



GESAMP

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

REPORT OF THE FORTY-SECOND SESSION OF GESAMP

Paris, France
31 August to 3 September 2015



IMO



FAO



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Contents

EXECUTIVE SUMMARY	5
1 INTRODUCTION	7
Adoption of the agenda	7
2 REPORT OF THE CHAIRMAN OF GESAMP	7
GESAMP and the wider international community.....	7
3 REPORT OF THE ADMINISTRATIVE SECRETARY OF GESAMP	8
Outcome of the meeting of the Executive Committee of GESAMP (ExCom)	8
Funding	8
Governance	8
Activities and achievements of the Sponsoring Organizations of GESAMP since 2014	8
4 PLANNING OF GESAMP ACTIVITIES.....	8
4.1 Evaluation of the hazards of harmful substances carried by ships (WG 1)	8
Use of the work	8
Guidance published.....	9
Evaluation and hazard rating	9
Spillage and response	10
Membership issues	10
Funding issues	10
4.2 Review of applications for 'active substances' to be used in Ballast Water Management systems (WG 34)	11
Methodology for information gathering and the conduct of work of WG 34	11
4.3 Expanded scientific review of mercury and its compounds and threats to the marine environment (WG 37)	12
4.4 Atmospheric input of chemicals to the ocean (WG 38).....	12
Impact of ocean acidification on fluxes of atmospheric non CO ₂ climate-active species.....	13
Changing atmospheric nutrient solubility.....	13
4.5 Global trends in pollution of coastal ecosystems (WG 39).....	14
4.6 Sources, fate and effects of micro-plastics in the environment – a global assessment (WG 40)	15
5 CONTRIBUTION TO OTHER UN PROCESSES.....	15
Regular Process for Global Reporting and Assessment of the State of the Marine Environment including Socio-economic aspects.....	15
GEF Transboundary Waters Assessment Programme (TWAP)	15
Presentations by observers	16
UNEP/NOWPAP.....	16
PICES	16
IMarEST.....	16

PERSGA.....	16
CIESM	16
Coastal Communities	16
IUCN	17
6 IDENTIFICATION OF NEW AND EMERGING ISSUES REGARDING THE DEGRADATION OF THE MARINE ENVIRONMENT OF RELEVANCE TO GOVERNMENTS AND SPONSORING ORGANIZATIONS	17
Disinfection by-products	17
Biofouling	17
7 SCOPING ACTIVITIES.....	18
7.1 Proposal to establish a working group on marine geoengineering	18
7.2 Proposal to establish a working group on the impacts of wastes and other matter in the marine environment from mining operations	18
8 GESAMP SIDE EVENT: DESALINATION AND THE MARINE ENVIRONMENT.....	19
9 DATE AND PLACE OF GESAMP 43.....	20
10 FUTURE WORK PROGRAMME.....	20
11 ANY OTHER BUSINESS	20
12 ELECTION OF CHAIRPERSONS.....	21
13 CONSIDERATIONS AND ADOPTION OF THE REPORT OF GESAMP 42.....	21
14 CLOSURE OF THE SESSION.....	21
ANNEXES	
ANNEX I – PROVISIONAL AGENDA.....	22
ANNEX II – LIST OF DOCUMENTS.....	23
ANNEX III – LIST OF PARTICIPANTS.....	24
ANNEX IV – ACTIVITIES AND ACHIEVEMENTS BY THE SPONSORING ORGANIZATIONS OF GESAMP DURING THE INTERSESSIONAL PERIOD.....	27
ANNEX V – CURRENT WORKING GROUPS AND THEIR TERMS OF REFERENCE	51
ANNEX VI – TEMPLATE FOR NEW GESAMP WORKING GROUPS	55
ANNEX VII – GESAMP REPORTS AND STUDIES.....	56

EXECUTIVE SUMMARY

0.1 Introduction: The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) held its 42nd session hosted by the Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO), at the UNESCO Headquarters in Paris, France from 31 August to 3 September 2015. 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 problems with a view to avoiding duplication of efforts within the United Nations system. The main topics considered at this session are described below. GESAMP continues to function largely through its working groups which can be sponsored directly by the UN agencies in answer to their scientific needs, or in collaboration with partners. Alternatively, attention for topical and urgent issues is raised through GESAMP's New and Emerging Issues programme with mixed or outside funding. Securing sustainable funding for its working groups, not least through partnerships with Governments as well as other scientific organizations, remains a priority for GESAMP and its Executive Committee.

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 around 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 41, evaluating 5 new substances to assign full GESAMP Hazard Profiles. Furthermore, 19 additional substances were re-evaluated. In addition, there is an ongoing review and consolidation of information held in the WG's database that has resulted in a series of updates and amendments to some existing profiles. GESAMP noted that the "Revised GESAMP Hazard Evaluation Procedure for Chemical Substances Carried by Ships, 2nd Edition", had been finalized and published by IMO and on the GESAMP website. GESAMP also noted progress made by the WG with respect to several issues that will ensure harmonization in evaluations and hazard ratings.

0.3 Review of applications for 'active substances' to be used in ballast water management systems (WG 34): WG 34 met twice since GESAMP 41, evaluating eight ballast water treatment systems and reporting its recommendations to IMO's Marine Environment Protection Committee (MEPC). Five of these systems received a recommendation for Basic Approval and one received a recommendation for Final Approval. One system was denied a recommendation for Basic Approval and one was denied recommendation for Final Approval.

GESAMP agreed that an introduction to the WG 34 Methodology would be presented together with the relevant links to the various Revisions of the Methodology on the GESAMP website.

0.4 Metals (formerly mercury) Working Group (WG 37): GESAMP decided to prepare an Executive Summary of the contribution of the WG to the 2013 UNEP Global Mercury Assessment (GMA), to be placed as Report No. 86 on the GESAMP website. This summary will contain a link to the 2013 UNEP GMA report and make reference to the contributions WG 37 made to the UNEP GMA report.

0.5 Atmospheric input of chemicals to the ocean (WG 38): Since its inception, the WG has published five scientific papers in peer-reviewed journals, under its initial terms of reference, and has continued its work to deliver further papers under the new terms of reference. So far, one scientific paper has been published, two others have been submitted for publication and four additional papers are still in preparation and should be submitted before the end of the year. WG 38 has also developed two possible proposals for future activities: impact of ocean acidification on fluxes of atmospheric non-CO₂ climate-active species; and changing atmospheric nutrient solubility. A third future activity proposed by WG 38 is the assessment of the impact of nitrogen on the marine environment as a contribution to the Integrated Nitrogen Management System (INMS). GESAMP also welcomed Prof. Timothy Jickells as new co-chairman of the WG, who replaced Prof. Peter Liss when the latter decided to step down.

0.6 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 and global assessment of pollution trends during the last century in sensitive coastal ecosystems. The WG has continued its work on the literature survey and compilation of a bibliographic records database. In addition, a pilot web platform has been developed with the aim to host and manage the information contained in the database. GESAMP noted with appreciation the provision of funds from IAEA and GESAMP which will enable the completion of the work of WG 39. The draft final technical report is expected to be finalized by August 2016 and presented at the 43rd session of GESAMP, in 2016.

0.7 Global assessment of (micro)-plastics (WG 40): In the intersessional period, WG 40 completed the first phase of the work programme, under the leadership of the IOC of UNESCO, and started a second phase with co-sponsorship shared by the IOC and UNEP. The new Terms of Reference were adopted in early 2015 and the first inception

workshop was hosted by the FAO in Rome in April 2015. The most immediate milestone for WG 40 is to provide an interim assessment report, including the impact of microplastics on commercial fish and shellfish species, to inform the Second Meeting of the UN Environment Assembly (UNEA-2), in May 2016. The second WG 40 workshop was planned to take place during the period 2 to 6 November 2015. GESAMP welcomed the progress made by the WG and noted that the next Open-ended Informal Consultative Process on Oceans and the Law of the Sea (ICP) meeting in the UN (New York, 2016) will address marine plastics, which would provide a great opportunity to highlight the work carried out by GESAMP.

0.8 Contribution to the United Nations ‘Regular Process’: GESAMP noted that the Executive Summary of the first World Ocean Assessment (WOA) was available online and that the full report was undergoing editing and would be released following consideration by the Ad Hoc Working Group of the Whole on the Regular Process.

0.9 Transboundary Waters Assessment Programme (TWAP): GESAMP noted that its Task Team had completed a revised assessment of ‘Pollution of the Open Oceans’, which was subsequently peer-reviewed by GESAMP as well as external experts, and was now being prepared by IOC for publication as GESAMP Reports and Studies No. 91. Another GESAMP contribution to the TWAP was from Phase 1 of WG 40 on microplastics in the ocean. GESAMP also noted that the technical assessment reports from the five water system components and a cross-cutting analysis of the assessments were both being finalized for publication by UNEP.

0.10 Presentations by observers: Several observers attended the session and informed the meeting of recent developments and possibilities for further cooperation. Presentations were given by the United Nations Environment Programme/Northwest Pacific Action Plan (UNEP/NOWPAP), the North Pacific Marine Science Organization (PICES), the Institute of Marine Engineering, Science and Technology (IMarEST), the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA), the Mediterranean Science Commission (CIESM), Coastal Communities by the Observatoire de Versailles SQY, and the

International Union for Conservation of Nature (IUCN). GESAMP agreed that the exchange of information with current and potential future partners is a valuable initiative and that more time should be allocated for such dialogue in future sessions.

0.11 Side event on “Desalination and the marine environment”: GESAMP and IOC organized a special side event. The session was attended by approximately 30 people with two presentations on various aspects of desalination and the marine environment.

0.12 Identification of new and emerging issues regarding the degradation of the marine environment: Several potential issues were discussed. GESAMP agreed to develop scoping papers on the impact of chronic residues of oil spills and on biofouling, in particular in relation to shipping as a vector to transfer invasive species (hull fouling). It was further agreed to update the scoping paper on disinfection by-products.

0.13 Scoping issues: Following a proposal by IMO, GESAMP agreed to establish a working group on marine geoengineering (WG 41). It was noted that a GESAMP study could provide a better understanding of the potential ecological and social impacts of different marine geoengineering approaches on the marine environment, and that the WG would provide information that could assist decision makers, in particular in relation to the newly amended 1996 London Protocol. The new WG, will be led by IMO, with support from IOC and WMO.

0.14 GESAMP was informed of the progress made by the correspondence group in developing a scoping paper on the impacts of mine tailings in the marine environment, including the outcomes of the GESAMP International Workshop held in Lima, Peru, in June 2015, on this topic. GESAMP noted a proposal to establish a working group on the issue, however, given that the outcomes of the recent workshop were expected to be further discussed at the next meeting of the governing bodies of the London Convention and Protocol in late 2015, GESAMP decided to further develop the Terms of Reference and work plan in the intersessional period with a view to establishing a working group as soon as practicable.

1 INTRODUCTION

1.1 The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) held its 42nd session from 31 August to 3 September 2015 in Paris, France, hosted by the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO). The session was held under the Chairmanship of Dr. Peter Kershaw, with Dr. Manmohan Sarin as Vice-Chairman. The session was preceded by the GESAMP Executive

Committee (ExCom) meeting and GESAMP Members' informal meeting both held on 31 August 2015.

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.

2 REPORT OF THE CHAIRMAN OF GESAMP

2.1 The main focus of GESAMP since the 41st session has been on the planned activities of the Working Groups. The Chairman noted that the continued support from the UN Sponsoring Organizations, supplemented with funding from other sources, was essential to allow this core work to continue and deliver high quality outputs that are appreciated by the target audience and a much wider user-group. The support from the UN Sponsoring Organizations is greatly appreciated and GESAMP urges that this level of support should be maintained and, if at all possible, increased. The independence, credibility and cost-effectiveness of the GESAMP model are well recognised.

2.2 GESAMP welcomed the strengthening of the GESAMP Office (see section 3 below), which should provide an opportunity to address some of the issues - for example, around improved communication and maintenance of the website - raised during the 41st session. Ad hoc requests for GESAMP advice or support have been steadily increasing in recent years and this trend has continued since the 41st session. Requests range widely in topic area, and it is encouraging to see that GESAMP is seen as a source of reliable information and advice. However, each enquiry takes time to respond to and this puts an additional load on the GESAMP Office and the GESAMP Chairman.

GESAMP and the wider international community

2.3 The Chairman represented GESAMP at the Annual Science Conference of the North Pacific Marine Science Association (PICES) for the sixth successive year. The 2014 Conference took place in Yeosu, Republic of Korea. The Chairman co-chaired a one-day special session on marine litter, co-sponsored by ICES, PICES and GESAMP, with invited speakers from European and PICES nations. GESAMP has Observer status on the Marine Environmental Quality Committee (MEQ). This Committee has been participating in a wide range of marine environment protection issues. MEQ has set up a Working Group on emerging issues in Marine Pollution which

complements GESAMP's New and Emerging Issues programme.

2.4 The Chairman represented GESAMP at the second meeting of the Ocean Acidification International Reference User Group (OA-iRUG) held at the Oceanographic Museum in Monaco <http://www.iaea.org/ocean-acidification/page.php?page=2198>. The RUG is chaired by Mr. Dan Laffoley of the IUCN, and is supported by Prince Albert of Monaco. The IAEA Environment Laboratories hosts the Ocean Acidification International Coordination Centre. The main activity has been the preparation of a report titled '*Acting on ocean acidification – improving prospects by planning ahead*'. This was presented at the international scientific conference '*Our common future under climate change*' in Paris in July 2015, in advance of the UN Framework Convention on Climate Change (UNFCCC) Conference in Paris in November/December 2015.

2.5 The Chairman is a member of the Steering Committee of the Global Partnership on Marine Litter (GPML), advising UNEP DEWA on its implementation and the potential contribution of GESAMP.

Action taken by GESAMP

2.6 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 support and financial backing to provide a vibrant programme, providing a cost-effective service for the Sponsoring Organizations and responding to requests from external bodies to contribute to the experience and expertise GESAMP. There appear to be two components to ensuring GESAMP can thrive: i) 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 activities; and ii) 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 met on Monday, 31 August 2015. The main points of discussion are shown in paragraphs 3.2 to 3.5 below.

Funding

3.2 ExCom discussed the financial and in-kind support, which the nine Sponsoring Organizations of GESAMP committed to support the activities of GESAMP in 2015-2016. ExCom noted that the Sponsoring Organizations present intended to, as a minimum, continue their support to the level of the previous years.

Governance

3.3 ExCom noted that the issue of institutional arrangements had been discussed at several previous ExCom meetings, and that GESAMP currently operates under an MOU, which was most recently updated in 1994. Given that this system continues to work well it was agreed to continue operating under these arrangements.

Activities and achievements of the Sponsoring Organizations of GESAMP since 2014

3.4 GESAMP considered the Administrative Secretary's report (GESAMP 42/3). The Administra-

tive Secretary also presented an overview of the activities and achievements of the Sponsoring Organizations of GESAMP. The highlights of these achievements are reported in detail in Annex IV to this report.

3.5 The Administrative Secretary informed the meeting of the latest developments in the GESAMP Office, which was established at IMO as a co-sponsoring arrangement between the current Sponsoring Organizations. GESAMP noted that IMO had been able to secure a permanent administrative position in the GESAMP Office and welcomed Ms. Chrysanthe Kolia as the new GESAMP Administrative Coordinator. In addition, it was noted that IMO was in discussion with the World Maritime University (WMU) to formalize support from WMU to GESAMP through the GESAMP Office. In addition, the main activities of the GESAMP Office were reported and GESAMP took note of these developments.

Action taken by GESAMP

3.6 GESAMP discussed the possibility to make better use of the wealth of information provided in the annual summary of the activities of the Sponsoring Organizations, and how this could be better communicated to the outside world. It was agreed to continue the discussion at future sessions with the view to identify options to present the report of the Administrative Secretary in a more prominent way.

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 Dr. Thomas Höfer, Chairman of the Working Group (WG).

4.1.2 GESAMP noted that since its last session WG 1 has met once (EHS 52). The meeting was held at the IMO in London from 13 to 17 April 2015. The full report has been circulated as IMO circular PPR.1/Circ.2.

Use of the work

4.1.3 As outlined in the previous report 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 alphanumerical 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)

and are placed on the IMO website for the use of maritime Administrations, the shipping industry and chemicals manufacturers; and

- .3 provide the basis for the pollution categorization of over 900 substances. MARPOL Annex II and the International Bulk Chemical Code utilise these profiles to define the pollution category, ship type and carriage conditions associated with each chemical.

4.1.4 During the last several decades, the use of the GESAMP Hazard Profiles (GHP) has increased. Member State Administrations and IMO bodies, in particular the PPR Working Group on the Evaluation of Safety and Pollution Hazards of Chemicals (ESPH), have based the assignment of carriage requirements for the transport of bulk liquids on these GESAMP ratings, as required by international maritime legislation. This is not limited to pollution hazards, but also covers ship safety and occupational health aspects. The IMO Sub-Committee on Pollution Prevention and Response (PPR) is now developing a revised Chapter 21 of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) revising the hazard classification criteria used for assigning carriage requirements. The current draft makes direct reference to all GHPs with respect to carriage conditions requiring an evaluation of hazards to human and environmental health.

Guidance published

4.1.5 The guidance for the hazard evaluations was finalized in 2014 and published as a new edition of GESAMP Reports and Studies No.64 "Revised GESAMP Hazard Evaluation Procedure for Chemical Substances Carried by Ships, 2nd Edition". The purpose of the second edition is not to completely replace the previous version of the GESAMP hazard evaluation procedure, but to update it with as little disruption as possible to the users and with minimal impact on the maritime regulations. It only introduced changes where necessary, in particular to ensure harmonization with the United Nations "Globally Harmonized System of Classification and Labelling of Chemicals (GHS)".

Evaluation and hazard rating

4.1.6 There are still some minor discrepancies with the GHS in the area of acute mammalian inhalation toxicity. This resulted from the finalization of the revised GESAMP procedure about 15 years ago when the GHS had not yet been finalized and the IMO regulations were not fully harmonized with the GHS. At that time, WG 1 only evaluated the hazards of chemicals to the marine environment and those created by spills, but did not address any risks to crews resulting from possible exposure to vapours from tank openings on deck. During operational

procedures, crews are exposed only to vapours, whereas under accidental leakage or spillage at sea, people may be exposed to aerosols or a mixed atmosphere with vapours and aerosols (mists). The focus of WG 1 therefore was on aerosol exposure or mixed exposure.

