine Litter Management in the Caribbean which was updated in 2015. Sandals Foundation is coordinating the implementation of pilot project activities in the towns of Bluefields and Whitehouse in Jamaica. A contractual agreement was finalized between UN Environment and Sandals Foundation and signed in May 2018. The project was later launched in the communities of Bluefields and Whitehouse on June 8, 2018. Activities during 2018 include public education and outreach, distribution of garbage bins, livelihood training for recycling with Recycle 360 in Jamaica, separation of Polyethylene terephthalate plastics (PET) into distributed bins and composting.

258 The 20 million USD 5-year GEF-funded project for Integrating Water, Land & Ecosystems Management in Caribbean SIDS (GEF-IWEco) commenced during the second half of 2016. This project will contribute to the preservation of Caribbean ecosystems that are of global significance and the sustainability of livelihoods through the application of existing proven technologies and approaches that are appropriate for small island developing states through improved fresh and coastal water resources management, sustainable land management and sustainable forest management that also seek to enhance resilience of socio-ecological systems to the impacts of climate change. Project Cooperation Agreements (PCAs) were duly signed for three countries: Trinidad & Tobago, St. Lucia and Antigua & Barbuda. PCA was also signed with PCI Media Impact for execution of Component 4 – Enhance knowledge exchange. Project Cooperation Agreements (PCAs) are currently being developed with the remaining project countries and project partners.

259 The IWEco project held a Communications and Capacity Building Workshop from 28-29 March 2017, Havana, Cuba, nine project Focal Points attended. In October 2017, a 'Communication Partnership Group' meeting and capacity building workshop (Regional Communications Workshop, 30 October - 3 November 2017) was held in Saint Lucia, bringing together the various national focal points and the contracted partners

related to communications and awareness raising work. During this meeting, a strategy to launch the IWEco Project in the various countries was agreed upon, including funding arrangements. This resulted in successful launches of the IWEco Project in Saint Lucia, Cuba, and in Trinidad & Tobago. A second IWEco Project Steering Committee Meeting was organised and held in Havana, Cuba, 26-28 February 2018, bringing together project countries and co-executing agency representatives and allowing for management decisions with regards to the ongoing execution and progress of the IWEco Project in the region.

260 The development of new CEP Technical Reports, Infographics and Fact Sheets, has enhanced use of social media with targeted training for media professionals, and has facilitated greater knowledge sharing and awareness raising of the general public and other interested persons on coastal and marine issues, including on emerging issues such as ocean acidification and the negative environmental and human health impacts of microplastics.

261 The Secretariat also initiated the development of the first *State of Convention Area (Marine Environment Report)* for the Wider Caribbean Region. The report captures and presents key information on the state of coastal and marine ecosystems within the WCR in terms of their current condition; the pressures and the drivers of those pressures; and an assessment of current environmental management initiatives. It is expected to serve as an operational tool that the Parties and other partner organizations can use to determine baseline conditions and priorities to be addressed in the region and to set targets for region-wide action. The development of the SOCAR starts the reporting process that will occur in 4-year cycles. It is also expected to complement the development of a State of Habitat Report coordinated through the SPAW Protocol. Through the institutionalization of an integrated reporting mechanism on the "State of the Marine Environment and Associated Economies" in the region ("CLME+ SOME"), this provided an opportunity to develop the Driver Pressure State Impact Response Methodology (DPSIR) which is being used as the methodology for the SOCAR and the State of the Marine Environment (SOME) Report under the UNDP/GEF CLME+ project. The Pre-Technical Workshop was held on 17 July 2018 immediately preceding the 4th LBS STAC and further reviewed the progress on SOCAR and included recommendations for consideration by the 4th LBS STAC

262 The Strengthening Ecosystem Based Management (EBM) Frameworks and Ocean Governance in the North Brazil Shelf Large Marine Ecosystem (NBSLME) project developed by the Cartagena Convention Secretariat's AMEP and SPAW Sub-Programmes in partnership with the Caribbean Large Marine Ecosystem Project aims to develop and test various governance arrangements to enable effective ecosystem-based management (EBM) of mangroves and wetlands. The project will implement at least one (1) mangrove restoration/rehabilitation/protection and pollution abatement/prevention project in each of four (4) countries of the NBSLME: Trinidad and Tobago, Guyana, Suriname and Brazil. This project will support national and regional coastal management programmes, assist participating countries in implementation of the SPAW (Specially Protected Areas and Wildlife) and LBS (Land Based Sources of marine Pollution) Protocols, and meet their international obligations with regards to RAMSAR and CBD (Convention on Biological Diversity).

Abidjan Convention

263 The Convention for Cooperation on the Protection, Management and Development of the Marine Environment and the coastal zones of the Atlantic Coast of the West, Central and Southern Africa Region - Abidjan Convention - has for over 6 years accelerated the process of developing regional cooperation instruments. These cooperation agreements include the additional protocols to the Abidjan Convention on: Pollution from land-based sources and activities -LBSA; Environmental norms and standards related to offshore oil and gas activities; Integrated coastal zone management -GIZC- and Sustainable mangrove management.

264 LBSA: The Protocol on Cooperation in Pollution Control in Emergency Situations was signed in June 2012. In addition, a Regional Emergency Plan to organize cooperation in the event of pollution incidents has been adopted and a Regional Emergency Centre established.

265 Environmental norms and standards: The establishment of a regulatory framework for monitoring and surveillance of offshore oil and gas activities follows COP 9, COP 10 and CoP 11. The Secretariat organized the Dakar meeting which outlined the main line of action of the additional protocol and the roadmap for the adoption of the present protocol under preparation. The meeting of Malabo has amended and adopted the preliminary draft protocol and initiated the idea of beginning national consultations to share the document with all national stakeholders concerned by the offshore oil and gas issue who did not have the opportunity to take part in the regional process. The last meeting, which took place in Praia, made it possible to adopt, subject to reservations, the annexes to this additional protocol and to draw up a roadmap for national consultations.

266 Sustainable mangrove management: In accordance with Decision - CP 11/1. d) COP. 10/7: Sustainable management of mangrove ecosystems in the area of influence of the Abidjan Convention "which encourages the transformation of the Charter for the sustainable management of mangrove resources signed in 2010 by the Gambia, Guinea, Guinea-Bissau, Mauritania, Senegal and Sierra Leone into an additional protocol to the Abidjan Convention, in accordance with recommendation No. 2 adopted at the 7th Regional Coastal and Marine Forum, held in Dakar in 2013, the Secretariat of the Abidjan Convention initiated the development process of the said protocol. To this end, it organized three panels of experts. The first, held in Abidjan in November 2014, transformed the mangrove charter into a protocol and validated the draft version. The second meeting held in August 2015 in Calabar-Nigeria made it possible to improve the provisional version, to initiate the development of an action plan based on the protocol and to launch the process of developing the annexes. The third panel that met in Bissau in May 2016 validated the draft version of the Protocol, reviewed and validated subject to the annexes to the Protocol and developed a roadmap for national consultations.