4.1.7 During the last meeting, the WG discussed the situation and developed a specific notation for those chemicals which would show a much lower hazard as pure vapour compared to aerosol exposure. Full harmonization between the GESAMP evaluation procedure and the GHS would need a re-evaluation of about 900 products and would have a major impact on the current maritime regulations governing the transport of bulk liquid cargoes. For about two thirds of the products, inhalation hazard classification would not be possible, as there are no animal test data available and the GESAMP acute inhalation toxicity extrapolation method will not work under the GHS criteria. Based on these arguments, full harmonization has not been introduced.

4.1.8 In evaluating some chemicals in respect to the aspiration hazard according to the GHS criteria, which are now fully introduced by GESAMP, the WG experienced difficulties in interpreting the GHS criteria for Aspiration Toxicity Category 1. The WG therefore agreed to refer this matter to the competent UN Sub-Committee of Experts on the GHS for further clarification.

4.1.9 On request by IMO and in an attempt to further harmonize the GESAMP procedure with the GHS, a new hazard classification system for sensitizers has been introduced with the 2nd edition of GESAMP Report and Studies No.64. The sensitizer category, which had previously only identified a substance as a 'sensitizer', has now been broken down into two categories: skin sensitizer and respiratory sensitizer. More than 100 chemicals were re-evaluated by the experts intersessionally to align the existing hazard profiles with this new change. The results of this work were discussed and agreed during the last session of EHS and new sensitizer ratings were assigned for all concerned chemicals.

4.1.10 As part of the routine work of the WG 1, five new substances were reviewed in order to assign full GESAMP Hazard Profiles. Based on correspondence with industry, 19 additional substances were re-evaluated.

4.1.11 The WG confirmed that a review of the family of alkanes would be beneficial and started this work during the last session. This work will have significant implications, as many mineral oil products typically contain alkanes as a significant fraction, and a number of spillages of paraffin (long-chain alkanes) have been reported throughout Europe along many countries' coastlines. The WG noted that in particular high-viscosity paraffins transported as pure chemicals and as crude products from the mineral oil refinery process will need detailed hazard assessments. A substantial volume of additional

data on alkanes and alkenes had been compiled intersessionally by the Chairman and the Secretariat from various sources, including the OECD, US Environmental Protection Agency and the European Chemicals Agency. Due to time constraints, the WG was unable to complete this work and, as a result, the work will continue at EHS 53 in 2016.

Spillage and response

4.1.12 It was noted that the WG had discussed the rationale for presenting hazard information on the physical behaviour of chemicals spilled at sea (E2 rating). There are products consisting of chemicals which will dilute in the water phase and others which will float on the sea surface. In the past, the most severe impact was rated by the experts. As the GESAMP Hazard Profiles are increasingly used for spill response, this approach could mislead first responders and those involved in combating spills. The WG therefore developed a notation for the hazard profiles in the GESAMP Composite List that will, in specific cases, explain that different physical behaviours are expected.

4.1.13 GESAMP was reminded that the WG had incorporated a system in its guidance (Reports and Studies No. 64) that built upon the Bonn Agreement behaviour classification system, in particular for floating substances. It was also recalled that these particular definitions for floating substances had been developed to address the specific behaviour of such substances when released into the marine environment and were used in a number of IMO documents and manuals. As these terms were finding increasing usage, the WG suggested that it may be useful to ensure that any future criteria that may be developed by the GHS to define floating substances should take note of the current system developed by GESAMP/EHS, as set out in the Reports and Studies 64. This would ensure a harmonized approach and, in this context, the WG agreed that a document would be submitted to the Sub-Committee of Experts on the GHS so that they are made aware of what has been developed by GESAMP/EHS and then take any action as appropriate.

4.1.14 In the intersessional period, the Chairman of the WG participated and delivered a presentation on "Cargo information needed during the initial stages of a chemical spill" at the Interspill 2015 Conference, which took place from 24 to 26 March 2015 in Amsterdam, the Netherlands. The Chairman indicated that, further to this presentation about the work of GESAMP, the feedback provided by attendees had suggested that the addition of information on flammability and explosivity limits would be a useful addition to the GESAMP Hazard Profile for the purposes of hazard assessment for spill response.

4.1.15 As the WG recognized that such information was generally included with new product submissions, it was agreed that future consideration could

be given to including this as an additional E rating. However, given that the revised Reports and Series No. 64 had only recently been published, it was agreed that a decision on this proposal would be deferred for the time being.

Membership issues

4.1.16 GESAMP noted that the WG continues its efforts to secure an additional toxicologist to join the group.

4.1.17 To enhance the visibility of WG 1 in communities involved in marine science and marine environmental protection, the output of the WG (the yearly reports and the GESAMP Composite List), the potential utility of the GESAMP hazard profiles and the competence of its membership should be better presented on the GESAMP website (www.gesamp.org). Activities by the GESAMP Office led to a more comprehensive presentation of the work of WG 1. However, further work is needed in this respect.

Funding issues

4.1.18 The funding of WG 1 is based on a fixed fee which is charged for each new product evaluation. It was noted, however, that to date no additional fees were applied for cases where some follow-up action was needed on a specific issue, for example, to clarify study methodology details or where the GESAMP/EHS experts had questioned particular test results. During the last session, five chemicals were evaluated under the fixed fee payment system. About 20 chemicals were re-evaluated based on industry requests free of charge, based on the current EHS policy for re-evaluations. As a result of new regulations in Europe and similar activities in America and Asia, as well as the OECD chemicals programme, many new test data are being produced by the industry or have been made publicly available for the first time. As a consequence, EHS is facing an increasing number of industry and administration requests for re-evaluation of one or more ratings associated with substances on the GESAMP Composite List.

4.1.19 GESAMP further noted the change in the WG's manner and method of work with regard to the assessment of submissions, with a concerted shift in the past several years from reviewing original test data that accompanied submissions, to accessing referenced test data that is available through established regulatory systems such as OECD, GHS and through EU databases (REACH and CLP). This was recognized to be a much less burdensome requirement for the submitters, but a heavier workload for the experts prior to and during meetings of GESAMP/EHS. It was also noted that the number of re-evaluations being requested was steadily increasing, most of which were geared towards consideration of new data to justify a

lowering of the respective GHP ratings that would, in many cases, lower the carriage requirements, ultimately resulting in a commercial benefit for the submitter.

Action taken by GESAMP

4.1.20 Following discussion, GESAMP noted that it was important that the WG remains on a solid and self-sustaining financial footing in order to ensure no interruptions in the regulatory flow of which GESAMP/EHS is a pivotal part, and that IMO may wish to consider that the system of fees is kept under review to reflect the workload.

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

4.2.1 A report on the activities of WG 34 was given by Mrs. Annette Dock, Vice-Chairman of the Working Group.

4.2.2 GESAMP noted that the International Convention for the Control and Management of Ships' Ballast Water and Sediments, (hereafter referred to as the 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. To date, 21 July 2015, 44 countries have ratified the BWM Convention, well above the required 30 Contracting Parties. These countries represent 32.86% of the required 35% of the world's merchant shipping tonnage required for the Convention to enter into force. Therefore, the second criterion has not yet been met.

4.2.3 Within this framework, an approval procedure has been set up for those ballast water management systems which 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 also a third step, the type approval, but this is outside the remit of WG 34.

4.2.4 A more general outline, scope and aim of the BWM Convention were provided in the report of GESAMP 35 (see document GESAMP 35/5/1). This report focuses on the main activities of WG 34, which consists of the evaluation of several ballast water management systems (hereafter 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).

4.2.5 WG 34 convened two times since GESAMP 41 to evaluate proposed BWMS. Furthermore, a stocktaking workshop was planned for the week after GESAMP 42 and will be reported to GESAMP 43. During the two WG 34 meetings, eight BWMS were discussed and evaluated. Of these BWMS, five received a recommendation for Basic Approval and one received a recommendation for Final Approval. One system was denied a recommendation for Basic Approval and one system was denied a recommendation for Final Approval. The control and monitoring of the post-treatment of Active Substances of the system that was denied a recommendation for Basic Approval could not guarantee a safe and successful operation of the system. The working, control and monitoring of the neutralization process could not guarantee the safe and successful operation for the system that was denied Final Approval. During its meeting in May 2015, MEPC agreed with the recommendations of WG 34 in all cases and granted the approvals accordingly.

4.2.6 WG 34 was able to clear the whole stock of BWMS submitted for evaluation before the meeting of MEPC for which the evaluation was requested.

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

4.2.7 The evaluation Methodology of WG 34 has been determined to be a living document based on increasing experience in the evaluation of BWMS. During its Stocktaking Workshops, WG 34 has further developed the Methodology by adding:

- 1 quantitative methods for the evaluation of human risk assessment including exposure assessment for professionals and the general public;
- 2 quantitative assessment of the environmental effects by using a specific ballast water model, MAMPEC 3.0.1 BW; and
- 3 finalization of the second version of the database for 41 specific disinfection by-products (DBP) in which the physico-chemical data, the toxicological data and the environmental fate and effect data are included. For these 41 substances the applicants of BWMS do not have to submit the data mentioned anymore to IMO as the Group is of the opinion that all the sufficient and relevant information is already available. All physico-chemical data has already been included in the MAMPEC BW, version 3.0.1.

4.2.8 MEPC endorsed the latest version of the WG 34 Methodology as revision 3 (BWM.2/Circ.13/Rev.3) during its meeting in May

2015 and decided that the revision will be applied to the future applications for Basic Approval submitted to MEPC from 2017 and onwards, and subsequent submissions for Final Approval of those systems.

4.2.9 In 2014, MEPC started its work to review the Guidelines for approval of ballast water management systems (G8) (resolution MEPC.174(58)), which is used for evaluating biological efficacy and granting type approval by National Administrations. This is the second amendment of Guidelines G8, which may include the changes of test water conditions (salinity, DOC, POC and TSS), tank holding times (less than 5 days may be accepted) and evaluation of efficacy under extreme conditions. Although the purpose of the review is to seek more accuracy on the evaluation of biological efficacy in ballast water treated by BWMS, the test water and treated water will be also used for evaluation in accordance with Procedure (G9). Therefore, there is a need to develop a uniform approach across the Guidelines (G8) and the Methodology in several areas. WG 34 is currently formally attending the correspondence group for the review of Guidelines (G8) in order to contribute to achieving such a uniform approach.

4.2.10 GESAMP noted that WG 34 will hold its 7th Stocktaking Workshop from 7 to 10 September 2015 at IMO in London. Furthermore, although the deadline for the submission of proposals for approval of BWMS to MEPC 69 has not yet passed, WG 34 already tentatively scheduled two meetings to accommodate future applications: BWWG 32 from 9 to 13 November 2015 and BWWG 33 from 11 to 15 January 2016. The number of meetings depends on the number of submissions. Both meetings are foreseen to be held at the IMO Headquarters in London.

4.2.11 The Vice-Chairman expressed the WG's gratitude to all the members of GESAMP that take 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.

Action taken by GESAMP

4.2.12 GESAMP noted that the WG was making progress with the publication of its Methodology. However, since the Methodology is a living document, and with the forthcoming revision of the Guidelines (G8), (likely to be approved in April 2016), which is linked to Rev. 4 of the WG Methodology, it was agreed that the publication will consist of an introduction to the Methodology, which can be presented together with the relevant links to the various Revisions of the Methodology on the GESAMP website. This would be beneficial since the application dates differ between the Methodology versions.

4.3 Expanded scientific review of mercury and its compounds and threats to the marine environment (WG 37)

4.3.1 It was noted that there was a need to bring to a close the work of the WG following a long period of inactivity since GESAMP 38. It was recognized that the preliminary report of WG 37 to UNEP, entitled "Mercury in the Aquatic Environment: Sources, Releases, Transport and Monitoring", completed in 2011, had not been published on its own in the GESAMP Reports and Studies series. However, in 2013 UNEP published the *Global Mercury Assessment: Sources, Emissions, Releases and Environmental Transport* (GMA), with valuable contributions from the GESAMP WG report.

Action taken by GESAMP

4.3.2 GESAMP decided to prepare and issue an Executive Summary of the contribution to the *Global Mercury Assessment* as Report No. 86 on the GESAMP website. This summary will contain a link to the 2013 UNEP *Global Mercury Assessment* report and make reference to the contributions WG 37 made to the UNEP GMA report. The existing Executive Summary will be edited by Dr. Gerardo Gold-Bouchot.

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

4.4.1 A report of the activities of WG 38 was presented by Dr. Robert Duce, Co-chairman of the WG. WG 38 continues to demonstrate a high level of success and productivity in delivering high level assessment and peer-reviewed publications on the atmospheric input of chemicals to the ocean. WG activities have been sponsored primarily by WMO as well as IMO, SCOR, SIDA, the European Commission Joint Research Centre, the University of Arizona, the University of East Anglia, the US National Science Foundation, and the International Environment Institute at the University of Malta. Following the initial terms of reference and as a result of several working group meetings and follow up activities, five scientific papers have been published in the peer reviewed scientific literature. These can be found in <http://www.gesamp.org/work-programme/workgroups/working-group-38/publications>

4.4.2 During and following GESAMP 39, new terms of reference for the continued work of GESAMP WG 38 were approved to address issues related to the impact of the atmospheric deposition of anthropogenic nitrogen to the ocean. To address these new terms of reference, a workshop on "The Atmospheric Deposition of Nitrogen and its Impact on Marine Biogeochemistry" was held at the University

of East Anglia in Norwich, United Kingdom, from 11 to 14 February 2013. As an outcome of the discussions on each task of the new Terms of Reference, seven scientific papers were planned.

4.4.3 One scientific paper has been published, two others have been submitted for publication and four additional papers are still in preparation and should be submitted before the end of the year. This includes a major summary paper on our current understanding of the impact of atmospheric nitrogen deposition on marine biogeochemical cycling, led by Prof. Timothy Jickells, and a paper comparing observation and model-based estimates of atmospheric nitrogen deposition to the ocean, led by Dr. Alex Baker. Dr. Baker presented preliminary results of the latter at GESAMP 42.

4.4.4 Following its successful 2014 session at the European Geosciences Union (EGU) meeting, WG 38 again organized a session on atmospheric input of chemicals to the ocean for the 2015 EGU meeting, held in Vienna, Austria in April, 2015. Papers at this session were presented by a combination of WG 38 members and other scientists. The co-chairs, several members of WG 38, and officials from the Atmospheric Environment Research Division, WMO, met at the 2015 EGU meeting and began to discuss possible additional tasks for WG 38. Since then, WG members have developed two possible proposals for future WG 38 activities and these (see summaries below) were presented at GESAMP 42:

Impact of ocean acidification on fluxes of atmospheric non CO₂ climate-active species

4.4.5 Earlier investigations on the impact of ocean acidification (OA) have primarily focused on changes in oceanic uptake of anthropogenic CO₂, the resulting shifts in carbonate chemical equilibria and the consequences for marine calcifying organisms. Very little attention has been paid to the direct impacts of OA on the ocean sources of a range of other gaseous and aerosol species (including N₂O, CH₄, DMS, and marine VOCs and halocarbons important in tropospheric chemistry and particle formation) that are influential in regulating radiative forcing, atmospheric oxidising capacity (via OH and O₃ cycling) and atmospheric chemistry. The oceanic processes governing emissions of these species are frequently sensitive to the changes in pH and ocean pCO₂ accompanying ocean acidification. The direct and indirect influences of these oceanic processes (e.g. microbial metabolic rates, levels of surface primary production, ecosystem composition, etc.) on ocean fluxes of non-CO₂ trace gases and aerosols, and the subsequent feedbacks to climate remain highly uncertain. If such a task was undertaken by WG 38, the additional terms of reference would be to:

- .1 review and synthesize the current science on the direct impacts of ocean acidification on marine emissions to the atmosphere of key species 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 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 and other initiatives on ocean acidification (e.g. NOAA-OAP, OAi-RUG, etc.) and with relevant WMO programmes (e.g. Global Atmosphere Watch (GAW)) to build on their recent relevant activity in achieving the above objectives.

Changing atmospheric nutrient solubility

4.4.6 Atmospheric deposition of nutrients to the ocean is known to play a significant role in regulating marine productivity and biogeochemistry, in turn potentially impacting the drawdown of CO₂ from surface seawater as well as the production of other climate-active gases (e.g., N₂O and dimethylsulphide (DMS)). The specific impact is dependent on the nutrient in question, the location of the deposition (more significant impact where a particular nutrient is in short supply), and the bioavailability of the deposited nutrient. Bioavailability is largely governed by the chemical speciation of a nutrient and, in general, insoluble species are not bioavailable. For Fe and P, solubility increases during transport through the atmosphere. The causes of this increase are complex, but interactions of aerosol particles with acids appear to play a significant role. Past and future changes in anthropogenic emissions of acidic (SO₂ and NO_x) and alkaline (NH₃) gases have had and likely will have an impact on the acidity of the atmosphere downwind of major urban/industrial sources, with potential consequences to the supply of soluble nutrients to the ocean. Concurrent with this change in acidity there are likely to be other changes which may also impact marine productivity rates and microbial species population composition. If such a task was undertaken by WG 38, the additional terms of reference would be to:

- .1 review and synthesize the current scientific information on solubility of key biogeochemical elements, their pH sensitivity and the biogeochemical controls on the pH sensitivity. Consider the likely future changes in solubility

of key species into the future and the potential biogeochemical consequences of such changes;

- .2 identify the key future research needs that are necessary to reduce uncertainties in predictive capability in this area;
- .3 publish the results of this activity in the open peer-reviewed scientific literature; and
- .4 interact with, and provide information to, leading relevant international groups including the IGBP/Future Earth core projects SOLAS, IGAC and IMBER, SCOR particularly its GEO-TRACES programme and WMO programmes such as GAW.

4.4.7 A third future activity proposed by WG 38 is the assessment of the impact of nitrogen on the marine environment as a contribution to the Integrated Nitrogen Management System (INMS). INMS is a global targeted research project with the aim to provide clear scientific evidence to inform future international nitrogen policy development. INMS's core funding comes from the Global Environment Facility (GEF) with the UNEP as the Implementing Agency and the United Kingdom Natural Environment Research Council (Centre for Ecology and Hydrology) as the Executing Agency acting on behalf of the International Nitrogen Initiative (INI).

4.4.8 WG 38 is in an excellent position to bring together observational scientists and atmospheric modelling groups to address these issues. The expertise needed would be very different for the three activities, and thus it is likely that there would be very little overlap in personnel at the planned workshops. WG 38 members would act as an overall executive committee and engage other experts for each of the projects.

4.4.9 Prof. Peter Liss, who has served as a co-chair of WG 38 since its inception, has asked to step down from that position. An appropriate replacement as co-chair would be Prof. Timothy Jickells (University of East Anglia, United Kingdom). Prof. Jickells has been involved with WG 38 activities for many years and is the lead author on the primary nitrogen paper that is coming out of the current WG 38 work on nitrogen deposition to the ocean and its impacts.