267 Integrated Coastal Zone Management: Marine and coastal areas are home to many human activities such as deforestation for various purposes, maritime transport, fishing and aquaculture, renewable energy production, extraction of raw materials, water sports and tourism. Experts have been warning for several years about the threats these activities pose to the marine and coastal

environment. Strengthening their supervision has gradually become a major objective for the States Parties to the Abidjan Convention. The Parties consider that the drafting of a protocol on ICZM would contribute to more effective management of coastal zones and the marine environment. To this end, the Abidjan Convention Secretariat has already organized the first meeting of the Abidjan Convention Expert Panel on the elaboration of an additional protocol on integrated coastal zone management in West, Central and Southern Africa. It was held in Accra, Ghana, from 16 to 18 June 2015 and led to the establishment of a working group and the adoption of the outlines of the protocol. Following this meeting, the second meeting of experts was held in Lomé, Togo, from 24 to 26 May 2016. The latter adopted a new version of the preliminary draft protocol; adopted, subject to the guidelines of the four annexes to this protocol and finally set out the road map for the national consultations held between July and September.

268 In sum, all the above-mentioned protocols have been the subject of national consultations with the aim of reflecting national concerns as far as possible in the protocols. To this end, the Convention Secretariat has set up 3 teams of experts who travelled across West and Central Africa between July and October 2016 to conduct these national consultations. At least 50 participants per country took part in these consultations and they come from diverse backgrounds: Technical services of the ministries concerned, Policy makers, Private sector, Civil society organizations, Research, etc.

269 The participants' profiles are also varied: environmentalists, oceanographers, biologists, hydrologists, soil scientists, mining engineers, lawyers, communicators, etc. The areas of expertise sought included: mining, environmental assessments, pollution, marine and coastal biodiversity, fisheries, environmental law, etc.

270 The workshops took place over an average of 3 days during which all the articles are discussed. At the end of the work, annotations in mode followed by modification are attached to the country report. In October 2016, the Secretariat invited the members of the Committee on Science and Technology to take note of the comments, observations and recommendations of the Parties. The results of all the national consultations and meetings of the Abidjan Convention's Committee on Science and Technology were presented in the form of a guidance note attached to the draft decision. These are the consolidated versions resulting from a long participatory and iterative process that were presented and adopted by the Parties at the twelfth Conference held in Abidjan in March 2017.

271 To date, the Secretariat is actively preparing the meeting of plenipotentiaries, which will probably be held at the beginning of the last quarter of 2018. This involves considering the amendments made to the protocol by the Contact Group set up at CoP12. To this end, the CST, the body authorized in this area, met from 23 to 27 May 2017 to take these amendments into account. The final versions considered the comments of the contact group. To define a post-signature roadmap for the protocols, the Abidjan Convention Secretariat is organizing a scoping workshop from 23 to 25 July. The aim is to have an action plan for the implementation of each protocol and the process of transposing the protocols into national laws. The meeting will also define the lines of communication needed to raise awareness among all stakeholders on the implications of the protocols and the role of each. The agenda below

provides further details on the framework of the working methodology.

The Regular Process for reporting and assessment of the state of the marine environment including socioeconomic aspects.

272 UN Environment continues to provide scientific and technical support to the Group of Experts, the bureau and the secretariat in the implementation of the second phase of the World Oceans assessment. The second phase of the WOA was launched in January 2016. Support to the second cycle of the process is being focused on awareness raising, resource mobilization, identification of additional 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.

273 UN Environment through its Nairobi Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Western Indian Ocean hosted and supported the Indian Ocean, the Arabian Sea, the Red Sea and Gulf of Aden and the ROPME/RECOFI area Regional Workshop in Zanzibar, United Republic of Tanzania, from 14 to 15 December 2017. The workshop provided an opportunity to present the main conclusions of the First Global Integrated Marine Assessment – World Ocean Assessment I; it enabled participants to put forward their views on the scope and structure that should be adopted for the assessment or assessments to be prepared in the second cycle of the Regular Process, and aimed at promoting capacity-building within the region so as to assist in creating the abilities to contribute from the region to the production of the assessment.

274 The draft outline for the second world oceans assessment has been approved by the tenth meeting of the Ad Hoc Working Group of the Whole on the Regular Process which met from 28 February to 1 March 2018. The second round of capacity building workshops (2018) are being organized by the secretariat as follows:

- .1 The North Pacific- Valletta, Malta, from 27 to 28 August 2018;
- .2 The South Pacific - Koror, Palau, from 8 to 9 August 2018;
- .3 The Indian Ocean (including the Arabian Sea and the Bay of Bengal), the Red Sea and Gulf of Aden and the ROPME/RECOFI area;
- .4 The North Atlantic, the Baltic Sea, the Mediterranean Sea and the Black Sea; and
- .5 The South Atlantic (between the African and American coasts) and the wider Caribbean

UN Environment following a request to nominate additional experts to the Pool of Expert for the Regular Process has nominated over 30 experts through the Regional Seas to the secretariat for consideration.

The GEF Transboundary Waters Assessment Programme (TWAP)

275 The TWAP Full Size Project which commenced in April 2013 and envisioned to fill two major objectives: (1) to undertake the first global assessment of transboundary water systems that will assist GEF and other international organizations improve the setting of priorities for funding; and (2) to formalise the partnership with key institutions so that transboundary considerations are incorporated in regular assessment programmes has been completed. The project which was completed in 2017 and has undergone a terminal evaluation which report is available online at the following web address: <http://geftwap.org/publications/terminal-evaluation-report>

276 All TWAP publications are available at www.geftwap.org. Other products include a TWAP Comparative Analysis of Governance Report and the Transboundary Water Profile-Global Baseline Folio. To provide access to the quantitative data that underpin the assessments, a central data portal can be explored at <http://www.geftwap.org/data-portal>. For water category-specific data and water-system factsheets, links to partner websites are also provided from the central data portal webpage.

277 The execution of the TWAP has been coordinated by UN ENVIRONMENT (Science Division as executing unit and the Ecosystem Division as implementing unit, project-wide) and involves many partners already engaged in assessment efforts. Lead organizations at the project component scale are: Transboundary aquifers and SIDS groundwater systems: UNESCO's International Hydrological Programme (IHP); Transboundary lake/reservoirs basins: International Lake Environment Committee (ILEC); Transboundary river basins: UN ENVIRONMENT-DHI Centre for Water and Environment (lead); Large marine ecosystems: Intergovernmental Oceanographic Commission of UNESCO (IOC of UNESCO); Open ocean: IOC of UNESCO; Crosscutting Analysis: UN ENVIRONMENT-Science Division; and Data and information management: UN ENVIRONMENT/Science Division/Global Resources Information Database (GRID-Geneva).

Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA)

278 The GPA continues to focus its efforts mainly on the three pollution source categories of nutrients, wastewater, and marine litter, through establishment and management of global partnerships, in response to the Manila Declaration. The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities will hold its 4th Intergovernmental review Meeting in Bali in October 2018 having been postponed from the same period last year due to threatening volcanic activity in proximity to the meeting location. The main goal of the Intergovernmental Review Meeting is to secure additional commitments from a full range of partners to further the implementation of the Global Programme of Action in addressing the priorities and needs of countries. This meeting will also focus on strategic directions for the programme into the future with particular reference to the resolutions adopted by countries at the third session of the UN Environment Assembly (UNEA3) that strengthened the mandate to address land-based pollution in resolutions on water, marine, soil and air pollution.

279 UN Environment through the GPA/Wastewater is providing support to the Tanzanian government in developing guidelines and standards for decentralized wastewater management systems. An expert meeting was held in Tanzania in January 2018 for selected sector experts to revise and provide input to the Guidelines for Decentralized Wastewater Treatment Systems. This activity is part of a project implemented by UN Environment together with the Bremen Overseas Research and Development Association (BORDA), who is also a member of the Global Wastewater Initiative (GW²I) and UN-Habitat. The project aims to support the scaling-up of decentralized sanitation solutions throughout Tanzania. Inputs gathered have been compiled into one final document which will then be presented to relevant ministries and used as a basis for developing standards on decentralized wastewater treatment systems for Tanzania and other potential countries.

280 UN Environment, through the GPA/Wastewater, has developed, and almost completed the implementation of the activities of phase two of a community-based project for biodiversity conservation and local community development through tree planting supported by Korea Forest Service (KFS) in Benin, Ethiopia, Ghana, and Morocco.

281 A Policy Brief on SDG6 has been developed by the Science Division of UN Environment, in collaboration with the Freshwater Unit and the GPA/Wastewater. The Sustainable Development Goals Policy Briefs highlight a hotspot of environmental concern. The evidence provided builds on the scientific data and information hosted on the online platform Environment Live and is complemented by stories from around the world.

282 A Sanitation and Wastewater Story Map has been developed under the ongoing “Wastewater Management and Sanitation Provision in Africa Project,” which is a partnership between UN Environment and the GPA, the African Development Bank (AfDB) and GRID-Arendal. The story map has won the first place in the Infrastructure, Planning and Government category of the “Storytelling with Maps” contest run by ESRI. This Story Map illustrates challenges associated with the inadequate infrastructure for sanitation provision and wastewater management in Africa at a time when volumes are increasing due to population growth, and expansion in industry and agriculture. Case studies are given from Kenya and from across Africa. Link: <https://gridarendal.maps.arcgis.com/apps/Cascade/index.html?appid=caf411c40c3442b782406de631bddb2f>. A draft version on the Sanitation and Wastewater Atlas has also been developed and deliberated upon during a workshop held in Rwanda in April 2018.

283 A Science-to-Policy Brief on managing wastewater to support the health and resilience of coral reefs and titled “Wastewater Pollution on Coral Reefs” has been developed by the GPA and the Coral Reef Unit of UN Environment. This brief provides policy and management recommendations for addressing and reducing the impacts of wastewater on coral reefs, based on current scientific knowledge. It promotes integrated planning and management, awareness-raising, capacity-building and other efforts to improve monitoring of wastewater loading and its impacts, among key stakeholder groups. It is primarily aimed at national and state policymakers.

284 UN Environment through the GPA/Wastewater continues to provide support in the implementation of the UNEA3 resolutions. Inputs on the ongoing activities in support of the implementation of the UNEA3 resolutions related to wastewater were recently shared during a multi-stakeholder brainstorming session on the UNEA3 implementation plan in Paris, 13-14 June 2018.

285 A Massive Open Online Course (MOOC) titled “From Source to Sea to Sustainability. Integrated Cycle in Wastewater and Nutrient Management” was developed by UN Environment/GPA, Concordia University and the Loyola Sustainability Research Centre to raise awareness and build capacity on the two pollution streams.

286 UN Environment, through the GPA/Wastewater and the Global Wastewater Initiative (GW²I) is organizing a series of webinars to enhance the understanding and recognition of wastewater as a resource as well as to expand knowledge generation, awareness raising and outreach on crucial issues related to sustainable wastewater management. The webinars also serve as an opportunity for the members of the Global Wastewater Initiative to share their expertise and experiences regarding critical issues related to sustainable wastewater management. The first webinar titled “The need for innovative financial mechanisms for sustainable wastewater management,” hosted by UN Environment was held on 30 April 2018. A second webinar titled “The impact of land-based pollution on coral reefs: focus on nutrients, plastics and wastewater” was hosted by UN Environment on 24 May 2018.

287 The GPA/Wastewater organized a mini-workshop on the “polluter pays” principle in March 2018. The mini-workshop explored the “polluter pays” principle from different perspectives, which triggered discussions around the benefits and challenges of implementing the principle as well as some possible undertakings for UN Environment.

288 Under the nutrient pollution portfolio, the Secretariat continues to support the Global Partnership on Nutrient Management (GPNM) within UN Environment’s Programme of Work. The GPNM, in collaboration with the GW²I supported through the GPA, delivered a Massive Open Online Course (MOOC) on nutrients and wastewater management over the first quarter of 2018 to assist in the outreach and availability of web-based resources. Concordia University of Montreal, Canada developed the MOOC sourcebook and online platform, and administered the MOOC roll-out which had an uptake of just over 1,080 registrants from 170 countries.

289 Under the GEF-funded Global Nutrient Cycling (GEF-GNC) Project that is nearing completion, a significant body of knowledge related to quantitative modelling approaches (based on tools such as Global NEWS model), on coastal nutrient enrichment has been generated with several published scientific journal articles available on the topic. Key collaborators to this work included IOC-UNESCO along with University of Utrecht, Washington State University and University of the Philippines. The nutrient load data is fully integrated in a Global Nutrient Management Toolbox that has also been developed under the project, along with a comprehensive suite of best field and policy management practices which is accessible through the Nutrientchallenge.org website.

The watershed-based nutrient flux modelling for the Manila Bay watershed led by the Marine Science Institute of the University of the Philippines is complete. The work supported the design of watershed BMPs and strategies for addressing nutrient loading into the receiving environment. Specific deliverables included the Environmental Atlas of Manila Bay, the Laguna de Bay ecosystem health report card (Philippines), the Management plan for the Manila Bay and State of Coast reports for provinces surrounding Manila Bay. Under the project the Chilika Lake ecosystem health report card (India) was also developed.

290 A collaboration has been established with the World Resource Institute to prepare experience notes on the implementation highlights of the project and market the nutrient management toolbox to global users. GRID-Arendal is being engaged to translate the key scientific outputs from the project to a suite of information products for wider audiences and decision makers in the formats that include information graphics, a map atlas and a story-map that focuses on Manila Bay. The work under the GEF-GNC Project is now being extended to support the development of the SDG 14.1 target indicator on nutrient pollution of the marine environment in collaboration with IOC-UNESCO and other partners under the guide of UN Environment's Science Division.