Action taken by GESAMP

4.4.10 GESAMP members decided that WG 38 is well positioned to proceed with all three proposed activities. WG 38 will primarily devote the next year to complete all the papers from the nitrogen workshop and will begin to plan and seek additional funding from other UN agencies as well as SCOR, the US National Science Foundation and the INMS initiative for workshops on each of the new topics.

4.4.11 GESAMP members accepted the proposal to appoint Prof. Timothy Jickells as the new co-chair of WG 38.

4.5 Global trends in pollution of coastal ecosystems (WG 39)

4.5.1 The purpose of WG 39 is to contribute to the reduction of stress in the coastal ecosystem by providing stakeholders, scientists and society with an objective and global assessment of pollution trends during the last century in sensitive coastal ecosystems. At the request of IAEA, the WG 39 looks at the establishment of trends in global pollution in coastal environments.

4.5.2 A report of the second meeting of WG 39 was submitted to the 41st session of GESAMP. It was explained that all information obtained from the data analysis will be carefully described and interpreted in the detailed report for each LME, and submitted for review by the GESAMP members before publication.

4.5.3 GESAMP agreed that appropriate funding was required to support the implementation of the pending WG 39 activities (e.g. digitation of paper graphs, maps production, third meeting of the WG 39 to review the report) during the intersession period. The timeline for completion of the work would depend on the availability of funds.

4.5.4 During the first quarter 2015, IAEA and ExCom have agreed to provide the needed funds to support the pending work of WG 39. UNINMAR-UNAM has committed to provide the final report within one year, upon receipt of the resources. IAEA's and the GESAMP funds contributions (€ 5,000 and € 10,000 respectively), as agreed by ExCom, have already been transferred and UNINMAR-UNAM is currently in the process to hire the students that will contribute to the WG 39 tasks.

Action taken by GESAMP

4.5.5 The meeting noted with satisfaction the provision of appropriate funds from IAEA and GESAMP, which will enable the completion of the work of WG 39 (digitization of paper graphs, uploading data in a web-accessible data base, statistical analysis and graphical representation of trends per pollutant family at LMEs and preparation of the technical report). The draft final technical report is expected to be finalised by August 2016 and presented at the 43rd session of GESAMP, in 2016. IAEA will follow the implementation of pending activities through communication with the Chairman of WG 39.

4.6 Sources, fate and effects of micro-plastics in the environment – a global assessment (WG 40)

4.6.1 A report of the activities of WG 40 was given by Dr. Peter Kershaw, Chairman of the Working Group.

4.6.2 GESAMP noted that WG 40 had completed the first phase of the work programme, under the leadership of the IOC-UNESCO, and started a second phase with a co-sponsorship shared by the IOC and UNEP. The new Terms of Reference were adopted in early 2015 and the first inception workshop was hosted by the FAO in Rome in April 2015. It was attended by 25 WG members, three observers (PlasticsEurope, the American Chemistry Council and the University of Copenhagen) and 12 members of FAO, UNEP and IOC. The workshop took place the week following the publication, on-line, of the first WG 40 assessment report (GESAMP Reports and Studies No. 90), which allowed this state of the art report to be taken into consideration by the group.

4.6.3 One aspect of the first WG 40 report that was praised during the workshop was the inclusion of confidence levels in the conclusions. A wider discussion on risk, including perceived risk, focused on the need for WG 40 to develop a risk assessment framework. There was a need to provide a range of options when describing potential solutions and to distinguish issues of ecological significance from those that are useful for awareness raising.

4.6.4 The most immediate milestone for this group is to provide an interim assessment report, including the impact of microplastics on commercial fish and

shellfish species, to inform the Second Meeting of the UN Environment Assembly (UNEA-2), taking place in June 2016. It was agreed to form a small 'drafting group', comprising the leads of the main report sections, to produce a draft report prior to the second WG workshop to facilitate this process, given the tight deadlines involved.

4.6.5 In a related development, the first workshop of the UNEP modelling group on marine litter was planned to take place in parallel with the GESAMP 42 meeting, also in Paris. The modelling group contains many members of WG 40 and the results will feed into the WG 40 report as appropriate.

4.6.6 The second WG 40 workshop is planned to take place during the period 2 to 6 November 2015. A revised timeline has been produced to reflect these plans.

4.6.7 The Rome workshop provided an opportunity for the WG 40 membership to be refreshed to set the scene for the new phase, and to have discussions with the supporting Agencies to ensure that the anticipated outcomes match their requirements.

Action taken by GESAMP

4.6.8 GESAMP welcomed the progress made by the WG and noted that next ICP meeting in the UN (New York, 2016) will address marine plastics, which would provide a great opportunity to highlight the work carried out by GESAMP. GESAMP also noted that further funding will be required to carry out the full agreed work programme following the UNEA-2, when the Norwegian Government support to UNEP for the study expires.

5 CONTRIBUTION TO OTHER UN PROCESSES

Regular Process for Global Reporting and Assessment of the State of the Marine Environment including Socio-economic aspects

5.1 GESAMP noted that the Executive Summary of the first World Ocean Assessment (WOA), was now available online at: <http://undocs.org/A/70/112>, and that the full report is currently undergoing editing and will be released in the next few months after consideration by the Ad Hoc Working Group of the Whole on the Regular Process during its meeting 8 to 11 September 2015 at the UN Headquarters in New York.

GEF Transboundary Waters Assessment Programme (TWAP)

5.2 GESAMP recalled that it has been involved in the GEF-sponsored Transboundary Waters Assessment Programme (TWAP) since its inception. In the intersessional period, the GESAMP Task Team completed a revised assessment of 'Pollution of the Open Oceans', which was subsequently peer-reviewed by GESAMP, as well as external experts, and is being prepared for publication as GESAMP Reports and Studies No. 91. Another GESAMP contribution was from Phase 1 of WG 40 on microplastics in the ocean.

5.3 The technical assessment reports from the five water system components and a cross-cutting analysis of the assessments are currently being finalized for publication

by UNEP together with the web products at: <http://www.geftwap.org>

Presentations by observers

UNEP/NOWPAP

5.4 A presentation on the Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the Northwest Pacific Region (NOWPAP) was given by Dr. Alexander Tkalin. NOWPAP was adopted as part of the Regional Seas Programme of the United Nations Environment Programme (UNEP) and aims at the protection of the coastal and marine environment in order to protect human populations, human health and the ecological integrity of the region. GESAMP noted several areas where NOWPAP could cooperate with GESAMP, for example in the issue of atmospheric input of chemicals in the ocean, microplastics and marine litter among others. For more information on the work of NOWPAP visit <http://www.nowpap.org/>

PICES

5.5 Dr. Alexander Bychkov gave an overview of the work of PICES, an intergovernmental scientific organization, established to promote and coordinate marine scientific research in the North Pacific Ocean and adjacent seas in order to advance scientific knowledge of the area concerned and its living resources; There is already on-going collaboration between PICES and GESAMP, i.e in co-sponsoring of workshops on themes pertaining to Pollutants and Marine Debris in the Oceans. This co-operation continues through observers' exchange in GESAMP and PICES meetings. PICES invited GESAMP to co-sponsor a Topic Session on 'Source, Transport, fate and effects of hydrocarbons in the marine environment' and a workshop on 'Data compilation for emerging pollution issues in the North Pacific Ocean' to be convened at the 2016 PICES Annual Meeting. The invitation to co-sponsor the session was accepted by Dr. Gold-Bouchot to serve as a GESAMP Convenor. Special focus during the presentation was given to a project by PICES on Marine Debris following the Great Tsunami in Japan, in 2011. For more information on PICES' work, see: <http://www.pices.int>

IMarEST

5.6 A presentation on the work of IMarEST was given by Dr. Natalia Martini. IMarEST is an international membership body and learned society for all marine professionals with a global reach in 100 countries. The Organization brings together marine engineers, scientists and technologists into one

international multi-disciplinary professional body, uses a multidisciplinary problem-solving approach to promote the sustainable use of the ocean and its resources and provides impartial expertise from a range of key stakeholders on emerging issues, technologies and standards. IMarEST offered to advertise the work of GESAMP on its website and through its distribution list, newsletters and social media. It can further provide administrative support for environmental thematic workshops/seminars, provide help with students and interns and enable access to a high-quality multidisciplinary network of marine professionals from government, academia and industry. IMarEST could assist in bringing the industry perspective and contribution to the GESAMP's work. IMarEST's work can be accessed at <http://www.imarest.org>

PERSGA

5.7 The Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA) is an intergovernmental Organization Dedicated to the Conservation of the Coastal and Marine Environment in the Region. Prof. Ziad Abu Ghararah in his presentation pointed to PERSGA's training programme and its efforts in capacity building, networking, partnership building and exchange of expertise and technology transfer. PERSGA's Climate Change Strategy and Programme highlighted assessments of litter and land-based sources, ocean acidification and blue carbon and the devastating effects of these in the region. PERSGA is ready to cooperate with GESAMP in any field GESAMP considers appropriate. For further details on the work of PERSGA visit: <http://www.persga.org>

CIESM

5.8 Dr. Frederic Briand presented the work on the Mediterranean Science Commission (CIESM), a multi-lateral, cross-basin organization with over 5000 associate researchers in 510 institutes in 45 countries. CIESM organizes an International Congresses, held every three years, which is the largest forum on Mediterranean and Black Sea research. This forum further encourages the interaction and exchange of marine scientists and policy makers concerned with the Mediterranean ecosystem and incorporates better academic and industry research. Some of CIESM's major programmes were presented which include tropical signals, exotic species, jellywatch, blue technologies and issues arising in the Mediterranean EEZs. Mr. Briand pointed to the Organization's comprehensive website in which can be found a geographic atlas incorporating CIESM's work over the last 50 years. For more information on CIESM, see <http://www.ciesm.org>

Coastal Communities

5.9 Dr. Juan Baztan presented the work of an initiative named 'Coastal Communities-based Observatories Tackling Marine Litter' (Coastal) by the Université de Versailles Saint-Quentin-en-Yvelines, based in Famara Beach, Lanzarote (The Canary Islands). The project's steps were presented and the project emphasized the importance of working with and for communities as the most effective way to solve the litter problem. The project will feature in next year's MICRO 2016 Conference on Fate and Impact of Microplastics in Marine Ecosystems. Tools for interdisciplinary, network of communities' based observatories and the MICRO 2016 International Conference were identified as potential contributions by the institute to the work of GESAMP. For more information please visit <http://www.uvsq.fr>

IUCN

5.10 The representative of the International Union for the Conservation of Nature (IUCN), Mr Joao Sousa presented the Organization's Global Marine and Polar Programme as a pioneering approach to solutions for marine environmental challenges. A brief outline of the Organization's marine work was given its global engagement followed by an overview on IUCN's Marine Litter Projects (The Azores Project, Odyssey and Close the Plastic Tap). Areas of collaboration with GESAMP were identified in the topics of High Sea, Marine Litter, Coastal Livelihoods and Marine Protected Areas. More information on IUCN can be obtained at <http://www.iucn.org>.

Action taken by GESAMP

5.11 GESAMP agreed that the exchange of information with current and potential future partners is a very valuable effort, and that more time should be allocated for such dialogue in future sessions.

6 IDENTIFICATION OF NEW AND EMERGING ISSUES REGARDING THE DEGRADATION OF THE MARINE ENVIRONMENT OF RELEVANCE TO GOVERNMENTS AND SPONSORING ORGANIZATIONS

6.1 This GESAMP agenda item is intended to provide an opportunity for 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 GESAMP meeting. Two topics were identified and discussed during this session.

6.2 An important topic raised by Dr. Felicia Mogo and Dr. Gerardo Gold-Bouchot during the informal meeting of the GESAMP Members in the morning of Monday 31 August 2015 addresses the "Impact of residues of chronic oil spills". Frequent oil spill incidents coupled with continuous application of dispersants is leaving a large build-up of a variety of chemicals that eventually deposit at different levels in the water columns in addition to their toxic impact on biodiversity and sediments. Through the food chain/food web, there could be transfer of these harmful chemicals into human beings and subsequent environmental and health problems. In view of these issues, it has become imperative that GESAMP carries out the above study to add further knowledge on the subject matter.

Action taken by GESAMP

6.3 GESAMP agreed to develop a scoping paper in the inter-sessional period (led by Dr. Mogo, Dr. Gold-Bouchot and Dr. Ana Carolina Ruiz). It was also seen as imperative to ensure the viability

of the scoping paper, and to involve the potentially interested Sponsoring Organizations.

Disinfection by-products

6.4 GESAMP discussed the possibility to revisit the scoping paper on disinfection by-products (DBPs) with the intention of setting up a WG on DBPs. It was recognized that there would need to be a clear interest from Sponsoring Organizations, and relevant funding needs to be identified to establish a WG on this topic. Therefore, it was suggested to rewrite the scoping paper with the emphasis on discharge from power plants, sewage plants, cooling facilities in conjunction with other industrial activities. The intention would not be to make a comparison with BWMS as a source of DBPs, but to use the knowledge of WG 34 with regards to the production of DBPs, including eco-toxicological and toxicological data on some of the most common DBPs.

Action taken by GESAMP

6.5 It was agreed that a sub-group, under the lead of Mrs. Annette Dock, would prepare a revised scoping paper on this topic taking into account comments made by the Members.

Biofouling

6.6 GESAMP noted the interest from UNDP and IMO to obtain a better scientific understanding of biofouling, in particular, in relation to shipping as a vector to transfer invasive species (hull fouling). Other vectors were also identified such as pleasure craft, oil rigs, dredgers and fishing gear.

7 SCOPING ACTIVITIES

7.1 Proposal to establish a working group on marine geoengineering

7.1.1 Dr. Chris Vivian (Cefas, United Kingdom) provided an overview of current and proposed techniques for marine geoengineering. A wide variety of techniques have been proposed that involve either adding substances to the ocean or placing structures into the ocean, primarily for climate mitigation purposes, but also for other purposes such as enhancing fisheries. These proposed techniques are often little more than concepts but most of them involve potentially large-scale interventions in the ocean with the potential for significant impacts on the marine environment. In addition, many of these activities would be likely to take place on the high seas outside national jurisdictions so that they will raise international concerns. While a number of reviews of geoengineering per se have considered a small number of marine geoengineering techniques, mainly for their efficacy, none have reviewed a wide range of marine geoengineering techniques for their marine environmental impacts.

7.1.2 To provide a regulatory framework, the London Protocol was amended in October 2013 to regulate ocean fertilization activities, which also enables the Parties to regulate other marine geoengineering activities within the scope of the Protocol, in future. The amendments need to be ratified by two thirds of the Contracting Parties to come into force.

7.1.3 In this context, a GESAMP study could provide a better understanding of the potential ecological and social impacts of different marine geoengineering approaches on the marine environment. In addition, it was agreed that a GESAMP working group could provide information that could assist London Protocol Parties to identify those marine geoengineering techniques that might be sensible to consider for listing in the new Annex IV of the Protocol.

7.1.4 GESAMP noted that the topic was of immense and immediate importance to several of the Sponsoring Organizations and that some funding for the initial phase of the working group

Action taken by GESAMP

6.7 GESAMP agreed to produce a scoping paper, under the leadership of Dr. Mike Huber, in the intersessional period, in order to inform the possible future activities of UNDP and IMO. It was noted that IMO, as well as IMarEST, the World Ocean Council and other organizations, had already done work on this issue and that the correspondence group would need to liaise with these. GESAMP agreed to aim at the completion of the scoping paper by December 2015 or early 2016.

had been secured by IMO. Furthermore, IOC and WMO indicated their willingness to contribute to the working group by sponsoring one member of the working group.

Action taken by GESAMP

7.1.5 Following discussion, GESAMP agreed to establish Working Group 41 on marine geoengineering, under the lead of IMO, supported by IOC of UNESCO and WMO, under the co-chairmanship of Dr. Chris Vivian and another expert (to be confirmed). The Draft Terms of Reference and work plan, as adopted by GESAMP, are attached at Annex V.

7.2 Proposal to establish a working group on the impacts of wastes and other matter in the marine environment from mining operations

7.2.1 Dr. Michael Huber presented the report of the correspondence group and associated workshop on the impacts of mine tailings in the marine environment including links to seabed mining. The report reviewed a range of tailings disposal practices, environmental impacts, best practice and uncertainties/gaps. The June 2015 GESAMP workshop on mine tailings, held in Lima in June 2015, attracted over 90 participants from a range of stakeholders. The workshop highlighted the importance of characterizing specific receiving environments in terms of biogeochemistry, spatial scale and baseline data requirements; reviewed the status of modelling and good practice; and summarized a range of knowledge gaps and the need for taking a multi-disciplinary approach. The workshop noted the considerable similarities in STD and deep-sea mining and the potential to create synergies across both types of activities.

7.2.2 GESAMP noted that partial funding for a working group had been secured by IMO, but that Terms of Reference, a revised work plan and an

identification of further partners and sourcing of additional funds were needed prior to the possible establishment of a working group.

Action taken by GESAMP

7.2.3 Given that the outcomes of the GESAMP workshop were expected to be further discussed at the next meeting of the governing bodies of the London Convention and Protocol in October 2015, GESAMP decided to further develop the Terms of Reference and work plan in the intersessional period under the leadership of Dr. Huber, with a view to establishing a working group as soon as practicable.

8 GESAMP SIDE EVENT: DESALINATION AND THE MARINE ENVIRONMENT

8.1 On Wednesday 2 September, GESAMP and IOC organized a special side event entitled "Desalination and the marine environment". The side event was chaired by Dr. Michael Huber and approximately 30 people attended.

8.2 In many arid regions, countries are increasingly reliant on seawater desalination to supply drinking water for rapidly growing coastal populations. There are currently more than 14,000 desalination plants in more than 150 countries worldwide. About 50% of this capacity exists in the West Asia Gulf region, while North America has about 17%, Asia (apart from the Gulf) about 10%, and North Africa and Europe about 8% and 7%, respectively. In 2008, the installed capacity was 52.3 million m³/d. The desalination market is expected to grow by 12% per year reaching a capacity of 94 million m³/d by 2015.

8.3 The impacts of a seawater desalination plant discharge on the marine environment depend on the physical and chemical properties of the desalination plant reject streams and the susceptibility of coastal ecosystems to these discharges depending on their hydrographical and biological features. Literature reviews have investigated the potential environmental effects of marine discharges from both distillation and reverse osmosis (RO) desalination plants. These literature reviews paid particular attention to quantified impacts of desalination discharges on the physical, chemical or biological characteristics of the marine environment. Despite the number of desalination plants that have been constructed around the world there is little data available on the impacts of their discharges (Water Consultants International 2006; Tularam & Ilahee 2007, Latterman & Hopner 2008).