291 The Global Programme of Action under the nutrient pollution portfolio, in co-operation with the South Asia Cooperative Environment Programme (SACEP), commenced a project in Sri Lanka on reducing the risk of degradation of coral reef ecosystems by addressing nutrient, wastewater and other land-based sources of marine pollution. The project will contribute to strengthening local and regional enabling environments to foster the uptake and adoption of innovative approaches in reducing threats to coral reefs from land-based pollution. This initiative will be contributory to the UNEA2 resolution on the protection of coral reefs and feeds into activities under the 2018 International Year of the Coral Reef.

292 The GEF-funded International Nitrogen Management System (INMS) Project commenced implementation at the start of 2017. The project is a science-policy support process that seeks to develop and merge best policy practice and regional demonstration across the global regions, as a basis to support governments and others in improving nitrogen management and reducing adverse environmental outcomes. Implementation and planning workshops with key technical specialists and country representatives continue, with scenarios modelling approaches taking account of marine impacts of nitrogen influxes.

293 The concern over the impact of climate change related to ocean temperatures and influences on the proliferation and persistence of harmful algal blooms will continue to be tracked under the nutrient management portfolio of the GPA. Efforts will continue toward improving the understanding of the phenomenon through research,

while bolstering national measures to reduce nutrient loading (agricultural discharges, municipal wastewater) to the environment require continued, and in some areas, stepped-up attention. The sargassum proliferation events in the Caribbean and West Africa in recent years have been suggested by researchers to be potentially linked to this phenomenon. In the Caribbean, there is collaboration under the Caribbean Large Marine Ecosystem Project to develop a nutrient management strategy and in the West Africa region under the Abidjan Convention, an alien invasive species response strategy that includes sargassum management has been developed.

294 One of the main focuses of the GPA during the period under review was continued development of the Global Partnership on Marine Litter (GPML) which is a voluntary open-ended partnership for international agencies, governments, businesses, academia, local authorities, and civil society. As well as supporting the Global Partnership on Waste Management, GPML seeks to protect human health and the global environment through several specific objectives, with reduction and management of marine litter as its main goal. UN ENVIRONMENT provides the Secretariat for the GPML in line with the mandate received in the "*Manila Declaration on Furthering the Implementation of the GPA*", and leads on the focal area on land-based sources of marine litter. FAO and IMO lead the focal area on sea-based sources of marine litter. Much support has been provided to various organizations, including Regional Seas Conventions and Action Plans. Regional nodes for the GPML have been established in the Northwest Pacific, co-hosted by the Northwest Pacific Environmental Cooperation Center and the NOWPAP Secretariat, and the Wider Caribbean Region, hosted by the Gulf and Caribbean Fisheries Institute and the Cartagena Convention Secretariat.

295 The first meeting of the Ad Hoc Open Ended Expert Group was held in United Nations, Nairobi, Kenya from 29 to 31 May 2018. It was attended by 266 participants, representing 72 member States, 9 intergovernmental organizations and 28 observers representing major groups and stakeholders accredited to the United Nations Environment Assembly of the United Nations Environment Programme. The Ad Hoc Open Ended Expert Group was established in response to UNEP/EA.3/Res.7 Marine Litter and Microplastics.

296 As a follow up to the United Nations Environment Assembly (UNEA-1, 2014) resolution 1/6 on Marine plastic debris and microplastics study, which was presented to the Second Session of UNEA (UNEA-2), recommendations for the most urgent of the GESAMP Working Group 40 study focused on to provide guidelines for a harmonised approach for assessment and monitoring of marine plastics and microplastics. The report will be published before the end of the year. These methodologies will be useful for monitoring on SDG 14.1.1.

ANNEX V — Current working groups and their terms of reference

WG 1: Evaluation of the hazards of harmful substances carried by ships

Lead Agency: IMO

Co-sponsors: None

Chairperson: Thomas Höfer (Germany)

Members: Stéphane le Floch (France), Thomas Höfer (Germany), Wenxin Jiang (China), Richard Luit (Netherlands), Bette Meek (Canada), Michael Morrissette (United States), Patricio H. Rodriguez (Chile), Haito Saito (Japan), Assad Ahmed Al-Thukair (Saudi Arabia)

Products: Hazard profiles of new substances and correspondence with the industry.
Maintenance and update of 900 GESAMP hazard profiles.

Planning: 56th session in 2019

Terms of Reference for WG 1

The terms of reference of the GESAMP EHS Working Group, as given by GESAMP at its 6th session in Geneva (1974) and amended at its 8th session in Rome (1976) are revised to read:

The GESAMP Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships is an expert group to provide best available scientific assessment of the environmental, occupational and safety hazards of chemicals, in particular to:

- 1 provide scientific advice on the hazards of chemicals transported by ships as may be requested, particularly by IMO;
- 2 evaluate safety data and test reports on specific chemicals submitted by industry in accordance with the rationale approved by GESAMP for this purpose and create a GESAMP Hazard Profile for such chemicals accordingly;
- 3 maintain a list of hazard evaluations ("Composite List" of GESAMP Hazard Profiles) for the use by IMO and keep it up to date based on available scientific data; and
- 4 observe the developments concerning the international harmonization of hazard classification by the United Nations and scientific guidance on hazard assessment published by international organizations to improve the GESAMP hazard evaluation procedure and GESAMP hazard ratings.

WG 34: Review of applications for "Active Substances" to be used in ballast water management systems

Lead Agency: IMO

Co-sponsors: None

Chairpersons: Jan Linders (Netherlands)
Vice-Chair: Annette Dock (Sweden)

Members: Teresa Borges (Portugal), Barbara Werschkun (Germany), Shinichi Hanayama (Japan), Kitae Rhie (Republic of Korea), David J. D. Smith (United Kingdom), Gregory Ziegler (United States), Claude Rouleau (Canada), Flavio da Costa Fernandes (Brazil), Assad Ahmed Al-Thukair (Saudi Arabia).

Consultants: Annette Dock (dual function)

Product(s): Evaluation of the risks to the environment, human health and the ships' crew from ballast water management systems

Completion of the methodology in Reports & Studies following external and GESAMP peer review (draft by September 2017 deadline for peer review on 7 December 2018)

Planning: Two One meetings of the BWWG isare planned prior to the 4654th session of GESAMP: the 385th meeting of the BWWG is taking place from 148 to 170 November January 20197 and the 36th meeting from 4 to 8 June 2018. The 397th meeting and 40th meeting areis also scheduled tentatively from 4 to 8 November 2018 and from 9 to 13 December 2019 subject to the number of applications received.