8.4 An emerging threat to the desalination industry is from harmful algal blooms (HABs). HABs are blooms of algae both microscopic (phytoplankton) and macroscopic (seaweeds) that cause harm in many ways. High biomass HABs can restrict operations in desalination plants by clogging filters, but other impacts include fouling of surfaces due to dissolved organic materials that can also compromise the integrity of RO membranes, or that

can cause taste and odour problems. A recent HAB of the dinoflagellate *Cochlodinium* in 2008/09 is a clear example of the risk posed by these phenomena (Richlen et al. 2010). That outbreak, which discolored the water and lasted nearly eight months in the Gulf/Gulf of Oman region, closed or restricted the operation of multiple desalination plants, one for as long as 55 days. With little reserve water storage or alternative sources, this was a major threat to the region.

8.5 The presentations were given as part of the side-event:

- .1 Potential environmental impacts of desalination plants; progress towards decreasing their ecological footprint (by Dominique Grizeau Laboratoire); and
- .2 Combatting the emerging impacts of harmful algal blooms (HABs) on desalination plants: bloom detection, forecasting, and strategies for impact reduction (by Henrik Enevoldsen, Intergovernmental Oceanographic Commission of UNESCO, IOC Science and Communication Centre on Harmful Algae).

In summary, GESAMP noted the following points on the subject:

8.6 The process of seawater desalination is not per se environmentally friendly. Indeed effluents from desalination plants are multi-component wastes with potentially multiple effects on water, sediments and marine organisms (Younos, 2005; Lattermann and Höpner, 2008). The main concern is the way the brines are disposed of, from evaporation ponds to land or surface water applications, but also through deep well injections. According to desalination technology, the final concentration factor is in the range of 1.25 to 2.0 for reversed osmosis (RO) or less than 1.15 for multiple effect distillations. Relative increases of temperature have also to be taken in account as well as different chemical treatments used to clean membranes or to prevent corrosion, biofouling or scale deposits (Cooley *et al.*, 2013). The levels of these additives may show some fluctuations throughout the year. Some heavy metals are also released mainly from traditional

installations, mainly from heat exchangers. However concentrations of metals such as copper generally seem too low for inhibiting microalgae growth, when others additives were demonstrated to impact some marine organisms, as revealed by failures of whole effluent toxicity tests (WET).

8.7 One side effect of high concern seems to be the low dissolved oxygen concentrations of the brines, thanks to the increase in salinity and temperature but also to the use of oxygen scavengers to prevent corrosion or to neutralize residual chlorine. Therefore low oxygen levels could also participate to the observed toxic effects. During the last decade, good manufacture practices (GMP) in desalination some recommendations, particularly by introducing on one hand new seawater pretreatments with no or low chemicals input and on the other hand new RO membranes resistant to fouling and oxygenation of brines before disposal (Jenkins *et al.*, 2012). More ecofriendly approaches include for instance pumping of deep-sea water, seabed filtration galleries, coagulation/flocculation before sand filtration, hydrocycloning or dissolved air flotation (DAF) followed by ultrafiltration. Other approaches aim to valorize the brines. The zero liquid discharge is obtained either by passive evaporation ponds, thermal concentrators but also by electrodialysis (Swift *et al.*, 2002). Some waste salt residues are planned for salting roads during winter, saving by this way mined salt resources, salinity balance as seawater salts will return to the sea. Another

valorization strategy is related to the use of RO brines by the chlore-alkali industry; this technology for producing NaOH, Cl₂ and H₂ requires brines pre-concentration by electrodialysis before membrane electrolysis. Recent economic studies seem to confirm the interest in lithium recovery from brines, as a means of completing the metal recycling from and for batteries (Bardi, 2010). A recent study resulted in a process using a specific lithium membrane using diluted hydrochloride acid for recovering the metal with electricity generation (Hoshino, 2015). Brines could also be used for cultivating halophilic or hyperhalophilic algae/organisms respectively from distillation or RO desalination plants (Abdel-Raouf *et al.*, 2012; El Sergany *et al.*, 2014).

8.8 Extensive microalgae production results in elimination of phosphorus and nitrogen compounds, which could otherwise stimulate the occurrence of harmful algae blooms in coastal seawaters close to the desalination plants. The algae could also be a source of high value products such a b-carotene (Ortega Méndez *et al.*, 2012). The European research and development project REAPower project (<http://www.reapower.eu/>) is ongoing with the use of reverse electrodialysis for alternative power production from pre-concentrated brines, with a pilot industrial unit already operational. These last decades of improvements, as well as better manufacturing practices and some technological advances must not hide the difficulties to transfer such progress to old desalination plants.

9 DATE AND PLACE OF GESAMP 43

9.1 GESAMP noted the offer by UNEP to host the 43rd session of GESAMP in 2016, and that the exact dates would be confirmed by the ExCom as soon as possible.

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 noted that in the informal meeting of Members during Monday morning, the issue of massive arrival of pelagic *sargassum* to Caribbean beaches had been noted as a conspicuous phenomenon over the past couple of years. *Sargassum* is a floating algae, which regularly circulates throughout

the Gulf of Mexico and North Atlantic, but now it is arriving further south, in exceptional amounts, reaching international awareness due to the regional economic impacts to the tourism industry (due to the strong smell and visual impact). The origin of this phenomenon is still unclear, but it has been related

to global change (e.g. deviation of marine currents due to warmer waters and/or eutrophication).

11.2 GESAMP agreed that a small group, under the lead of Dr. Ana Carolina Ruiz Fernandez, would prepare a short submission on this issue to the next annual session.

11.3 The observer from WMU brought GESAMP's attention to the issue of aggregate

(e.g. sand) mining, which could be a potential issue of interest to the Sponsoring Organizations. The Technical Secretary of IMO noted that this issue is in part addressed under the London Convention and Protocol. For more information on aggregate mining, see https://na.unep.net/geas/getUNEPPageWithArticleIDScript.php?article_id=110

12 ELECTION OF CHAIRPERSONS

12.1 GESAMP elected Dr. Peter Kershaw as Chairman and Dr. Manmohan Sarin as Vice-Chairman, unanimously, for the intersessional period and the 43rd session of GESAMP.

13 CONSIDERATIONS AND ADOPTION OF THE REPORT OF GESAMP 42

13.1 The report of the 42nd session of GESAMP was considered and approved.

14 CLOSURE OF THE SESSION

14.1 The Chairman of GESAMP, Dr. Peter Kershaw, closed the 42nd session of GESAMP on Thursday, 3 September 2015 at 13:00 hrs.

ANNEX I – PROVISIONAL AGENDA

42nd session of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) held at IOC-UNESCO,

Paris, France from 31 August to 3 September 2015

Monday, 31 August

Informal meeting of the members of GESAMP

Initial meeting of the Executive Committee of GESAMP (ExCom)

Opening of the session

- 1 Adoption of the agenda
- 2 Report of the Chairperson 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)
 - 3 Expanded scientific review of mercury and its compounds and threats to the marine environment (WG 37: UNIDO and UNEP leading)

Tuesday, 1 September

- 4 Atmospheric input of pollutants to the oceans (WG 38: WMO leading)
- 5 Establishment of trends in global pollution in coastal environments (WG 39: IAEA leading)
- 6 Sources, fate and effects of micro-plastics in the environment – a global assessment (WG 40: IOC-UNESCO/ UNEP/FAO leading)
- 7 Report of the correspondence group on mine tailings
- 5 Contributions to other UN processes

Wednesday, 2 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

Afternoon session

- 8 GESAMP side event: "Desalination and the Environment"

Thursday, 3 September

Morning session

- 9 Date and place of GESAMP 43
- 10 Future work programme
- 11 Any other business
- 12 Election of chairpersons
- 13 Consideration and adoption of the report of GESAMP 42
- 14 Closure of the session

Afternoon session (closed session)

Concluding Meeting of the Executive Committee of GESAMP (ExCom)

ANNEX II – LIST OF DOCUMENTS

42/1	Provisional agenda
42/1/1	Annotations to the provisional agenda
42/INF.1	Provisional list of participants
42/2	Report of the Chairman of GESAMP
42/3	Report of the Administrative Secretary of GESAMP
42/3/Add.1	Activities and achievements of the Sponsoring Organizations of GESAMP: WMO
42/4	Report of the Chairman of WG 1: Evaluation of the Hazards of Harmful Substances Carried by Ships
42/4/1	Report of the Co-Chairmen of WG 38 : Atmospheric Input of Pollutants to the Oceans
42/4/2	Report of the GESAMP microplastics group (WG 40 – 2nd Phase 2015-2018): Sources, fate and effects of micro-plastics in the marine environment – A global assessment
42/4/3	Report of the GESAMP BWWG 34: Review of applications for ‘Active Substances’ to be used in ballast water management systems
42/4/4	Report of the Chairperson of Working Group 39: Establishment of trends in global pollution in coastal environments
42/7	Scoping activities: Proposal to establish a GESAMP marine geoengineering working group
42/7/1	Scoping Activities: Scoping Paper on the impacts of wastes and other matter in the marine environment from mining operations
42/INF.2	Scoping Activities: Proposal to establish a GESAMP marine geoengineering working group

ANNEX III – LIST OF PARTICIPANTS

A. MEMBERS

Peter Kershaw

Chairman of GESAMP
Kachia House
The Street
Hapton
Norfolk NR15 1AD
United Kingdom
Tel: +44 1508 488049
Email: peter@pjkershaw.com

Manmohan Sarin

Vice-chairman of GESAMP
Physical Research Laboratory
Geosciences Division
Navrangpura 380009
Ahmedabad
India
Tel: +91 7926314306
Fax: +91 7926314900
Email: sarin@prl.res.in and
manmohan_sarin@yahoo.com

Robert Duce

Texas A&M University
Department of Oceanography
TAMU – 3146
College Station, Texas 77843 – 3146
United States
Tel: +1 979 229 3821
Fax: +1 512 549 3626
Email: robertduce@hotmail.com

Michael Huber

Jacobs Australia
32 Cordelia St
South Brisbane, Queensland 4101
Australia
Tel: +61 7 3026 8170
Fax: +61 7 3893 4522
Email: mhuber@bigpond.net.au

Ana Carolina Ruiz-Fernandez

Instituto de Ciencias del Mar y Limnología
Universidad Nacional Autónoma de México
Unidad Académica Mazatlán
Calz. J. Montes Camarena s/n
Col. Playa Sur, 82040 Mazatlán, Sin
México
Tel: +52 669 9852845
Fax: +52 669 9826133
Email: caro@ola.icmyl.unam.mx

Roberta Delfanti

Italia National Agency for New Technologies, Energy &
Sustainable Economic Development
ENEA
Marine Environment Research Centre
P.O. Box 224
19100 La Spezia
Italy
Tel: +39 0187 978258
Fax: +39 0187 978236
Email: Roberta.delfanti@enea.it

Alex Baker

School of Environmental Sciences
University of East Anglia
Norwich Research Park
Norwich
NR4 7TJ
Tel: +44 1603 591529
Fax: +44 1603 591327
Email: Alex.Baker@uea.ac.uk

Thomas Hoefler

Federal Institute for Risk Assessment
Max-Dohrn-Str.8-10
D-10589 Berlin
Germany
Tel.: +49 30 18 4123267
Fax: +49 30 18 4122714
Email: thomas.hoefler@bfr.bund.de

Felicia Chinwe Mogo

Marine Environment Management Department
Nigerian Maritime Administration and Safety Agency
(NIMASA)
4 Burma Road Apapa
Nigeria
Tel: +234-8033157989
Email: felichimogo@yahoo.com and
felicia.mogo@nimasa.gov.ng

Annette Dock (on behalf of Jan Linders)

Adalia AB
Runslingan 3E
SE-187 72 Täby
Sweden
Tel: +46 8 510 149 36
Fax: +46 8 510 126 02
Mobile: +46 70 483 11 23
Email: info@adalia.se

Gerardo Gold Bouchot

Oceanography Department
Texas A&M University
797 Lamar St
College Station, TX 77840
United States
Email: gerardo.gold.bo@gmail.com

B. SECRETARIAT

Stefan Micallef

Administrative Secretary of GESAMP
IMO
4 Albert Embankment
London SE1 7SR
United Kingdom
Tel: +44 207 587 3142
Fax: +44 207 587 3210
Email: smicallef@imo.org

Luis Valdes

IOC Technical Secretary of GESAMP
IOC of UNESCO
7 Place de Fontenoy
75007 Paris
France
Tel: +33-1-45 684011
Fax: +33-1-45 685812
Email: jl.valdes@unesco.org

Henrik Enevoldsen

IOC of UNESCO
University of Copenhagen
Universitetsparken 4
2100 Copenhagen Ø
Denmark
Tel: +45 23260246
Email: h.enevoldsen@bio.ku.dk

Michail Angelidis

IAEA Technical Secretary of GESAMP
IAEA Environment Laboratories
4 Quai Antoine 1er
MC 98000
Monaco
Tel: +377-9797-7236
Fax: +377 97977276
Email: M.Angelidis@iaea.org

Silvina Carou

WMO Technical Secretary of GESAMP
Atmospheric Research and Environment Branch
(AREB)
WMO
7 bis, Avenue de la Paix
BP2300, 1211 Geneva 2
Switzerland
Tel: +41 (0)22-7308569
Fax: +41 (0)22-7308049
Email: scarou@wmo.int

Joana Akrofi

UNEP Technical Secretary of GESAMP
UNEP
P.O. Box 30552, Nairobi
00100 Kenya
Tel: +254-20-7622015
Fax: +254-20-7622798
Email: joana.akrofi@unep.org

Andrew Hudson

UNDP Technical Secretary of GESAMP
Head, UNDP Water and Ocean Governance Programme
FF-9100, 1 United Nations Plaza
New York, NY 10017
United States
Tel: +1-212-906-6228
Fax: +1-212-906-6998
Email: andrew.hudson@undp.org

Edward Kleverlaan

IMO Technical Secretary of GESAMP
IMO
4 Albert Embankment
London SE1 7SR
United Kingdom
Tel: +44 207 587 3122
Fax: +44 207 587 3210
Email: EKleverl@imo.org

Fredrik Haag

Technical Officer
IMO
4 Albert Embankment
London SE1 7SR
United Kingdom
Tel: +44 207 463 4161
Fax: +44 207 587 3210
Email: fhaag@imo.org

Chrysanthe Kolia

GESAMP Administrative Coordinator
IMO
4 Albert Embankment
London SE1 7SR
United Kingdom
Tel: +44 207 463 4212
Fax: +44 207 587 3210
Email: ckolia@imo.org

C. INVITED SPEAKERS

Dr. Dominique Grizeau

Polytech Nantes Site de Gavy
France

Marie-Jose Durand

Polytech Nantes Site de Gavy
France

Dr. Zouher Amzil

Phycotoxin Laboratory
IFREMER, Nantes, France

Dr. Antonio Ordóñez Fernández

GS Inima Environment Spain

D. OBSERVERS

Dr. Jean Paul Vanderlinden

Observatoire de Versailles SQY (OVSQ)
78280 Guyancourt
France
Tel: +33 (0) 180 28 55 01
Fax: +33 (0) 180 28 53 00
Email: jean-paul.vanderlinden@uvsq.fr

Dr. Juan Baztan

Observatoire de Versailles SQY (OVSQ)
78280 Guyancourt
France
Tel: +33 (0) 180 28 50 61
Fax: +33 (0) 180 28 53 00
Email: juan.baztan@uvsq.fr

Dr. Christian Gorini

Université Pierre et Marie Curie
Institute of Earth Sciences, Paris (IsTEP)
Campus JUSSIEU
Tour 56-66, 5ème étage
75005 Paris
France
Tel : 01 44 27 50 39
Email: christian.gorini@upmc.fr

Dr. Alexander Bychkov

Special Projects Coordinator
North Pacific Marine Science Organization (PICES)
P.O. Box 6000
9860 West Saanich Road
Sidney, B.C.
Canada V8L 4B2
Tel: +1 250 363 6346
Fax: + 1 250 363 6827
Email: bychkov@pices.int

Prof. Ziad H. Abu Ghararah

Secretary-General
Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA)
7th Floor, PME Building
Hael Street, Rwais district
Jeddah
PO Box 53662,
Jeddah 21583
Kingdom of Saudi Arabia
Tel: +966 2 6573224 ext. 201
Fax: +966 2 652 1901
Email: ziad@persga.org

Dr. Natalia Martini

The Institute of Marine Engineering, Science and Technology (IMarEST)
Aldgate House
33 Aldgate High Street
London EC3N 1EN
United Kingdom
Tel: +44 20 7382 2628
Fax: +44 20 7382 2670
Email: natalia.martini@imarest.org

Frederic Briand

Director General
The Mediterranean Science Commission (CIESM)
16 bd de Suisse
MC 98000
Monaco
Tel: +377 9330 3879
Fax: +377 9216 1195
Email: fbriand@ciesm.org

Prof. Lawrence Hildebrand

World Maritime University
PO Box 500
SE 201 24 Malmö
Sweden
Phone: +46 40 356 345
Email: lh@wmu.se

Dr. Alexander Tkalin

UNEP/NOWPAP
NOWPAP Regional Coordinating Unit
5-5 Ushijimashin-Machi
Toyama 930-0856
Japan
Tel: +81 76 444 1611
Fax: +81 76 444 -2780
Email: alexander.tkalin@nowpap.org

Dr. Chris Vivian

The Centre for Environment, Fisheries and Aquaculture Science (Cefas)
20 Barnmead Way
Burnham-on-Crouch
Essex, CM0 8QD
United Kingdom
Tel: +44 1621 783 972
Email: chris.vivian@cefas.co.uk

Joao Sousa

International Union for the Conservation of Nature (IUCN)
Rue de Mauverney, 28
1196 Gland
Switzerland
Email: joao.sousa@iucn.org

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

This document provides a summary of the Organizations' achievements since GESAMP 41 (1 to 4 September 2014) from IMO, IAEA, UNESCO-IOC, UNDP, UNEP, UN and the WMO.

GESAMP Office

1 The GESAMP Office, established at IMO as a co-sponsoring arrangement between the current sponsors of GESAMP, has not been fully staffed since the support arrangement with the Swedish Agency for Development Cooperation (Sida) expired on 31 December 2010. In July 2015, IMO assigned an Administrative Coordinator (Mrs. C. Kolia) to the GESAMP Office¹ and is currently also relying on the staff of the Marine Environment Division to carry out the Secretariat functions. During its meeting by teleconference in January 2015, the ExCom welcomed the proposal by IMO to formalize the support by the World Maritime University (WMU) to the GESAMP Office, which, once operational, will further strengthen the support arrangements for GESAMP.

2 Since September 2014, the main activities of the GESAMP Office have been the following:

- .1 supporting the activities of the existing Working Groups of GESAMP, including the various peer review activities;
- .2 implementation of the GESAMP Funding Strategy, in coordination with the Chairman of GESAMP;
- .3 assisting in the publication of two GESAMP reports;
- .4 maintenance of the GESAMP website and communication with its users, as and when required;
- .5 supporting the activities of the GESAMP Transboundary Waters Assessment (TWA) Project Task Team;
- .6 preparation of the current session of GESAMP and the side-event on desalination; and
- .7 organizing and facilitating the GESAMP workshop on mine tailings (10 to 11 June 2015 in Lima, Peru).

¹ IMO provides the time of the Administrative Secretary and Technical Secretary (extended support to the Office, in addition to the normal duties of the Technical Secretary) and a General Service Staff member as an in-kind contribution. Furthermore, IMO provides office space and equipment, storage, publication support etc. as well as financial and legal advice and support.

IMO

Implementation of the Ballast Water Management Convention

3 The Ballast Water Management 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 Convention will enter into force 12 months after the date on which not less than 30 States, the combined merchant fleet of which constitute not less than 35% of the world's gross tonnage, have ratified it. Currently, a total of 44 States, representing 32.86% of the world merchant fleet tonnage, have ratified the Convention.

4 IMO's Marine Environment Protection Committee (MEPC), at its 67th and 68th sessions, granted Basic Approval to 5 and Final Approval to 1 ballast water management system that make use of Active Substances, based on the recommendations of the 30th and 31st meetings of the GESAMP Ballast Water Working Group (BWWG). MEPC 68 further noted that there are already 57 type-approved ballast water management systems available.

5 MEPC 68, having noted the outcome of the Sixth Stocktaking Workshop on the activity of the GESAMP-BWWG, endorsed a revision of the GESAMP-BWWG Methodology for information gathering and conduct of work. The revised Methodology has been disseminated as BWM.2/Circ.13/Rev.3.

6 Important progress was made with regard to guidance for enforcing the BWM Convention with the adoption by MEPC 67 of the *Guidelines for port State control inspection for compliance with the BWM Convention* (resolution MEPC.252(67)) and with the approval by MEPC 68 of the revised *Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines* (G2) (BWM.2/Circ.42/Rev.1).

7 MEPC 68 continued the work on the agreed review of the *Guidelines for approval of ballast water management systems* (G8), and considered the interim report of the Correspondence Group on the review of the Guidelines. The Correspondence Group was re-established to continue working on the review and submit its report to MEPC 69 scheduled for April 2016.

8 A "Roadmap for the implementation of the BWM Convention" was agreed by MEPC 68, which emphasises that early movers, i.e. ships which install ballast water management systems approved in accordance with the current Guidelines (G8), should not be penalized. The Roadmap invites the Committee to develop guidance on contingency measures and to expand the trial period associated with the Guidance on ballast water sampling

and analysis (BWM.2/Circ.42/Rev.1) into an experience-building phase.

9 MEPC 68 further developed draft amendments to regulation B-3 of the BWM Convention to reflect Assembly resolution A.1088(28) on application of the Convention, with a view to approval at MEPC 69 and consideration for adoption once the Convention enters into force. The draft amendments will provide an appropriate timeline for ships to comply with the ballast water performance standard described in regulation D-2 of the Convention.

10 MEPC 69 is further expected to consider the report of a study, initiated by MEPC 67, on the implementation of the ballast water performance standard described in regulation D-2 of the BWM Convention, and to develop further guidance for granting exemptions under regulation A-4 of the BWM Convention.

Ship recycling

11 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. At its 68th session, in May 2015, the MEPC adopted the *2015 Guidelines for the development of the Inventory of Hazardous Materials* (resolution MEPC.269(68)).

Review of MARPOL Annex V (Garbage)

12 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. The MEPC is currently considering amendments to MARPOL Annex V on Record of Garbage Discharge, aimed at addressing discrepancies between the text of the Annex and the Form of Garbage Record Book. MEPC 68, due to time constraints, agreed to defer consideration of this matter to MEPC 69.

Issues related to MARPOL Annex II and IBC Code

13 MEPC 68 approved a number of matters related to MARPOL Annex II and the IBC Code as follows:

- .1 modifications to the issue date of the annual MEPC.2/Circular on *Provisional categorization of liquid substances in accordance with MARPOL Annex II and the IBC Code* and to the expiry dates for tripartite agreements (i.e. issue date of 1 December and expiry dates for tripartite agreements of 31 December) and agreed that these changes would be implemented in December 2015;
- .2 a generic entry for Used cooking oil in list 1 of the MEPC.2/Circular with validity for all countries, without an expiry date;

.3 evaluation trade-named mixtures presenting safety hazards for inclusion in list 3 of the MEPC.2/Circular, with validity for all countries and no expiry date and of a number of cleaning additives for inclusion in annex 10 to the MEPC.2/Circular; and

.4 *Revised PPR Product Data Reporting Form and related guidance notes*, subsequently issued as MEPC.1/Circ.857.

Unified interpretations of paragraph 15.13.5 of the IBC Code

14 MEPC 68 and MSC 95 approved unified interpretations of paragraph 15.13.5 of the IBC Code for products requiring oxygendependent inhibitors, subsequently issued as MSCMEPC.5/Circ.10.

Mandatory Polar Code

15 As reported to the last session, in view of the increased interest in the polar regions with the projected growth in shipping traffic therein and the need to further promote the safety of navigation and prevention of pollution from ship operations in those areas, IMO developed a mandatory International Code for Ships Operating in Polar Waters (Polar Code). The maritime safety requirements of the Code were adopted by MSC 94 in November 2014 by resolution MSC.385(94), together with new SOLAS chapter XIV to make it mandatory under the SOLAS Convention; and the marine pollution prevention requirements of the Code were adopted by MEPC 68 in May 2015, together with amendments to MARPOL Annexes I, II, IV and V to make them mandatory.

MARPOL Annex VI (Prevention of air pollution from ships)

16 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.

Amendments to MARPOL Annex VI and associated guidelines

17 MEPC 67 adopted amendments to MARPOL Annex VI, concerning regulation 2 (Definitions), regulation 13 (Nitrogen Oxides (NO_x) and the Supplement to the International Air Pollution Prevention Certificate (IAPP Certificate), in order to include reference to gas as fuel and to gas-fuelled engines.

18 MEPC 68 considered a number of amendments and revisions to existing guidance and requirements related to air pollution measures and in particular:

- .1 adopted the *2015 Guidelines for exhaust gas cleaning systems*. The update relates to certain aspects of emission testing, regarding measurements of carbon dioxide (CO₂) and sulphur dioxide (SO₂), clarification of the washwater discharge

pH limit testing criteria and the inclusion of a calculation-based methodology for verification as an alternative to the use of actual measurements;

- .2 approved, for adoption at MEPC 69, draft amendments to the NO_x Technical Code 2008 to facilitate the testing of gas-fuelled engines and dual fuel engines for NO_x Tier III strategy;
- .3 approved, for adoption at MEPC 69, draft amendments to MARPOL Annex VI regarding record requirements for operational compliance with NO_x Tier III emission control areas;
- .4 approved *Guidance on the application of regulation 13 of MARPOL Annex VI Tier III requirements to dual fuel and gas-fuelled engines*; and
- .5 adopted amendments to the *2011 Guidelines addressing additional aspects to the NO_x Technical Code 2008 with regard to particular requirements related to marine diesel engines fitted with Selective Catalytic Reduction (SCR) Systems* (resolution MEPC.198(62)).

19 The Committee continued its work on further developing guidelines to support the uniform implementation of the regulations on energy-efficiency for ships (chapter 4 of MARPOL Annex VI).

20 MEPC 67, in October 2014 adopted;

- .1 *2014 Guidelines on survey and certification of the Energy Efficiency Design Index (EEDI)*, updating the previous version to include, for example, identification of the primary fuel for the calculation of the attained EEDI for ships fitted with dual-fuel engines using LNG and liquid fuel oil; and
- .2 amendments to the *2013 Interim Guidelines for determining minimum propulsion power to maintain the manoeuvrability of ships in adverse conditions*, to make the guidelines applicable to phase 1 (starting 1 January 2015) of the EEDI requirements.

21 MEPC 68, in May 2015 also adopted:

- .1 amendments to update the *2014 Guidelines on survey and certification of the Energy Efficiency Design Index (EEDI)* and endorsed their application from 1 September 2015, at the same time encouraging earlier application;
- .2 amendments to the *2013 Interim Guidelines for determining minimum propulsion power to maintain the manoeuvrability of ships in adverse conditions*, for the level-1 minimum power lines assessment for bulk carriers and tankers, and agreed on a phase-in

period of six months for the application of the amendments; and

- .3 amendments to update the *2014 Guidelines on the method of calculation of the attained EEDI for new ships*.

EEDI review

22 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.

23 MEPC 68 considered a progress report from the correspondence group and following consideration and clarification of the terms of reference re-established the correspondence group to further the work and submit an interim report to MEPC 69.

Further technical and operational measures to enhance energy efficiency

24 MEPC 67 agreed, in principle, to develop a data collection system for ships and, having agreed on the general description of the data collection system for fuel consumption of ships, to the re-establishment of an intersessional correspondence group to develop full language for the data collection system for fuel consumption that can be readily used for voluntary or mandatory application of the system. The core elements of the data collection system include: data collection by ships, flag State functions in relation to data collection and establishment of a centralized database by the Organization.

25 MEPC 68, having considered the report of the correspondence group, agreed text for its further development to be the full language for the data collection system for fuel consumption of ships, which can be readily used for voluntary or mandatory application of the system. In this regard, the Committee noted that a purpose of the data collection system was to analyze energy efficiency and for this analysis to be effective some transport work data needs to be included, but at this stage the appropriate parameters have not been identified.

26 MEPC 68 also agreed to recommend to the IMO Council the holding of an intersessional working group to: further consider transport work and/or proxies for inclusion in the data collection system; further consider the issue of confidentiality; consider the development of guidelines identified in the text; and to submit a report to MEPC 69.

Reduction of GHG emissions from ships

27 MEPC 67, in October 2014, approved the Third IMO GHG Study 2014 providing updated estimates for greenhouse gas emissions from ships. The Study

estimates that international shipping emitted 796 million tonnes of carbon dioxide (CO₂) in 2012, against 885 million tonnes in 2007. This represented 2.2% of the global emissions of CO₂ in 2012, against 2.8% in 2007. However, the “business as usual” scenarios continue to indicate that those emissions are likely to grow by between 50% and 250% in the period to 2050, depending on future economic and energy developments.

28 MEPC 68 considered a submission from the Marshall Islands, calling for a quantifiable reduction target for greenhouse gas emissions from international shipping. Whilst expressing gratitude to the Marshall Islands for the submission, the Committee took the view that the priority at this stage should be to continue its current work, in particular, to focus on further reduction of emissions from ships through the finalization of a data collection system. The Marshall Islands proposal could then be further addressed at an appropriate future session of the Committee. The need to consider the proposal further was recognized and the Committee also looked forward to a successful UN climate change conference (UNFCCC COP 21 meeting) in Paris from 30 November to 11 December 2015.

Fuel oil availability

29 MEPC 67 reviewed a progress report from the correspondence group which had been instructed to develop a draft framework for a methodology to examine whether sufficient fuel meeting the requirements set out in regulation 14 (Sulphur Oxides (SO_x) and Particulate Matter) of MARPOL Annex VI is likely to be available by the effective date of those requirements, taking into account the global market supply and demand for fuel oil, trends in fuel oil markets, and any other relevant issues.

30 MEPC 68 agreed terms of reference for the review, required under regulation 14 (Sulphur Oxides (SO_x) and Particulate Matter) of MARPOL Annex VI, of the availability of compliant fuel oil to meet the global requirements that the sulphur content of fuel oil used on board ships shall not exceed 0.50% m/m on and after 1 January 2020. The IMO Secretariat was requested to initiate the review by 1 September 2015, with a view to the final report of the fuel oil availability review being submitted to MEPC 70 (autumn 2016) as the appropriate information to inform the decision to be taken by the Parties to MARPOL Annex VI.

31 MEPC 68 also established a Steering Committee consisting of 13 Member States, one intergovernmental organization and six international non-governmental organizations to oversee the review.

Fuel oil quality

32 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 68 considered the report of the group and re-established it to: further develop draft guidance on best practice for assuring the quality of fuel oil delivered for use on board ships; further examine the adequacy of the current legal framework in MARPOL

Annex VI for assuring the quality of fuel oil for use on board ships; and submit a report to MEPC 69.

Black Carbon

33 MEPC 68 agreed to a definition for Black Carbon emissions from international shipping, based on the “Bond et al.” definition which describes Black Carbon as a distinct type of carbonaceous material, formed only in flames during combustion of carbon-based fuel, distinguishable from other forms of carbon and carbon compounds contained in atmospheric aerosol because of its unique physical properties.

OPRC and OPRC HNS Protocol

34 MEPC 67 approved *the Guidance on the safe operation of oil pollution combating equipment*. This Guidance provides information on the identification, assessment and mitigation of the risks to the responders in transporting and operating oil pollution combating equipment, taking into account the lessons learnt by government and industry from oil spill response operations of recent years.

35 MEPC 68 considered and subsequently approved two sets of guidelines to assist in oil spill response. These included the *Guidelines on international offers of assistance in response to a marine oil pollution incident*, intended as a tool to assist in managing requests for spill response resources and offers of assistance from other countries and organizations when confronted with large, complex or significant oil spill incidents. The Committee also approved *Guidelines for the use of dispersants for combatting oil pollution at sea Part III* (Operation and technical sheets for surface application of dispersants) which will be published together with Part I (Basic information) and Part II (National Policy) which had already been approved. These are an update on guidance published by IMO and UNEP in 1995.

36 In its upcoming sessions, MEPC will consider, inter alia, the update of the IMO OPRC model training course, the update of the IMO Manual on oil pollution Section II – Contingency planning, in addition to the Guide on oil spill response in ice and snow conditions and the final part of the Guidelines for the use of dispersants for combatting oil pollution at sea, specifically dealing with subsurface application.

London Convention and Protocol (LC/LP)

Marine geoengineering including ocean fertilization

37 Following the adoption, in 2013, of resolution LP.4(8) on the amendment to the London Protocol to regulate the placement of matter for ocean fertilization and other marine geoengineering activities, the Meeting of Contracting Parties to the London Protocol approved:

- .1 Guidance for consideration of (future) marine geoengineering activities; and
- .2 a description of arrangements for a roster of experts on marine geoengineering involved in the consultation process on proposals for activities listed in annex 4 of resolution LP.4(8).

38 The Scientific Groups under the London Convention and Protocol, held a Symposium on marine geoengineering on 23 April 2015, as part of their annual 'Science Day'. The Symposium was attended by some 50 participants and by Dr. Alex Baker (GESAMP). A full list of speakers and topics, as well as copies of the presentations is available at: <http://www.imo.org/en/OurWork/Environment/LCLP/recentevents/Pages/default.aspx>. The outcomes of this event are being fed into the development of a scoping document on this topic for consideration by GESAMP at its 42nd session.

Marine disposal of tailings and associated wastes from mining operations

39 The Meetings, having noted advice prepared by the IMO Legal Affairs and External Relations Division that the London Convention/Protocol (LC/LP) may, in the framework of UNCLOS, complement regulatory activities undertaken under the auspices of other organizations that are involved in the issue of marine disposal of wastes from mining operations and that the issue whether marine disposal of wastes from mining operations is included in the definition of dumping under LC/LP has to be interpreted by the State Parties to LC/LP, agreed to continue to gather information on best practices and existing guidance and legislation and other relevant issues of marine and riverine disposal of mine tailings around the world; and, identify any gaps in best practices and existing guidance.

40 As indicated last year, the Office for the LC/LP and Ocean Affairs of IMO successfully organized, in cooperation and assistance of the Peruvian Maritime Authorities, the GESAMP International Workshop on the impacts of mine tailings in the marine environment. This was held on 10 and 11 June 2015, in Lima, Peru and was attended by some 100 participants including relevant researchers, policy makers, coastal and marine managers and industry, as well as Dr. Mike Huber and Dr. Ana-Carolina Ruiz as representatives of GESAMP. All presentations can be downloaded at: http://www.dicapi.mil.pe/taller/en/down_workGesamp.html. The primary focus was to increase the scientific understanding of impacts on the marine environment of deep sea tailings placement. The workshop noted that there were strong correlations between the issues identified for marine disposal of mine tailings and those identified for wastes produced during deep sea-bed mining and that any further work or studies should address both activities as much as possible to reduce effort and costs. The outcomes of the Workshop will be presented to GESAMP 42, with a view to consider establishing a Working Group on this topic.

Deep seabed mining

41 The Meetings of Contracting Parties reviewed the objectives and workings of the International Seabed Authority (ISA) in areas beyond national jurisdictions and ISA's work on the development of a Mineral Exploitation Code. The Meetings, having noted, inter alia, that there are areas of overlap between the work of the LC/LP and ISA, but also potential gaps in the development of the environmental obligations in the Code, particularly in relation to the waste disposal in the marine environment.

The LC/LP agreed that the regulatory and technical regimes of the two bodies would need to be aligned. The Meetings agreed to explore ways to strengthen cooperation and instructed the Secretariat to initiate a dialogue with ISA to ensure a closer cooperation for future joint work.

42 The Meetings also considered deep seabed mining within national jurisdictions and noted that, while the definition of dumping in the Protocol (or Convention) excludes exploration and exploitation of seabed mineral resources, a potential gap in international standards or codes of practice was evident and hence the LC/LP bodies could offer technical advice in managing wastes arising from such activities. The Secretariat is currently collecting information on existing national and regional or other forms of legislation applicable to seabed mining in the EEZ to identify gaps and shortcomings in such regulations.

Twenty-five-year scientific review of all radioactive wastes and other radioactive matter

43 At their last meetings, the Contracting Parties recalled that, in 1993, when the London Convention was amended to ban the dumping of radioactive wastes or other radioactive matter (resolution LC.51(16)), the amendment also included an agreement that, within twenty-five years of the entry into force of the amendment, a scientific study, relating to all radioactive wastes and other radioactive matter other than high level wastes or other matter, shall review the position of such substances in LC article 12 of Annex I. Similarly, the London Protocol (Annex 1, article 3) provides for an analogous review with the same timeframe. The amendment of LC article 6 of Annex I entered into force on 20 February 1994, and thus a scientific study should be completed before 2019.