Terms of Reference for WG 34

- 1 Consideration of development of necessary methodologies and information requirements in accordance with the "Procedure for approval of ballast water management systems that make use of Active Substances (G9)" (adopted by resolution MEPC 169(57)) for consideration by MEPC 65;

2 For Basic Approval, the Group should review the comprehensive proposal submitted by the Member of the Organization along with any additional data submitted as well as other relevant information available to the Group and report to the Organization;

In particular, the Group should undertake:

- .1 scientific evaluation of the data set in the proposal for approval (see paragraphs 4.2, 6.1, 8.1.2.3, 8.1.2.4 of Procedure (G9));
- .2 scientific evaluation of the assessment report contained in the proposal for approval (see paragraph 4.3.1 of Procedure (G9));
- .3 scientific evaluation of the risks to the ship and personnel to include consideration of the storage, handling and application of the Active Substance (see paragraph 6.3 of Procedure (G9));
- .4 scientific evaluation of any further information submitted (see paragraph 8.1.2.6 of Procedure (G9));
- .5 scientific review of the risk characterization and analysis contained in the proposal for approval (see paragraph 5.3 of Procedure (G9));
- .6 scientific recommendations on whether the proposal has demonstrated a potential for unreasonable risk to the environment, human health, property or resources (see paragraph 8.1.2.8 of Procedure (G9)); and
- .7 preparation of a report addressing the above-mentioned aspects for consideration by MEPC (see paragraph 8.1.2.10 of Procedure (G9)).

3 For Final Approval, the Group should review the discharge testing (field) data and confirm that the residual toxicity of the discharge conforms to the evaluation undertaken for Basic Approval and that the previous evaluation of the risks to the ship and personnel including consideration of the storage, handling and application of the Active Substance remains valid. The evaluation will be reported to the MEPC (see paragraph 8.2 of Procedure (G9)); and

4 The Group should keep confidential all data, the disclosure of which would undermine protection of the commercial interests of the applicant, including intellectual property.

WG 38: Atmospheric input of chemicals to the oceans

Lead Agency: WMO

Co-sponsors: IMO, US National Science Foundation, SCOR, SOLAS, University of East Anglia

Chairpersons: R. Duce (United States), T. Jickells (United Kingdom)

Members: Alex Baker (United Kingdom), Laurent Bopp (France), Peter Croot (Ireland), Robert A. Duce (United States), Marion Gehlen (France), Cecile Guieu (France), Frances Hopkins (United Kingdom), Akinori Ito (Japan), Tim Jickells (United Kingdom), Maria Kanakidou (Greece), Kitack Lee (Republic of Korea), Natalie Mahowald (United States), Manmohan Sarin (India); Parvadhe Suntharalingam (United Kingdom)

Product(s): Preparation of a summary of the working groups' publications arising from the 'Atmospheric Deposition of Nitrogen and its Impact on Marine Biogeochemistry' workshop. This was published in the GESAMP and Studies series as R&S 97. Also 6 papers were published in the peer-reviewed scientific literature and one additional paper has been submitted on the nitrogen work.

Preparation of 9 peer-reviewed papers currently underway resulting from the recent WG 38 workshops "*Impact of Ocean Acidification on Fluxes of non-CO₂ Climate-Active Species*" and "*Changing Atmospheric Acidity and the Oceanic Solubility of Nutrients*".

Terms of Reference for WG 38

Impact of Ocean Acidification on Fluxes of non-CO₂ Climate-Active Species

1 Review and synthesize the current science on the direct impacts of ocean acidification on marine production and emissions to the atmosphere of key species (apart from CO₂) important for climate and atmospheric chemistry;

2 Identify the primary needs for new research to improve process understanding and to quantify the impact of ocean acidification on these marine fluxes (i.e., provide recommendations on the specific laboratory process studies, field measurements and model analyses needed to support targeted research activities and improved understanding on this topic);

- 3 Publish the results of this activity in the open peer-reviewed scientific literature; and
- 4 Provide input to and interact with national and international research programs on ocean acidification (e.g., UKOA, NOAA-OAP) and with relevant WMO programs (e.g., Global Atmosphere Watch (GAW)) to build on their recent relevant activity in achieving the above objectives

Changing Atmospheric Acidity and the Oceanic Solubility of Nutrients

- 1 Review and synthesize the current scientific information on the solubility of aerosol associated key biogeochemical elements, the biogeochemical controls on aerosol solubility, and the pH sensitivity of those controls;
- 2 Consider the likely changes in solubility of key species into the future and the potential biogeochemical consequences of such changes;
- 3 Identify the key future research needs to reduce uncertainties in predictive capability in this area;
- 4 Publish the results of this activity in the open peer-reviewed scientific literature; and
- 5 Interact with, and provide information to, leading relevant international groups including the Future Earth core projects SOLAS, IGAC and IMBER; SCOR, particularly its GEOTRACES program; and WMO programs such as GAW.

WG 39: Global trends in pollution of coastal ecosystems: retrospective ecosystem assessment

Lead Agency: IAEA

Co-sponsors: UNIDO

Chairpersons: Ana Carolina Ruiz-Fernandez (Mexico)

Members: Ms Roberta Delfanti (Italy), Mr José Marcus Godoy (Brazil), Mr Elvis Nyarko (Ghana), Mr Joan-Albert Sanchez-Cabeza (Mexico), Mr José L. Sericano (United States), Ms Elvira Sombrito (Philippines), Mr Norbert Theobald (Germany)

Product(s): Complete the analysis of the data and complete a final draft final report for review by internal and external reviewers in the latter part of 2018.

Terms of Reference for WG 39

- 1 Bibliographic Review, definitions, methodologies;
- 2 Critical review of existing methodologies on suitable environmental archives, dating methods, pollution indicators, analytical techniques and trend analysis. Review existing data, including data quality;
- 3 Database of global trends of pollution;
- 4 Global assessment and evaluation of global trends of pollution; and
- 5 Dissemination activities: Website, press releases, preparation of educational materials, presentation at stakeholder meetings

WG 40: Sources, fate and effects of plastics and micro-plastics in the marine environment

Lead Agencies: UNESCO-IOC and UN Environment

Co-sponsors: IMO, FAO, NOAA, NOWPAP, Ministry of Environment Japan, State Ocean Administration China, EU-BASECAMP project

Co-Chairs: Peter Kershaw (United Kingdom), Alexander Turra (Brazil)

Members: Markus Eriksen (United States), Amy Lusher (Norway), Denise Hardesty (Australia), Martin Hasselov (Sweden), Sang Hee Hong (Republic of Korea), Sheri Mason (United States), Chelsea Rochman (Canada), Peter Ryan (South Africa), Shige Takada (Japan), Akbar Tahir (Indonesia), Martin Thiel (Chile), Chris Wilcox (Australia), Weiwei Zhang (China)

Product(s): Report covering ToR 1 '*Monitoring and assessment of marine plastics and microplastics: supporting a harmonised approach*'.

Planning: Publication of Guidelines envisaged in late 2018 or early 2019, as a joint GESAMP, IOC and UN Environment publication.

Work on producing a separate report covering ToRs 2 and 3 will depend on securing additional funding and is not expected to be pursued actively until after the methods report has been finalized.