44 The Meetings agreed that a step by step assessment approach could be employed, in order to determine the type and level of review that would be needed to fulfil the requirements of the LC/LP. This could include, inter alia, a literature review focusing on the period after 1993, and a review of the Intergovernmental Panel of Experts on Radioactive Waste report. To this end the Meetings established a correspondence group, under the co-lead of the United Kingdom and the IAEA, to submit a full proposal for a work plan for the twenty-five-year review to the next meeting of the governing bodies; and agreed to establish a second correspondence group, to prepare a communications plan and develop possible options for e.g. an interpretative resolution, under the co-lead of the United Kingdom and the United States.

IAEA

45 Following the agreement made at the 41 GESAMP, IAEA/NAEL provided € 5,000 to the UNInMAR-UNAM (Institute of Marine sciences and Limnology, University of Mexico) for completing the digitisation of the core profiles from LMEs undertaken in the framework of the WG 39 "Global trends in pollution of coastal ecosystems".

Radiometrics Laboratory (RML) activities

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

46 In the framework of the IAEA's Nuclear Safety Action Plan, the IAEA collaborates with Japan to assist in the implementation of the marine monitoring programme set in place following the 2011 earthquake, tsunami and resulting Fukushima Daiichi Nuclear Power Station nuclear accident. Activities under this project are a follow-up to the the International Peer Review Mission on Mid- and Long-Term Roadmap towards the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station Units 1-4, which visited Tokyo and the Fukushima Prefecture in November-December 2013. The project started in 2014 and will run for 3 years, including 2 interlaboratory comparisons and one proficiency test for radionuclides in marine samples organized each year.

IAEA's Regional Technical Cooperation project RCA RAS/07/021 "Marine Benchmark Study on the Possible Impact of the Fukushima Radioactive Releases in the Asia-Pacific Region"

47 This is an IAEA Regional Technical Cooperation Project running in the Asia-Pacific region under the "Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific" (RCA) aiming to assist Member States in the region to build capacity allowing them to assess eventual impacts of the radioactive releases from the Fukushima Daiichi Nuclear Power Station on the marine ecosystems. The project, running between 2011-2015, was already successful in training scientists and laboratory staff from the region in analytical and assessment techniques and in updating the ASPAMARD regional database with 100 000 data on radioactivity in seawater, sediment and biota. The final project meeting is scheduled in November 2015.

Analytical quality services

- Production of Certified Reference Materials for radionuclides in marine samples Sediment from Bikini Atoll and Pacific Ocean:
 - Two candidate certified reference sediments (IAEA-412 and IAEA-410) are in advanced stage of certification. It is expected they will be available for distribution in 2016.
 - Two new sediment samples IAEA-465 (Baltic sea sediment) and IAEA-469 (Ibaraki Pacific Ocean sediment) are in preparation for future use.
- Proficiency Testing: After finalising 3PTs in 2012, 2013 and 2014 the Environment Laboratories have organised in 2015 a fourth PT exercise with seawater samples spiked with Sr-90, Cs-134, Cs-137 and H-3. Sixty participants take part in this proficiency test. The PT activities are carried out in the framework of the IAEA's Regional Technical Cooperation project RCA

RAS/07/021 "Marine Benchmark Study on the Possible Impact of the Fukushima Radioactive Releases in the Asia-Pacific Region" and the IAEA's Nuclear Safety Action Plan project for "Marine Monitoring Confidence Building and Data Quality Assurance".

MARIS database

48 In 2014-2015 the IAEA's MARine information System (MARiS), a global database for marine radioactivity measurements accessible on Internet through the IAEA's NUCLEUS portal, is being upgraded and developed. Development areas include updating the dataset, improving the website, and linking with larger environmental data networks. MARiS is now exploring links to both the Group on Earth Observations (GEO) and their data network GEOSS (Global Earth Observation System of Systems), and the iMarine virtual research environment. Furthermore, with the increasing need to educate the wider general audience on the topic of marine radioactivity and the issues surrounding it, MARiS also re-established links to the UN Atlas of the Oceans, a web portal that provides information relevant to the sustainable development of the Oceans. The UN Atlas of the Oceans is developed and maintained by the FAO and works in close collaboration with UN-Oceans, an inter-agency mechanism to coordinate ocean related activities. In 2015 new data were uploaded on Pacific Ocean radioactivity.

Radioecology Laboratory (REL) activities

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

49 The receptor binding assay for harmful algal bloom (HAB) toxin detection has been in full operation at NAEL for research and development application or for technology transfer and capacity building. This method is being used to study biotoxin food web transfer and metabolism. It is being optimized for application to the emerging ciguatera toxins and its proficiency assessed on new seafood sample matrices to broaden its regulatory application.

50 NAEL provides technical and scientific support to 30 Member States (MSs) in Latin America, Asia-Pacific and Africa to build capacity in HAB management through national and regional projects. NAEL also hosted several fellowship and internship to transfer the RBA technology to IAEA MSs. NAEL is joining efforts with other national and international organisation (IOC-UNESCO, US-NOAA, Malarde Institute in French Polynesia) to improve knowledge and enhance capabilities in HAB management.

51 A new Coordinated Research Project (CRP) on the application of the RBA technique for improving coastal management has been developed and the initial meeting of the will take place in 2015.

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

52 SFB 754 addresses the threat of ocean deoxygenation and its consequences on the global climatebiogeochemistry 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.

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

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

54 During the last year, REL continued to use radiotracers to investigate bioaccumulation of contaminants and essential elements in marine organism and to also assess seafood safety. The focus for this period was on (1) Cesium in various invertebrates and fish, (2) factors affecting accumulation of trace metals in cockles consumed in West Africa, (3) effect of low pH (ocean acidification) on fish larvae and (4) the food transfer of contaminants and essentials nutrients in fish species produced in aquaculture. For caesium experiments, REL team investigated the exposure of different marine species through different exposure pathways to understand fate of accidental release of this radionuclide in the marine environment and to respond to key questions: How CS is accumulated? What is the major pathway and what is the transfer through the food chain? What is the environmental risk? The results of these studies will help to better understand for example, the high levels found in some species tissues in Fukushima using laboratory experiments and modelling.

Activities of the "Ocean Acidification International Coordination Centre (OA-ICC)"

55 The OA-ICC co-organized two regional training courses on ocean acidification that benefited 28 scientists from 14 developing IAEA Member States. The first training course (1-7 September 2014) focused on the Mediterranean region and took place in La Spezia, Italy, in partnership with ENEA and MARES. The second one (9-16 November 2014) covered Latin America and was organized in co-operation with the University of Concepcion in Chile.

56 The OA-ICC supported 15 scientists from developing IAEA Member States to attend the 3rd International Symposium "Effects of climate change on the world's oceans", Brazil, March 2015. The project also sponsored the participation of two young Chilean researchers in a series of ocean acidification-related

activities at the UNFCCC COP20 in Lima, Peru in December 2014.

57 In January 2015 the OA-ICC and the Scientific Centre of Monaco organized the 3rd International Workshops "Bridging the gap between ocean acidification and economic valuation" at the Oceanographic Museum of Monaco. More than 50 natural and social scientists, as well NGOs and government representatives gathered to discuss the impact of ocean acidification on coastal communities. The results of the workshop were translated into a brochure for policy makers launched on World Oceans Day (8 June 2015).

58 The 2nd Meeting of the Ocean Acidification international Reference User Group took place at the Oceanographic Museum of Monaco on 14-16 January 2015 and focused on future research priorities and policy options. The meeting set the basis for the elaboration of The Monaco Ocean Acidification Action Plan – a guiding document for policy makers and resource managers, also published on World Oceans Day (8 June 2015).

59 The OA-ICC supported the second meeting of the Oceans 2015 Initiative (20-22 April 2015), working towards the inclusion of ocean acidification in the climate negotiations to be carried out during the UNFCCC COP21 in Paris in December 2015.

60 The results of one of the OA-ICC's inter-comparison activities - comparing ten public packages that compute ocean carbonate chemistry - were presented in a peer-reviewed scientific paper that was published in the journal Biogeosciences in March 2015. The OA-ICC has also contributed to several major international publications: a chapter in the CBD/UNEP report on ocean acidification, an ocean acidification box in the WMO Greenhouse Gas Bulletin, an article in the Annual WMO Bulletin and a chapter in an Inter-Agency UNDESA publication.

61 From September 2014 to June 2015, the OA-ICC news stream (news-oceanacidification-icc.org) hosted nearly 1100 posts, received almost 35,000 visitors and was viewed more than 85,000 times by people from 172 countries. The OA-ICC website (<http://www.iaea.org/ocean-acidification>) has been constantly expanded and enriched with resources grouped according to target audience and language. The project has started producing "OA-ICC Highlights" - quarterly updates on its activities, also available on the OA-ICC website.

62 The OA-ICC co-organized an exhibit booth and three side events on ocean acidification at the UNFCCC COP20 in Lima, Peru in December 2014.

Marine Environmental; Studies Laboratory (MESL) Activities

Production of Certified Reference Materials and Interlaboratory Comparison exercises

63 Three new Certified Reference Materials for trace elements and Methyl Mercury were finalised: IAEA-461 (marine biota - Clam), IAEA-456 (marine sediment) and IAEA-470 (marine biota - Oyster). The CRMs were produced to assist Member States improving quality

of measurement results in the analysis of Mercury and Methyl Mercury in marine environmental samples, in view of assessing Mercury pollution in line with the requirements of the Minamata Convention on Mercury and for enhancing seafood safety.

64 NAEL/MESL also participated in three Interlaboratory Comparisons (ILC) on Mercury, Methyl Mercury, trace elements and organotin determination in marine samples, organised by Brooks Rand, Quasimeme and the Warsaw Institute of Biosciences and Technology, in two ILCs organised by the Bohn OSINet Group for the identification of oil spill and paraffin sources using biomarkers and carbon stable isotopes and in one ILC on the analysis of Persistent Organic Pollutants in plastic pellets collected on the beach, organised by the International Plastic Pellet Watch programme.

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

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

66 In the framework of an agreement with UNEP/MAP, NAEL/MESL provided technical support on strengthening data quality assurance in marine pollution monitoring in the Mediterranean region. MESL organised two Proficiency Tests with the participation of 43 laboratories from 13 Mediterranean Member States and two Training Courses with the participation of 13 Mediterranean scientists:

- Analytical Performance Study for MEDPOL: Determination of trace elements in marine biota sample (IAEA-MEL-2014-01 PT/TE)
- Analytical Performance Study for MEDPOL: Determination of chlorinated pesticides, PCBs and petroleum hydrocarbon in sediment sample (IAEA-MEL-2014-01 PT/ORG)
- Training workshop on the analysis of Trace Elements in marine samples for laboratory practitioners in MEDPOL countries, 3-14 November 2014
- Training workshop on the analysis of Organic Contaminants in marine samples for laboratory practitioners in MEDPOL countries, 3-14 November 2014

67 A new agreement was signed on May 2015 between IAEA/NAEL and UNEP/MAP to continue the

collaboration on strengthening data quality assurance in marine pollution monitoring in the Mediterranean region. Already 2 Proficiency Tests and 2 Training Courses are under preparation. The project is on-going and will be completed within 2015.

68 Also an agreement was signed on March 2015 between IAEA/NAEL and the Regional Organisation for the Protection of the Marine Environment of the Gulf (ROPME). In the framework of this agreement, MESL, RML and REL are assisting the Gulf Member States implementing the regional ROPME Mussel Watch Programme, by jointly analysing oyster and sediment samples from the coastal zone of the Gulf Member States, for trace elements, organic contaminants, radionuclides and Harmful Algal Blooms related biotoxins. The project is on-going.

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

69 MESL continued the development and validation of monitoring methods, which were published in peer reviewed journals and presented in International Conferences.

Methods were developed on:

- Mercury and Methyl-Mercury analysis in sediment and marine biota
- Long-lived radionuclides (Plutonium, Uranium, Americium, and Thorium) analysis in marine samples
- Persistent organic compounds and petroleum hydrocarbons analysis in the marine samples
- Application of compound specific carbon isotope analysis to fingerprint petroleum hydrocarbons in polluted coastal water
- Lead stable isotopes analysis for identifying lead sources and pollution history

IOC of UNESCO

Ocean acidification

70 Ocean acidification (OA) is an emerging global concern and is a risk to marine biodiversity, ecosystems and human society. In terms of new research and networking the IOC is co-leading the Global Ocean Acidification Observing Network (GOA-ON) which is aimed to coordinate and improve ocean observation to detect the impacts of ocean acidification. The GOA-ON roadmap was published in September 2014 and the most recent development was the establishment of a biological working group, co-chaired and coordinated by IOC-UNESCO, in order to improve measurements detecting the impact of increasing CO₂ levels on marine life. Furthermore together with the support of the Ocean Acidification International Coordination Center of the IAEA a session focusing on OA during the Third International Symposium on the Effects of Climate Change on the World's Oceans in March 2015

in Santos, Brazil. COP20, was organized. To enhance the awareness among policymakers IOC contributed to a side event in Lima during the COP20 and currently prepares OA workshops and side events towards the COP21. Regarding communication with the general public and permanent delegations here at UNESCO, IOC celebrated the World Oceans Day, which included one session on ocean acidification. The TV corner, which was procured for the Second International Ocean Research Conference in November 2014, received a lot of positive feedback and was used again during other occasions.

Blue Carbon

71 The Blue Carbon Initiative, established in 2011 by the IOC, the International Union for the Conservation of Nature (IUCN) and Conservation International (CI) works to develop management approaches, financial incentives and policy mechanisms for ensuring the conservation, restoration and sustainable use of coastal blue carbon ecosystems. The IOC is highly involved in the Blue Carbon Scientific Working Group, which provides the scientific foundation for the Blue Carbon Initiative by synthesizing current and emerging science on blue carbon and by providing a robust scientific basis for coastal carbon conservation, management and assessment. Priority research of the Scientific Working Group functions in close partnership with the Initiative's Policy Working Group. Internationally applicable standards for quantifying and monitoring carbon storage, sequestration, and emissions in coastal ecosystems on regional and local scales were identified and the manual "Coastal Blue Carbon: methods for assessing carbon stocks and emissions factors in mangroves, tidal salt marshes, and seagrass meadows" was published and launched at the last meeting of the Scientific working group of the Blue Carbon Initiative in Rio Grande, Brazil, in October 2014. The distribution via internet in its pdf format is ongoing.

Deoxygenation

72 Deoxygenation 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 479 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. Therefore the IOC supports a group of scientists trying to create awareness among policymakers and the general public, e.g. via publishing a scientific fact sheet via the 'Ocean and Climate' platform on deoxygenation, as well as via assisting in the establishment of a global network of experts within this field.

Time Series

73 In a growing effort to distinguish between natural and human-induced earth system variability, the IOC is paying attention to sustained ocean time-series measurements. Shipboard biogeochemical time-series programmes provide the oceanographic community with the multi-year, high-quality data needed for characterizing ocean biogeochemistry and ecosystem variability and have taken a renewed importance as they represent one of the most valuable tools that scientists have to characterize and quantify ocean fluxes and their associated links to ecosystem functioning in a changing ocean. Under the auspices of the IOC the International Group for Marine Ecological Time Series – IGMETS, compiled data from more than 400 time series sites worldwide. It is envisaged that the analysis of these data sets, to be published in November 2015, will serve to disentangle natural and human-induced change in marine ecosystems. The initiative shows that the assessment of present data is critical to improve the information delivered to decision makers so that they understand marine ecosystem responses to a changing climate and plan accordingly.

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

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

75 In 2015 the WG continued to critically review and report on the status of shipping vector research with an emphasis on studies of shipping transport vectors, shipping vector management activities and risk assessment. WGBOSV discussed and evaluated sampling and analysis strategies for type approval and compliance testing of ballast water treatment technologies under consideration at IMO or by other regulators (e.g. U.S. Environmental Protection Agency). WGBOSV further discussed and evaluated available information on the effects of treated or exchanged ballast water on the aquatic environment and provided input on strategies which could be used to increase confidence surrounding environmental safety of treated ballast water being discharged. Other terms of reference were to provide input to WGITMO in connection with OSPAR 1/2015 request, to review a draft OSPAR JAMP Eutrophication Guidelines on phytoplankton species composition, and to investigate and report on new developments in non-native species issues in the Arctic, as a result of climate change and resource developments. Finally WGBOSV investigated and reported (incl. via AquaNIS) on new molecular tools for identification, early detection and monitoring of non-native species, in collaboration with ICES Working Group on Integrated Morphological and Molecular Taxonomy (WGIMT). Full report at <http://www.ices.dk/community/groups/Pages/WGBOSV.aspx>

Nutrient's coastal Impacts research

76 Nutrient over-enrichment of coastal ecosystems is a major environmental problem globally, contributing to problems such as harmful algal blooms, dead zone formation, and fishery decline. Yet, quantitative relationships between nutrient loading and ecosystem effects are not well defined. The IOC Nutrients and Coastal Impacts Research Programme (N-CIRP) is focusing on integrated coastal research and coastal eutrophication, and linking nutrient sources to coastal ecosystem effects and management in particular. A key component in the implementation strategy is a four-year Joint UNEP-IOC Global Environment Facility (GEF) Project 'Global foundations for reducing nutrient enrichment and oxygen depletion from land-based pollution' which was launched in March 2012. The IOC is leading the Project research component which delivers global and local models for impact of 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.

Microplastics

77 The Group of Experts on the Scientific Aspects of Marine environmental Protection (GESAMP) WG 40 'Sources, fate and effects of micro-plastics in the marine environment: a global assessment' has completed its work under the leadership of the IOC-UNESCO. It has started a second phase with a joint co-sponsorship shared by the IOC, UNEP and FAO. The new TORs were agreed by the three organizations plus GESAMP and the kick-off meeting was held in Rome last 21-23 April. The most immediate milestone for this group is to present a report on the impact of microplastics on fish by May 2016. The IOC is also acting as an advisory body on potential plastics projects funded by the European Union Joint Programming Initiative on Oceans (EU JPI Oceans).

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

78 IOC continued to follow closely the preparation of the World Ocean Assessment (WOA) report under the UN Regular Process, providing technical comments to the chapters related to its expertise. IOC also contributed financial resources to assist the UN Division for Ocean Affairs and the Law of the Sea (DOALOS) with the editorial process of the report. In December 2014, the Secretariat of the Regular Process (Division of Ocean Affairs and Law of the Sea) informed the Commission that the draft of the first global integrated marine assessment of the Regular Process was completed and ready to be reviewed by Member States and relevant intergovernmental organizations. Through

IOC Circular letter 2564, IOC Member States were invited to take part in the review process that concluded on 15 March 2015. In parallel, the IOC secretariat also provided a technical review for the chapters particularly relevant to the IOC field of expertise.

79 The WOA report is now being finalized by Group of Experts and will be ready in September 2015 for consideration by the UN Ad Hoc Working Group of the Whole. In the context of the WOA consideration by UN Member States, an evaluation of the 1st cycle of the Regular Process implementation may be conducted, reviewing the effectiveness of the arrangements and drawing lessons for improving the next cycle of the Regular Process.

80 In 2009, the Group of Experts leading the Assessment of Assessments (preliminary phase of the Regular Process) recommended that the Regular Process be serviced by an inter-agency secretariat co-located in one single intergovernmental organization. However, when the General Assembly decided to set up the Regular Process and its arrangements, it was decided to establish the Secretariat within the Division on Ocean Affairs and the Law of the Sea (DOALOS) in New York. The impact of this decision has resulted in a limited engagement of relevant intergovernmental bodies and programmes such as FAO, UNEP, IMO and IOC, or of scientific advisory groups such as GESAMP, in the operations of the Regular Process. The adequate provision of supporting resources is critical to facilitate the work of the Group of Experts as well as the inclusion of the state of the art scientific knowledge. The next cycle of the Regular Process may consider the use of indicators and reference points to compare status and trends over time. This would require a heavy investment in the development of an indicator-based methodology. This is an area where IOC, building on its experience with the Transboundary Water Assessment Programme (TWAP), is well placed to contribute to.

Transboundary Water Assessment Programme

81 IOC is leading the implementation of the marine components of the Transboundary Water Assessment Programme (TWAP) funded by GEF. The project will provide a number of core ecological, socio-economic and governance indicators for the marine environment (64 Large Marine Ecosystems and Open Ocean areas) using globally available datasets. From the IOC perspective, TWAP is the first integrated and global marine assessment that the Commission is leading, and the results produced have the potential to inform a number of ocean governance mechanisms; these include the GEF, other UN agencies with an ocean mandate, other global assessment processes such as WOA and Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES), regional seas organizations, and LME commissions, as well as Member States. In order to conduct this assessment, IOC established a consortium of institutional partners and experts for the current Open Ocean and LMEs assessments (these include for e.g. NOAA, IGBP, GESAMP, UNEP-WCMC, University of British Columbia, National Center for Ecological Analysis and Synthesis (NCEAS), amongst others). This consortium is crucial

for the conduct of the assessments, as the members provide the necessary expertise, tools and data that underpin the assessments. The final TWAP deliverables will be released in September 2015. There will be two technical assessment reports (IOC Technical Series, 119, vol. 1: LME and Vol.2: Open Ocean; IOC/2015/TS/119) and a joint web portal displaying the indicators globally and providing access to the underpinning data. (see <http://www.geftwap.org>).

UNDP

Highlights of relevant marine/coastal activities undertaken during the intersessional period

Sulu-Celebes Seas Sustainable Fisheries Management Project (SCS)

82 Fish and fishery products have a critical role in global food security and nutritional needs of people in developing and developed countries. Thus the threats that imperil the rich biodiversity of our oceans—overfishing, pollution, global climate change and others—also threaten the people and countries reliant on the oceans for their food and livelihoods. Working with the Governments of Indonesia, Malaysia and the Philippines, UNDP is supporting efforts to improve the condition of fisheries in the Sulu-Celebes Seas through integrated, collaborative and sustainable tri-national management. In the Philippines, by undertaking a scientific study on the local sardine fish stocks in a demonstration site, and leveraging the findings, the project successfully advocated for the seasonal closure of that fishery to allow for the recovery of sardine stocks, which was adopted by the Philippine Bureau of Fisheries and Aquatic Resources (BFAR) with overwhelming support from commercial fishing companies and other critical stakeholders. During the first two years of the enforcement of this policy, the fishing companies reported a 30% increase in the volume of their catch. The continued effective management of this economically and nutritionally important species will benefit the Philippines, particularly the local communities—with spillover effects in the two other countries—by improving food security through the increased supply of affordable protein; providing sustainable livelihoods among marginalized sectors; and conserving the coastal and marine ecosystems. Due to the success of that seasonal closure policy, other fishing fleets and local government units are encouraging the BFAR to adopt similar policies for other fishing grounds.

Towards Ecosystem Based Management of the Humboldt Current Large Marine Ecosystem

83 The Humboldt Current large marine ecosystem (HCLME) is an important, highly productive zone that hosts the world's biggest single fishery, the anchovy, which—with other key HCLME stocks—contributes around 15% of global marine fish yields. This ecosystem therefore has a major role to play in global food supply, and thus investment in its sustainable management is critical. With support from UNDP financed by the GEF, the Governments of Peru and Chile are working together to improve the governance and sustainable use of the living marine resources and services of the HCLME, which

are currently valued at upwards of US\$ 12 billion per year. Artisanal fisherfolk in San Juan de Marcona, Peru are applying ecosystem-based management principles to manage marine macroalgae beds to improve the health of the fisheries; these fisherfolk are protecting a 23 kilometer stretch of coastline where they collect beached macroalgae, the sale of which represents a sustainable contribution to their livelihoods. Their coastal management efforts have been instrumental in protecting the algal beds where commercially important benthic species live. In 2014, with support from UNDP, the Chilean Government endorsed a proposal for a 1.2 million hectare multiple-use coastal marine protected area around the Juan Fernandez Islands, which will be conserved through a nuanced management approach that combines restrictions (no-take zones) with sustainable use.

Timor and Arafura Seas Program

84 In 2014, with support from UNDP and GEF, Ministers from Timor-Leste, Indonesia and the Australian Ambassador to Indonesia endorsed a regional Strategic Action Programme (SAP) that will promote the restoration, conservation and management of marine and coastal ecosystems for the Arafura and Timor Seas – known as the ATS region. This significant area, that links the Indian and Pacific Oceans, provides livelihoods for millions of people and makes a substantial contribution to domestic food and exports. These seas contain some of the most pristine and also highly threatened coastal and marine ecosystems in the world, underscoring the urgent need for trans-boundary management. Both seas also play an important economic and ecological part in the three countries bordering them: Indonesia, Timor-Leste and Australia. The area is extremely rich in marine resources as well as oil and gas reserves.

85 The Declaration endorses the key environmental issues addressed in the regional Strategic Action Programme, including: recovering and sustaining fisheries; restoring degraded habitats; reducing land-based and marine sources of pollution; protecting marine species and supporting adaptation to the impacts of climate change in relevant sectors. UNDP, working closely with relevant Ministries, provided the technical expertise to help shape the regional Strategic Action Programme, raise necessary funds for its implementation, and now look to the future to support the training, policies, governance and community-based projects to implement the Programme.

86 The Declaration also approved the creation of a regional mechanism between the Government of Indonesia, the Democratic Republic of Timor Leste and the Government of Australia to ensure that the essential coordination and capacity are in place for sustainable and integrated management of the region. The Government of Indonesia has committed to provide a Regional Secretariat for this coordinating mechanism to be located in Bali. The Strategic Action Programme may be accessed at: <http://www.atsea-program.org/publication-1/atsea-strategic-action-programme>.

87 The GEF/UNDP/IMO GloBallast project continued to make significant progress at all levels. In 2014, a

Global TestNet MoU was established and a Global R&D Forum conducted with almost 0.5 million co-financing from the Republic of Korea. The project developed two new ballast water management guidance documents and initiated a new training series on compliance monitoring and enforcement with emphasis on shipboard sampling and analysis of ballast water. The project was able to leverage its training and awareness raising tools to expand its outreach to a much larger geographical coverage with the support of Regional Coordinating Organization (RCO) and National Focal Points (NFP). These RCOs and NFPs continued to take the ownership of the project at regional and national level.

88 The project continues to be a flagship GEF International Waters project being highlighted and showcased as a successful example of GEF intervention, through a number of GEF and UNDP publications. The catalytic role of GloBallast in accelerating ratification of the Global Convention on Ship's Ballast Water and Sediments is evident from the fact that Argentina, Turkey and Jordan (Three Project LPCs) announced their ratification decision during the reporting year. The shipping industry also acknowledges the incremental role of GloBallast in preparing the countries through the preparation work especially on the compliance monitoring and enforcement area that the project started focusing on in 2014. Another key achievement was the signing of a global MOU between all technology testing facilities, which was mediated by GloBallast. In sum, the project made considerable progress towards all of its expected outcomes which involve 5 regions, 15 Lead Partner Countries and over 70 Partner Countries.

UNEP

UNEP's Marine and Coastal Strategy²

89 UNEP's marine and coastal 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 focusing on UNEP's core competencies of scientific assessment, policy, planning and communications, providing objective science-based information and enhancing users' capacities. UNEP's work focuses on using sound science to apply ecosystem management to factors that cause decline of ecosystem services in marine and coastal areas.

90 The strategy cuts across the seven sub-programme areas of the UNEP work programme: climate change, disasters and conflicts, ecosystem management, environmental governance, chemicals and waste, resource efficiency and sustainable consumption and production, and environment under review.

91 The Division of Environmental Policy Implementation (DEPI) is the lead Division for UNEP's marine and coastal programme. Activities are supported by the other UNEP Divisions such as the Division for Early Warning and Assessments (DEWA), Division for Environmental Law and Conventions (DELIC), Division for Technology, Industries and Trade (DTIE) as well

² <http://www.unep.org/depi>.

as UNEP collaborating Centres such as UNEP World Monitoring and Conservation Centre (UNEP-WCMC) and GRID-Arendal. A key strength of the marine and coastal ecosystem programme is its ability to facilitate cooperation at global, regional and national levels through the Regional Seas Programme and the Global Programme of Action for the Protection of Marine Environment from Land-based Activities (GPA).

92 The key areas of work include management of marine litter, wastewater and nutrients, and environmental aspects of fisheries; integrated management of marine protected areas; marine biodiversity and ecosystems; green economy for oceans; and impacts of climate change on the marine environment.

93 UNEP continues to provide technical support and capacity building for integrated management of marine and coastal ecosystems within the framework of its marine and coastal strategy. In particular support, is given to member states through the platforms of the GPA and the Regional Seas Conventions and Action Plans such as Abidjan Convention, Barcelona Convention, Cartagena Convention, COBSEA, Nairobi Convention, and NOWPAP. There is also extensive collaboration 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.

Regional Seas Programme³

94 UNEP has been coordinating the Regional Seas Programme since 1974. The Regional Seas Conventions and Action Plans are among the most important regional mechanisms for promoting conservation and sustainable use of the marine and coastal environment. There are currently eighteen Conventions and Action Plans (RSCAPs) around the world, encompassing 143 countries. UNEP administers six of the eighteen RSCAPs.

95 The Regional Seas Programme celebrated its 40th anniversary during 2014. From 29 September to 1 October 2014, UNEP organized the 16th Global Meeting of the Regional Seas Conventions and Action Plans in Athens, Greece. It focused on: a review of the implementation of Regional Seas Strategic Directions 2013-2016⁴, Sustainable Development Goals for oceans, and implementation of the Global Partnership for Marine Litter. In addition, a report ⁵ "*Regional Seas@40: Setting*

³ <http://www.unep.org/ecosystemmanagement/water/regionalseas40/>.

⁴ <http://www.unep.org/regionalseas/globalmeetings/15/RegionalSeasStrategicDirections2013-2016REV.pdf>.

⁵ <http://www.unep.org/ecosystemmanagement/water/regionalseas40/Resources/RegionalSeasReport/tabid/1060396/Default.aspx>.

a *Course for Regional Seas*” was published online to celebrate the 40th anniversary.

96 UNEP is preparing the 17th Global Meeting of the Regional Seas Conventions and Action Plans in October 2015 to be held in Istanbul, Turkey which will discuss the future directions of the programme considering its growing importance as a regional implementation platform under the post-2015 development agenda. A renewed Regional Seas strategy for 2017 – 2020 is also expected to be developed.

Activities in the regions:

*Abidjan Convention*⁶

97 The establishment of a Regional Coordination Centre for Marine Pollution Emergency marks an important milestone of the Abidjan Convention. On 10 July 2014, Nigeria was formally notified of the approval to host the centre, following the decision at the Convention’s 11th Conference of Parties. The centre should be operational in 2015 and will coordinate activity against transboundary marine pollution across the 22 coastal countries under the Convention’s jurisdiction.

98 In recognition of the need to be pro-active in the face of oil spills, the Abidjan Convention Secretariat held a number of technical meetings to draft regional environmental standards for the exploration of offshore oil and gas in West, Central and Southern Africa. A regional set of environmental standards to regulate offshore oil and gas activities, the first of its kind, will be tabled at the next Conference of Parties due in 2017.

99 Under the Canary Current Large Marine Ecosystem (CCLME) project, the Secretariat has developed a geographic database on habitats, biodiversity and training while completing the biodiversity assessment of the CCLME area, including marine protected areas and endangered species. It has assessed the impact of land-based activities on water and sediment quality, identified policy and legislative gaps for the transboundary diagnostic analysis, and compiled data relevant to pollution and ecosystem health in the CCLME region.

100 The “Securing the foundations for fish food security in a changing ocean, West, Central and South Africa” project is on-going with support from the Government of Norway. If successful, the project may be expanded to other regions. A workshop has been held to mark the initiation of the project. Future projects being prepared by the Secretariat include pilot projects on the sustainable development of coastal urban areas in Côte d’Ivoire, Ghana and Togo in partnership with UN-Habitat. Other projects on economic growth and institutional capacity-building are under preparation.

*Cartagena Convention*⁷

101 The Secretariat continued to execute the GEF Wastewater Management (CRew) Project. Awareness of wastewater management issues at ministerial levels

⁶ <http://abidjanconvention.org/>.

⁷ <http://www.cep.unep.org/cartagena-convention>.

has increased through the engagement of Ministers of Environment in High Level Sessions. Guyana, Antigua and St. Lucia have new and updated national policies, legislation and regulations for wastewater management. Wastewater Baseline Assessments have been completed and more than 400 persons were trained in various aspects of wastewater management.

102 A new project developed by the Secretariat, “Implementing Integrated Water, Land and Ecosystems Management in Caribbean SIDS (IWEco),” received GEF CEO endorsement in April 2015. It includes ten participating Caribbean Small Island Developing States⁸. Other projects developed and supported by the Secretariat in the Wider Caribbean Region include the Caribbean Large Marine Ecosystem Projects, CLME and CLME+, and the GEF-UNDP-IMO GloBallast Partnership Project which benefited the Bahamas, Jamaica, Trinidad and Tobago and Venezuela. A regional strategy for lionfish control⁹ and better practices has also been widely implemented, and marine spatial planning was applied to scenario building¹⁰ for the transboundary management of marine mammals. The Secretariat is also working towards the development of the first State of the Convention Area Report (SOCAR).

103 The Specially Protected Areas and Wildlife (SPAW) Sub-Programme saw the completion of its Mentorship Programme during 2014, with three mentorship agreements and capacity-building activities successfully concluded between mentors of at least three Marine Protected Areas (MPA) sites (Bonaire Marine Park; La Caleta, Dominican Republic; and Hol Chan, Belize) which are listed under the SPAW Protocol. A Cooperation Programme was launched to provide small grants to support listed Protected Areas (PAs), and assist with additional nominations. By the end of 2014, 13 PA listed sites were added under the SPAW Protocol, bringing the total to 31 areas from the Wider Caribbean Region listed by Parties. Parties have also applied the Protocol’s criteria for species listing and included four coral reef species as fully protected under Annex II.

104 A major project “Biodiversity for Sustainable Development in the Caribbean through Ecosystem Based Management” was launched in April 2015. It builds on the outcomes of regional support provided during 2011-2013 for the Caribbean Challenge Initiative. This new project will include capacity building and pilot activities for SPAW Parties aiming at the successful application of Ecosystem Based Management (EBM) approaches and tools as a contribution to the conservation and sustainable management of coastal and marine resources, including the application of Marine Spatial Planning (MSP) and Decision Support Systems (DSS) tools. In 2014 the Convention and its SPAW Protocol, together with Parties and partners, also facilitated the identification of Ecological or Biological Significant

⁸ <http://www.cep.unep.org/gef-iweco>.

⁹ <http://www.car-spaw-rac.org/?Invasive-Lionfish-A-Guide-to,454>.

¹⁰ <http://www.car-spaw-rac.org/?Scenarios-for-marine-mammal>.

Marine Areas (EBSAs) in the Wider Caribbean and Western Mid-Atlantic under the CBD.¹¹

105 The Regional Action Plan on Marine Litter Management in the WCR was revised and will form the basis for new Marine Litter projects in the Wider Caribbean Region.

*Coordinating Body on the Seas of East Asia (COBSEA)*¹²

106 COBSEA has continued to support UNEP in reducing the negative impacts of dive tourism on coral reefs, through the Green Fins Initiative. This is an innovative private/public partnership conservation initiative to reduce negative impacts of dive tourism on coral reefs by promoting private sector compliance with a code of conduct and raising awareness among regulators, diving companies and their customers. In 2014 the Initiative was introduced in two additional countries and total membership now stands at more than 400 diving and snorkelling operators across six countries in Asia, who are continuously improving their business practices to mitigate negative environmental impacts. A comprehensive Green Fins Toolbox of guidance materials and tools is being developed to facilitate further replication.

107 COBSEA has supported seven countries in preventing/reducing the impacts of natural disasters, climate change and sea-level rise, by building the capacity of national authorities through the development of national assessment reports on coastal erosion. Such reports are considered by countries to be major and fundamental documents and reference material for coastal erosion control and coastal development and management, and for the development of new or updated national plans, policies, strategies and programmes on coastal erosion at national and local levels. COBSEA has supported four countries in producing national review reports on natural resource governance frameworks, including a resource toolkit for community involvement. Capacity building and pilot-scale demonstration interventions focusing on communities and local government have been identified and implemented, to support the reform of natural resource governance.

*Mediterranean Action Plan (Barcelona Convention)*¹³

108 Within the Mediterranean Action Plan (UNEP/MAP) Barcelona Convention, the ecosystem approach has been strengthened at the regional level. It has been confirmed as a guiding principle for the overall work of UNEP/MAP Barcelona Convention, and has been implemented in practical terms, by agreeing on region-wide common Ecological Objectives, Indicators and Targets. These serve as a basis for an Integrated Monitoring and Assessment Programme, covering regional-level monitoring and assessment of biodiversity,

non-indigenous species, pollution, marine litter, coast and hydrography, in an integrated manner¹⁴.

109 The Mediterranean Action Plan (MAP) adapted the framework of the UNEP/MAP Barcelona Convention to establish a Regional Plan on Marine Litter, with legally-binding measures and operational targets to be adopted by 2025 in order to minimize and prevent marine litter.