Revised terms of reference for WG 40:

1 The impact of plastics & microplastics on food security – environmental impacts of plastics & microplastics on species at a population level, including physical and chemical effects;

2 The impact of plastics & microplastics on food safety – chemical contaminants and pathogens in seafood associated with ingested microplastics; and

3 Transfer of biota – the social, economic and environmental effects of plastics and microplastics on the distribution of biota, including indigenous and non-indigenous species and pathogens

WG 41: Marine Geoengineering

Lead Agency: IMO

Co-Sponsors UNESCO-IOC and WMO

Chairpersons: Chris Vivian (United Kingdom), Philip Boyd (Australia)

Members: Richard Lampitt (United Kingdom), Andreas Oschlies (Germany), Greg Rau (United States), Alex Baker (United Kingdom), Katherine Ricke (United States), Fei Chai (United States), Ros Rickaby (United Kingdom), Timo Goeschl (Germany), John Cullen (Canada), Miranda Boettcher (Australia)

Product(s): Report on first phase of ToR will provide an overview to GESAMP Agencies and their Member States of a wide range of proposed marine geoengineering techniques and their potential implications and based on published literature. Final report of both phases including the detailed review of marine geoengineering techniques is due by end January 2018. The report will be made available on the website. It may include some outreach material as well.

Planning: The full report will be completed the first quarter of 2019 and will be discussed at the next annual session of GESAMP.

Terms of Reference for WG 41

The GESAMP study should provide an overview to GESAMP Sponsoring Organizations and their Member States of a wide range proposed marine geoengineering techniques and their potential implications by:

1 Providing an initial high level review of a wide range of proposed marine geoengineering techniques, based on published information, addressing:

- .1 The main rationale, principle and justification of the techniques;
- .2 Their potential scientific practicality and efficacy for climate mitigation purposes;
- .3 The potential impacts of different marine geoengineering approaches on the marine environment and the atmosphere where appropriate;
- .4 Identifying those techniques:
 - i. that appear unlikely to have the potential for climate mitigation purposes; and
 - ii. that appear to be likely to have some potential for climate mitigation purposes and that bear further detailed examination.

2 Providing a detailed focused review of a limited number of proposed marine geoengineering techniques that are likely to have some potential for climate mitigation purposes addressing:

- .1 The potential environmental and social/economic impacts of those marine geoengineering approaches on the marine environment and the atmosphere where appropriate.
- .2 An outline of the issues that would need to be addressed in an assessment framework for each of those techniques, using the London Protocol Assessment Framework for Scientific Research Involving Ocean Fertilization as a template.
- .3 Their potential scientific practicality and efficacy for climate mitigation purposes.
- .4 An assessment of monitoring and verification issues for each of those marine geoengineering techniques.
- .5 Identification of significant gaps in knowledge and uncertainties that would require to be addressed to fully assess implications of those techniques for the marine environment and the atmosphere where appropriate.

Product(s): Produce reports on the above work at appropriate points as reflected in the work plan. Produce final report by end of 2018 and make provisions for publication, dissemination and outreach.

WG: 42: Impacts of wastes and other matter in the marine environment from mining operations, including marine mineral mining

Lead Agency: IMO, UN Environment

Co-Sponsors: tbc

Chairperson: Tracy Shimmield

Members: Bronwen Currie (Namibia), Raymond Mepstad (Norway), Cindy Van Dover (United States), James Hein (United States), Stuart Simpson (Australia), Andrew Sweetman (United Kingdom), Gi Hoon Hong (Republic of Korea)

Terms of reference for WG 42

The working group on the impacts on tailings from mining operations on the marine environment is requested to undertake a literature review on the following aspects:

1 Identify and provide a better understanding of potential environmental impacts of marine disposal of tailings and associated wastes from land-based mining operations (hereinafter referred to as “mine tailings”), taking into account potential linkages between deep water ecosystems at the disposal site and other (e.g., ecological, biological) resources in the water column. The impacts could include, but are not limited to, those identified in the report of the workshop on mine tailings provided to GESAMP at its last meeting (GESAMP 42/7/1);

2 [Review the extent and suitability of baseline assessments (prior to any construction or discharge) conducted to date and identify the key elements for comprehensive surveys of baseline conditions from which abiotic and biotic impacts can be assessed, taking into account the latest detection technologies of marine pollution and its impact to the organisms;

3 Review and identify the best practices in modeling the physical and chemical behavior of discharged mine tailings (e.g. slurries), including the shearing and upwelling of both the solids and soluble fractions, as well as the significance of tidal dispersion and potential for long-range transport of fine materials, and determine whether existing models are adequate or further development is needed;

4 Review and evaluate the processes of exposure and effect and the pathways for mine tailings disposal operations, including those related to the physical presence of the wastes, exposure to associated contaminants, their accumulation, and the potential effects at community level;

5 Implications arising from the fact that marine organisms normally used for toxicity testing are from upper layers of marine water, not the deep sea;

6 Review and identify physical and ecological models to estimate the recovery processes of deep sea ecosystems around the possible impacted area; and

7 Produce a report on the above work under a time frame and any other reporting requirements to be agreed between LC/LP and the GESAMP].

Product(s): Produce a report addressing first term of reference to be presented at the next annual session. This will be followed by a review of the rest of the terms of reference in order to allow for further work on the issue.

CORRESPONDENCE GROUPS

The following activities will continue during the intersessional period:

Correspondence Group on the relevance of inputs of disinfection byproducts (DBPs) into the marine environment

Lead: Thomas Hofer (Germany)

Co-lead: Mattias Grote (Germany)

Based on the scoping paper accepted as basis for work at this session of GESAMP members was nominated in 2017/2018 to prepare a revised scoping document in preparation for a workshop in 2019 on the subject.

Correspondence Group on the issue of emerging pollutants in wastewater

Lead: Felicia Mogo (Nigeria) and Birguy Lamizana (UN Environment)

The Correspondence Group will revise the scoping paper in the intersessional period.

Correspondence Group on sand and gravel mining

Lead: Chris Vivian (United Kingdom) and Emanuel Ajao (Nigeria).

The Correspondence Group will revise the scoping paper in the intersessional period for consideration at the next annual session.

Task team on Updating the Information on Sources and Levels of the Main Pollutants Impacting the Global Marine Environment

Lead: David Vousden (South Africa)

The task team will prepare a scoping paper in the intersessional period on possible approaches to updating the figures of "80% land based versus 20% sea-based sources of ocean pollution".

ANNEX VI – Template for new GESAMP working groups

BACKGROUND & CONTEXT

The subject:

Brief description subject of the study

The nature of the issue:

Why the subject is of concern or interest to the international community from the perspective of marine environmental protection

The justification:

Why a GESAMP study is needed (e.g., synthesis of scattered information, assessment of environmental status/impacts, development of new methodologies, establishment of standards or guidelines, identify requirements for research, monitoring, management, and/or policy development)

TERMS OF REFERENCE

The Terms of Reference should:

1. Be specific, concrete, point-by-point tasks to be carried out by the WG, and/or specific information to be included in the report
2. Define the scope: what will and won't be done
3. Avoid being open-ended: focus on a specific product to be produced (usually a report)
4. Focus on the specific task being proposed
5. Identify the expertise required for the WG

WORK PLAN

Describe the proposed work programme and methods to carry this out, such as workshops, inter-sessional activities, electronic communications and on-line platforms.

Devise a provisional timeline, including:

1. Meeting dates
2. Milestones (drafts, reviews, revisions, etc.)
3. Deliverables and delivery date (usually publication of a report)
4. Provisions for peer review
5. Provisions for publication, dissemination and outreach (PR)

CONFLICTS OF INTEREST

GESAMP depends on members of working groups acting in an independent capacity, and for the assessment and advice it provided to be reliable, authoritative and independent of any interest groups. To ensure that this process is transparent, it is necessary for each agency, in consultation with the working group Chair, to identify potential conflicts of interest, and devise suitable steps to address this, if required.

ADMINISTRATIVE ARRANGEMENTS

The following information should be provided:

1. Sponsor agencies
2. Additional supporting organisations
3. Proposed budget & funding sources
4. WG Chairperson(s) & members if available at time of proposal
5. Proposed Technical Secretary for the WG

ANNEX VII - GESAMP Reports and Studies

The following reports and studies have been published so far. They are available from the GESAMP website: <http://gesamp.org>

1. Report of the seventh session, London, 24-30 April 1975. (1975). Rep. Stud. GESAMP, (1):pag.var. Available also in French, Spanish and Russian
2. Review of harmful substances. (1976). Rep. Stud. GESAMP, (2):80 p.
3. Scientific criteria for the selection of sites for dumping of wastes into the sea. (1975). Rep. Stud. GESAMP, (3):21 p. Available also in French, Spanish and Russian
4. Report of the eighth session, Rome, 21-27 April 1976. (1976). Rep. Stud. GESAMP, (4):pag.var. Available also in French and Russian
5. Principles for developing coastal water quality criteria. (1976). Rep. Stud. GESAMP, (5):23 p.
6. Impact of oil on the marine environment. (1977). Rep. Stud. GESAMP, (6):250 p.
7. Scientific aspects of pollution arising from the exploration and exploitation of the seabed. (1977). Rep. Stud. GESAMP, (7):37 p.
8. Report of the ninth session, New York, 7-11 March 1977. (1977). Rep. Stud. GESAMP, (8):33 p. Available also in French and Russian
9. Report of the tenth session, Paris, 29 May - 2 June 1978. (1978). Rep. Stud. GESAMP, (9):pag.var. Available also in French, Spanish and Russian
10. Report of the eleventh session, Dubrovnik, 25-29 February 1980. (1980). Rep. Stud. GESAMP, (10):pag.var. Available also in French and Spanish
11. Marine Pollution implications of coastal area development. (1980). Rep. Stud. GESAMP, (11):114 p.
12. Monitoring biological variables related to marine pollution. (1980). Rep. Stud. GESAMP, (12):22 p. Available also in Russian
13. Interchange of pollutants between the atmosphere and the oceans. (1980). Rep. Stud. GESAMP, (13):55 p.
14. Report of the twelfth session, Geneva, 22-29 October 1981. (1981). Rep. Stud. GESAMP, (14):pag.var. Available also in French, Spanish and Russian
15. The review of the health of the oceans.(1982). Rep. Stud. GESAMP, (15):108 p.
16. Scientific criteria for the selection of waste disposal sites at sea. (1982). Rep. Stud. GESAMP, (16):60 p.
17. The evaluation of the hazards of harmful substances carried by ships. (1982). Rep. Stud. GESAMP, (17):pag.var.
18. Report of the thirteenth session, Geneva, 28 February - 4 March 1983. (1983). Rep. Stud. GESAMP, (18):50 p. Available also in French, Spanish and Russian
19. An oceanographic model for the dispersion of wastes disposed of in the deep sea. (1983). Rep. Stud. GESAMP, (19):182 p.
20. Marine pollution implications of ocean energy development. (1984). Rep. Stud. GESAMP, (20):44 p.
21. Report of the fourteenth session, Vienna, 26-30 March 1984. (1984). Rep. Stud. GESAMP, (21):42 p. Available also in French, Spanish and Russian
22. Review of potentially harmful substances. Cadmium, lead and tin. (1985). Rep. Stud. GESAMP, (22):114 p.
23. Interchange of pollutants between the atmosphere and the oceans (part II). (1985). Rep. Stud. GESAMP, (23):55 p.
24. Thermal discharges in the marine Environment. (1984). Rep. Stud. GESAMP, (24):44 p.
25. Report of the fifteenth session, New York, 25-29 March 1985. (1985). Rep. Stud. GESAMP, (25):49 p. Available also in French, Spanish and Russian
26. Atmospheric transport of contaminants into the Mediterranean region. (1985). Rep. Stud. GESAMP, (26):53 p.
27. Report of the sixteenth session, London, 17-21 March 1986. (1986). Rep. Stud. GESAMP, (27):74 p. Available also in French, Spanish and Russian
28. Review of potentially harmful substances. Arsenic, mercury and selenium. (1986). Rep. Stud. GESAMP, (28):172 p.

29. Review of potentially harmful substances. Organosilicon compounds (silanes and siloxanes). (1986). Published as UNEP Reg. Seas Rep. Stud., (78):24 p.
30. Environmental capacity. An approach to marine pollution prevention. (1986). Rep. Stud. GESAMP, (30):49 p.
31. Report of the seventeenth session, Rome, 30 March - 3 April 1987. (1987). Rep. Stud. GESAMP, (31):36 p. Available also in French, Spanish and Russian
32. Land-sea boundary flux of contaminants: contributions from rivers. (1987). Rep. Stud. GESAMP, (32):172 p.
33. Report on the eighteenth session, Paris, 11-15 April 1988. (1988). Rep. Stud. GESAMP, (33):56 p. Available also in French, Spanish and Russian
34. Review of potentially harmful substances. Nutrients. (1990). Rep. Stud. GESAMP, (34):40 p.
35. The evaluation of the hazards of harmful substances carried by ships: Revision of GESAMP Reports and Studies No. 17. (1989). Rep. Stud. GESAMP, (35):pag.var.
36. Pollutant modification of atmospheric and oceanic processes and climate: some aspects of the problem. (1989). Rep. Stud. GESAMP, (36):35 p.
37. Report of the nineteenth session, Athens, 8-12 May 1989. (1989). Rep. Stud. GESAMP, (37):47 p. Available also in French, Spanish and Russian
38. Atmospheric input of trace species to the world ocean. (1989). Rep. Stud. GESAMP, (38):111 p.
39. The state of the marine environment. (1990). Rep. Stud. GESAMP, (39):111 p. Available also in Spanish as Inf.Estud.Progr.Mar.Reg.PNUMA, (115):87 p.
40. Long-term consequences of low-level marine contamination: An analytical approach. (1989). Rep. Stud. GESAMP, (40):14 p.
41. Report of the twentieth session, Geneva, 7-11 May 1990. (1990). Rep. Stud. GESAMP, (41):32 p. Available also in French, Spanish and Russian
42. Review of potentially harmful substances. Choosing priority organochlorines for marine hazard assessment. (1990). Rep. Stud. GESAMP, (42):10 p.
43. Coastal modelling. (1991). Rep. Stud. GESAMP, (43):187 p.
44. Report of the twenty-first session, London, 18-22 February 1991. (1991). Rep. Stud. GESAMP, (44):53 p. Available also in French, Spanish and Russian
45. Global strategies for marine environmental protection. (1991). Rep. Stud. GESAMP, (45):34 p.
46. Review of potentially harmful substances. Carcinogens: their significance as marine pollutants. (1991). Rep. Stud. GESAMP, (46):56 p.
47. Reducing environmental impacts of coastal aquaculture. (1991). Rep. Stud. GESAMP, (47):35 p.
48. Global changes and the air-sea exchange of chemicals. (1991). Rep. Stud. GESAMP, (48):69 p.
49. Report of the twenty-second session, Vienna, 9-13 February 1992. (1992). Rep. Stud. GESAMP, (49):56 p. Available also in French, Spanish and Russian
50. Impact of oil, individual hydrocarbons and related chemicals on the marine environment, including used lubricant oils, oil spill control agents and chemicals used offshore. (1993). Rep. Stud. GESAMP, (50):178 p.
51. Report of the twenty-third session, London, 19-23 April 1993. (1993). Rep. Stud. GESAMP, (51):41 p. Available also in French, Spanish and Russian
52. Anthropogenic influences on sediment discharge to the coastal zone and environmental consequences. (1994). Rep. Stud. GESAMP, (52):67 p.
53. Report of the twenty-fourth session, New York, 21-25 March 1994. (1994). Rep. Stud. GESAMP, (53):56 p. Available also in French, Spanish and Russian
54. Guidelines for marine environmental assessment. (1994). Rep. Stud. GESAMP, (54):28 p.
55. Biological indicators and their use in the measurement of the condition of the marine environment. (1995). Rep. Stud. GESAMP, (55):56 p. Available also in Russian
56. Report of the twenty-fifth session, Rome, 24-28 April 1995. (1995). Rep. Stud. GESAMP, (56):54 p. Available also in French, Spanish and Russian
57. Monitoring of ecological effects of coastal aquaculture wastes. (1996). Rep. Stud. GESAMP, (57):45 p.
58. The invasion of the ctenophore *Mnemiopsis leidyi* in the Black Sea. (1997). Rep. Stud. GESAMP, (58):84 p.

59. The sea-surface microlayer and its role in global change. (1995). Rep. Stud. GESAMP, (59):76 p.
60. Report of the twenty-sixth session, Paris, 25-29 March 1996. (1996). Rep. Stud. GESAMP, (60):29 p. Available also in French, Spanish and Russian
61. The contributions of science to integrated coastal management. (1996). Rep. Stud. GESAMP, (61):66 p.
62. Marine biodiversity: patterns, threats and development of a strategy for conservation. (1997). Rep. Stud. GESAMP, (62):24 p.
63. Report of the twenty-seventh session, Nairobi, 14-18 April 1997. (1997). Rep. Stud. GESAMP, (63):45 p. Available also in French, Spanish and Russian
64. The revised GESAMP hazard evaluation procedure for chemical substances carried by ships. (2002). Rep. Stud. GESAMP, (64):121 p.
65. Towards safe and effective use of chemicals in coastal aquaculture. (1997). Rep. Stud. GESAMP, (65):40 p.
66. Report of the twenty-eighth session, Geneva, 20-24 April 1998. (1998). Rep. Stud. GESAMP, (66):44 p.
67. Report of the twenty-ninth session, London, 23-26 August 1999. (1999). Rep. Stud. GESAMP, (67):44 p.
68. Planning and management for sustainable coastal aquaculture development. (2001). Rep. Stud. GESAMP, (68):90 p.
69. Report of the thirtieth session, Monaco, 22-26 May 2000. (2000). Rep. Stud. GESAMP, (69):52 p.
70. A sea of troubles. (2001). Rep. Stud. GESAMP, (70):35 p.
71. Protecting the oceans from land-based activities - Land-based sources and activities affecting the quality and uses of the marine, coastal and associated freshwater environment. (2001). Rep. Stud. GESAMP, (71):162p.
72. Report of the thirty-first session, New York, 13-17 August 2001. (2002). Rep. Stud. GESAMP, (72):41 p.
73. Report of the thirty-second session, London, 6-10 May 2002. Rep. Stud. GESAMP, (73)
74. Report of the thirty-third session, Rome, 5-9 May 2003 (2003) Rep. Stud. GESAMP, (74):36 p.
75. Estimations of oil entering the marine environment from sea-based activities (2007), Rep. Stud. GESAMP, (75):96 p.
76. Assessment and communication of risks in coastal aquaculture (2008). Rep. Stud. GESAMP, (76):198 p.
77. Report of the thirty-fourth session, Paris, 8-11 May 2007 (2008), Rep. Stud. GESAMP, (77):83 p.
78. Report of the thirty-fifth session, Accra, 13-16 May 2008 (2009), Rep. Stud. GESAMP, (78):73 p.
79. Pollution in the open oceans: a review of assessments and related studies (2009). Rep. Stud. GESAMP, (79):64 p.
80. Report of the thirty-sixth session, Geneva, 28 April - 1 May 2009 (2011), Rep. Stud. GESAMP, (80):83 p.
81. Report of the thirty-seventh session, Bangkok, 15 - 19 February 2010 (2010), Rep. Stud. GESAMP, (81):74 p.
82. Proceedings of the GESAMP International Workshop on Micro-plastic Particles as a Vector in Transporting Persistent, Bio-accumulating and Toxic Substances in the Oceans (2010). Rep. Stud. GESAMP, (82):36 p.
83. Establishing Equivalency in the Performance Testing and Compliance Monitoring of Emerging Alternative Ballast Water Management Systems (EABWMS). A Technical Review. Rep. Stud. GESAMP, (83):63 p, GloBallast Monographs No. 20.
84. The Atmospheric Input of Chemicals to the Ocean (2012). Rep. Stud. GESAMP, (84) GAW Report No. 203.
85. Report of the 38th Session, Monaco, 9 to 13 May 2011 (pre-publication copy), Rep. Stud. GESAMP, (85): 118 p.
86. Report of the Working Group 37: Mercury in the Marine Environment (in prep.). Rep. Stud. GESAMP, (86).
87. Report of the 39th Session, New York, 15 to 20 April 2012 (pre-publication copy), Rep. Stud. GESAMP, (87):92 p.
88. Report of the 40th Session, Vienna, 9 to 13 September 2013, Rep. Stud. GESAMP, (88):86p.
89. Report of the 41st Session, Malmö, Sweden 1 to 4 September 2014, Rep. Stud. GESAMP, (89) :90p.
90. Report of Working Group 40: Sources, fate and effects of microplastics in the marine environment : a global assessment. Rep. Stud. GESAMP (90) :96 p.

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