110 On the regional level, work is ongoing in the framework of UNEP/MAP Barcelona Convention, towards the development of a Regional Climate Change Adaptation Framework. This aims to provide a regional approach to coordinating and assisting policy-makers and stakeholders at all levels across the Mediterranean to promote the right enabling environment for mainstreaming adaptation in national and local planning; promote and exchange best practices and low-regret measures; promote leveraging of necessary funding; and exchange and access best available data, knowledge, assessments and tools on adaptation. The objective is to increase the resilience of the Mediterranean marine and coastal natural and socioeconomic systems to the impacts of climate change¹⁵.

*Nairobi Convention*¹⁶

111 The Nairobi Convention has prepared a Regional State of the Coast Report (RSOCR)¹⁷ which responds to the requirements of the Nairobi Convention and contributes to the United Nations-led production of the World Ocean Assessment (WOA) reports and to other global and regional processes, such as the Global Environment Outlook coordinated by UNEP.

112 Following the capacity building workshops organised under the Regular Process for Global Reporting and assessment of the state of the marine environment including socioeconomic aspects, the Nairobi Convention decided to prepare its first baseline integrated assessment of the state of the marine and coastal resources. The aim of the workshops was to provide a background to the Regular Process; improve skills and knowledge for conducting integrated assessments of the state of coastal and marine environment; and introduce a uniform assessment methodology. The RSOCR aims to integrate the socio-economic and ecological systems of the WIO

¹¹ See more at <https://www.cbd.int/marine/ebsa/booklet-02-wcar-en.pdf>.

¹² <http://www.unepmap.org/index.php?module=content2&catid=001001004w.cobsea.org/>.

¹³ <http://www.unepmap.org/index.php?module=content2&catid=001001004>.

¹⁴ The Contracting Parties to the Barcelona Convention, at their 18th Meeting, in December 2013, adopted by Decision IG. 21/7 a Marine Litter Regional Plan, which entered into force on the 8th of July 2014. Specific marine litter regional reduction target will be submitted for adoption to the 19th Meeting of the Contracting Parties to the Barcelona Convention in February 2016.

¹⁵ The Contracting Parties to the Barcelona Convention, at their 18th Meeting, in December 2013, supports by Decision IG. 21/17 the preparation of a Climate Change Adaptation Framework, to be reviewed by MCSD and submitted for consideration to the 19th Meeting of the Contracting Parties in February 2016.

¹⁶ <http://www.unep.org/nairobiconvention/>.

¹⁷ http://www.unep.org/NairobiConvention/Publications/Regional_State_of_Coast_Report_for_the_Western_Indian_Ocean.asp.

region by using a uniform methodology based on the Opportunities Framework and the DPSIR (Drivers, Pressures, Status, Impacts, and Responses) approach. The RSOCR's approach has been adapted from the WOA framework; however the content and organization of the concluding chapters are based on the distinct needs of the WIO region. The political process and mandate was led by the Contracting Parties and their National Focal Points to the Nairobi Convention, and the technical process was guided by the Western Indian Ocean Marine Science Association and involved a representative set of scientists with broad experience in the region. The RSOCR's main objectives are to provide a comprehensive baseline, highlight main opportunities, describe successes and challenges, identify capacity building needs, identify knowledge gaps, and propose policy options. The RSOCR was launched during the 8th Conference of Parties (CoP) held 22-24 June 2015 in Mahe, Seychelles.

113 The Nairobi Convention Secretariat in collaboration with the Western Indian Ocean Marine Scientists Association prepared the Climate Change Strategy for the Nairobi Convention Area in the period 2013-2015. The Strategy was presented and discussed by the Contracting Parties at the Eighth CoP. The Strategy will be finalized by December 2015 and will enable the Contracting Parties to the Nairobi Convention to integrate relevant recommendations of the Climate Change Strategy into their national climate change strategies and develop policies, programmes and projects on climatic variability and climate change.

114 "Blue economy", as a model to improve socio-economic development in the Western Indian Ocean Region in the ocean and coastal sectors, is gaining momentum in the development agenda of the Contracting Parties to the Convention. As a follow up to the first workshop held 11-13 December 2013, a second workshop was organized 17-18 June 2015 in Mahe, Seychelles. The aim was to facilitate intergovernmental dialogue on the principles, valuation and enabling frameworks for blue economy. As a result, South Africa has developed Operation PHAKISA, Seychelles has blue economy and Mauritius has ocean economy, while other countries are in the process of defining and developing blue economy pathways.

*Northwest Pacific Action Plan (NOWPAP)*¹⁸

115 Within the framework of the NOWPAP Medium-term Strategy (MTS) 2012-2017, NOWPAP Regional Coordinating Unit and four Regional Activity Centres continue to address marine and coastal environmental issues such as harmful algal blooms (HAB) and accidental spills of oil and hazardous chemicals. 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. In September 2014, a

regional workshop was organized to discuss Ecological Quality Objectives for the NOWPAP region.

116 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). NOWPAP is actively participating in the Global Partnership on Waste Management (GPWM) and Global Partnership on Marine Litter (GPML), hosting the NW Pacific regional node of the GPML since 2014.

Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA)¹⁹

117 The GPA focused 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.

118 The wastewater portfolio has strengthened the normative basis for better wastewater management. The GPA is coordinating activities under the UN-Water Task Force on Wastewater. The key activity of the Task Force was publication of an Analytical Brief on Wastewater, launched in February 2015. The Brief encourages governments to view treated wastewater as a valuable resource, and a priority for the post-2015 development agenda. It also warns that untreated wastewater, if not addressed, will increasingly pose a threat to human health, economic activity and water security.

119 The programme also completed an economic valuation of the impacts of wastewater, published in June 2015. GPA provided support to the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA) in developing Regional Guidelines on Wastewater Management in Coastal Cities on the Red Sea and Gulf of Aden. The aim is to help improve wastewater management and reduce the pollution loads in the coastal cities of the PERSGA region.

120 The Swiss Government gave approval for the initiative on the development of a Global monitoring mechanism for wastewater, water quality, and water resource management, with substantial financial support from the Swiss Development Cooperation (SDC). The GPA is also working in close collaboration with the UN-Habitat on the Greener Cities Partnership which was launched at the World Urban Forum in April 2014. Focusing on wastewater activities, the partnership was set up in response to the call of the Executive Directors of UNEP and UN-Habitat to raise the visibility and profile of the inter-agency cooperation.

121 The Global Wastewater Initiative (GW2I), launched by the Executive Director in 2013, is expanding, with more partners engaging in the promotion of demonstration projects on wastewater management. One project in Georgia, implemented by Women in Europe for Common Future (WECF), aims to reduce the pollution load in the Black Sea, by introducing

¹⁸ <http://www.nowpap.org/>.

¹⁹ <http://www.gpa.unep.org/>.

sustainable wastewater and nutrient management in rural Georgian communities. Knowledge products have been generated for decision-makers and practitioners, including a technology matrix on wastewater treatment technologies and supportive policies and financial instruments for integrated wastewater management and reuse.

122 One of the main focuses of the GPA during the period under review was continued development of the Global Partnership on Marine Litter (GPML). Launched during the United Nations Conference on Sustainable Development, Rio + 20 in June 2012, GPML 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. UNEP 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.

123 Various activities are underway in collaboration with partners, including a major publication "Plastics in Cosmetics", launched on World Oceans Day in June 2015. The most significant development in the area of marine litter was its inclusion in the Declaration of the G7 meeting in June 2015.

124 During the First Session of the UN Environment Assembly (UNEA-1) in June 2014, Member States requested the UNEP Executive Director, in consultation with other relevant institutions and stakeholders, to undertake a study on marine plastic debris and marine micro-plastics; building on existing work and taking into account the most up-to-date studies and data. The study is to be delivered to UNEA-2 in May 2016 and to feed into policy discussions. Various entities have been engaged in parallel processes to implement the different components. UNEP, through the GPA, as Secretariat of the GPML, is overseeing the process. The core study is being undertaken by the GESAMP Working Group 40 (WG 40). The kick-off workshop for the development of the UNEA-2 study was held in Rome from 20 to 22 April and hosted by FAO.

125 GRID-Arendal has been engaged to produce awareness-raising products and tools that can be used to reach out to policy-makers and decision-makers. Key among this is Vital Graphics on Marine Litter. The material will also target non-specialized audiences, including private sector stakeholders and the consumers, since they are the ones who, in cooperation with policy makers, can actually contribute to more resource-efficient use and sound management of plastics and micro-plastics.

UNEP coral reef-related work

126 Global change and local pressures are driving declining coral reef health around the world, and accelerated loss of ecosystem services will increasingly affect people dependent on these reefs in more than 100 countries. In 2014, UNEP initiated a Global Coral Reef Partnership to support countries to deliver internationally-agreed coral reef commitments, including Aichi Target 10. Developed in response Global Strategic Directions for the Regional Seas 2013-2016, the partnership brings together RSCAP, participating countries, and NGOs, academic institutions and private sector partners, to collaborate to achieve ecosystem-based management of coral reefs. The partnership is the primary vehicle for strengthening implementation of the International Coral Reef Initiative (ICRI) call to action through RSCAP.

127 The four substantive work areas of the partnership address key challenges facing coral reefs: building coral reef resilience to climate change and ocean acidification; strengthening use of coral reef ecosystem service values in public and private decision-making; enhancing data and information provision for ecosystem-based coral reef planning and management; and securing institutional support and outreach. UNEP hosts the partnership secretariat.

128 The Partnership is making progress in all its thematic work areas:

- In collaboration with NOAA and other partners, guidelines on use of resilience indicators and assessments to support spatial as well as sectoral planning in coral reef areas are being developed. This also encompasses development of datasets on future climate change exposure scenarios at a spatial scale that enables better prioritization of reef management actions.
- A report on mesophotic reefs and their role in supporting resilience of shallow-reef habitat, prepared in collaboration with GRID-Arendal, and a science-to-policy brief on wastewater pollution on coral reefs, prepared through collaboration with the Global Wastewater Initiative, will be launched in the third quarter of 2015.
- A demonstration project on the use of economic instruments to finance reef management through the establishment of a marine managed area, development of a public private partnership agreement, and a scheme for payment for ecosystem services, is being initiated in Barbados. This will develop guidance on the use of economic instruments, based on the ecosystem services provided by coral reefs.
- The Global Coral Reef Monitoring Network (GCRMN) report *Status and Trends of Caribbean Coral Reefs: 1970-2012* was launched in 2014. Based on its

recommendations, standard indicators and methods for coral reef monitoring in the Wider Caribbean have been developed, and their application in national programmes is being supported through the Regional Activity Centre for Specially Protected Areas and Wildlife of the Caribbean Environment Programme. Drawing on this experience, a regional GCRMN reporting process has been initiated in the Western Indian Ocean through the Indian Ocean Commission and Nairobi Convention.

- Partnership work and outputs are also reflected in decisions of intergovernmental bodies. These include the priority actions to achieve Aichi Biodiversity Target 10 for coral reefs and closely associated ecosystems, as contained in the annex to CBD CoP decision XII/23; the Abidjan Convention Conference of Parties Decision 11/6 on coral reefs, which emphasizes the importance of preserving coral reef ecosystem services, and collaboration on development and tools and methods as well as a network of marine protected areas for management of coral reefs; the recommendations of the Scientific and Technical Advisory Committee of the SPAW protocol to the Cartagena Convention in relation to strengthening regional coral reef monitoring and the implementation of the “ICRI Regional Strategy for the Control of Invasive Lionfish in the Wider Caribbean” developed with support from UNEP.

The Regular Process

129 The current process referred to as World Oceans Assessment (WOA), with its secretariat (UN DOALOS) and member states, is implementing the first integrated assessment cycle 2010-2015. UNEP has been providing technical and scientific support in the following areas: a) communication: initial support to set up a communications portal for use by the Group of Experts and member states; b) assessments: sharing its extensive knowledge gained through the GEO processes and in the development of integrated assessments; c) capacity building: support to member states on the Regular Process in the organization/facilitation of regional workshops through the platform of the Regional Seas Conventions and Action Plans; and d) resource mobilization: engagement with potential donor countries to support the Regular Process.

130 In 2009, the UN General Assembly approved the framework for the Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects (Regular Process). The framework consists of: the overall objective for the Regular Process; a description of the scope of the Regular Process; a set of principles to guide its establishment and operation; and best practices on key

design features for the Regular Process as identified by the Assessment of Assessments.

131 From 2009 to 2011, the UN General Assembly set up, on the recommendations of the Ad Hoc Working Group of the Whole (AHWG), the main institutional arrangements for the Regular Process. The Group of Experts proposed a draft outline for this first global integrated assessment of the marine environment – World Ocean Assessment I. After detailed dialogue, revision and consideration by the AHWG, this outline was endorsed by the UN General Assembly in 2012 (with an amendment approved by the AHWG in 2014).

132 The chapters on specific themes have been prepared by writing teams of one or more members, led by Convenors from the Group of Experts or the Pool of Experts. One or more lead members from the Group of Experts have overseen the preparation of (or, in some cases, prepared) each draft chapter. The draft chapters have been reviewed, in some cases by one or more commentators and, in all cases, by the Group of Experts as a whole. A first round of editing was done in 2014. In December 2014, all chapters were sent out for review to Member States, peer reviewers and intergovernmental organizations. By March 2015, nearly 5,000 comments had been received. The writing teams and the Group of Experts responded to these and revised the chapters accordingly. In July 2015, all chapters were sent to the Bureau of the AHWG, to be approved for submission to the AHWG. A final round of editing will be done before the document is published. The summary will be issued as a document of the UN General Assembly for its final approval by the Assembly at its 70th session. Editing of the report has been supported by UNEP and UNESCO.

The GEF Transboundary Waters Assessment Programme (TWAP)

133 The Transboundary Waters Assessment Programme (TWAP) is completing the first indicator-based global assessment of five recognized transboundary water system categories (aquifers and SIDS groundwater, lakes and reservoirs, river basins, large marine ecosystems, and the open ocean). It has also formalized the institutional partnerships for the current assessment, which may seed future expert and management practitioner networks for subsequent global assessments of international waters. Fulfilling these main goals, the TWAP envisions that its knowledge products and expert networks will be useful in assisting the GEF and other international organizations to improve the setting of priorities. In addition, the thematic (biophysical, socioeconomic and governance) indicators developed by TWAP may be used to help track the impacts of management interventions in terms of changes in the states of the aquatic environments under consideration. Integration of the methods, indicators and baseline results of TWAP into mainstream work plans of UNEP and its partner agencies, as the main platforms for sustaining the assessment and monitoring of international waters, is in process.

134 The five water-category assessments cover 199 transboundary aquifers and groundwater systems in 43 small island developing states, 206 transboundary lakes and reservoirs, 286 transboundary river basins, 66 large marine ecosystems, and the open ocean, with a total of 758 international water systems. The assessment results are organized into five technical reports, with a sixth volume providing a cross-category analysis of status and trends. Each will include a summary for policy makers. The TWAP Data Portal at <http://www.geftwap.org> aims to provide access to all the indicators that are used in the global assessment, and complements category-specific websites that will showcase water system profiles and databases. Publication of all TWAP products is being completed in 2015 and will be formally launched in 2016.

135 The execution of the TWAP is coordinated by UNEP (Division of Early Warning and Assessment as executing unit and the Division of Ecosystem Policy Implementation 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: UNEP-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: UNEP-DEWA; and Data and information management: UNEP/DEWA/GRID-Geneva.

UNEP's activities in support of Small Islands Developing States (SIDS)

136 Building on the issues identified by the Foresight Process for SIDS: Emerging Issues for Small Island Developing States²⁰, the Global Environment Outlook (GEO) for SIDS provided an outlook on four key areas: Green/blue economy, reconnecting with nature, priorities for island communities, and nature technological leap-frogging. The GEO for SIDS Outlook report was launched during the SIDS summit in September 2014. In addition, UNEP has made available relevant data flows and knowledge related to key SIDS issues on its new web-based knowledge management platform UNEP-Live²¹.

137 UNEP-Live, a new system-wide approach to keeping the environment under review, has been developed by UNEP with the aim of supporting assessment processes through the provision of substantiated, contextualized knowledge about the environment by developing richer sets of data and knowledge flows and bringing together diverse communities of practice. It also aims to facilitate the exchange and sharing of the latest data, information, assessments and knowledge among member countries, research networks, communities of practice, indigenous

peoples and society, in order to keep the environment and emerging issues under review.

Global Resources and Information Data Centre (GRID-Arendal)

138 GRID-Arendal a centre collaborating with the UNEP, supporting informed decision making and awareness-raising through: a) Environmental information management and assessment; b) Capacity building services; and c) Outreach and communication tools, methodologies and products.

139 GRID-Arendal has been actively involved in building capacity in ecosystem-based marine management in developing countries. Marine spatial planning, polar and mountain environments and state of the environment reporting are some of the other areas of focus of marine and coastal activities for GRID-Arendal.

140 Having worked with UNEP and the International Oceanographic Commission (IOC) of UNESCO to develop a 'Capacity Building for State of the Marine Environment Reporting' programme, a draft work plan has now been prepared by GRID-Arendal, and consultations are ongoing with UNEP and IOC. GRID-Arendal also helped UNEP draw up a global support programme for the Regional Seas Programme; this is now being tested in West Africa.

141 Geomorphic habitat map: For the Pacific, GRID-Arendal, in collaboration with Conservation International (CI) and Geoscience Australia, published the first digital map of global seafloor geomorphology. The spatial data for the map has been made available to support planning, research and improved environmental management.

142 GRID-Arendal has provided the global seafloor geomorphic habitat map and additional analysis of seamounts, canyons and marine minerals to the Pacific Ocean Ecosystem Analysis (PACIOCEA) project. This project is exploring marine spatial planning in the island nations of the South-western Pacific and is jointly run by the French Marine Protected Areas Agency and coordinated by the Secretariat of the Pacific Regional Environment Programme (SPREP). Staff from GRID-Arendal attended a PACIOCEA project workshop in August 2014 in Noumea to present this analysis and engage with other project partners in exploring spatial issues in the wider Pacific Region.

143 Support to the regional seas conventions and action plans: GRID-Arendal continued to support the Regional Seas Conventions and Action Plans; the Interim Secretariat of the Tehran Convention was supported in preparing the key documents to inform the Fifth Conference of the Parties (COP5) and further development of the Caspian Environmental Information Center. The State of the Marine Environment (SoME) web-based reporting portal commissioned by the Secretariat of the Abidjan Convention was delivered and presented at the 11th Conference of the State Parties to the Abidjan Convention in March 2015. The basic approach was also adopted by the states parties in decision CP11/13, for implementation throughout the entire region.

²⁰ http://www.unep.org/pdf/Emerging_issues_for_small_island_developing_states.pdf.

²¹ <http://www.unep-live.org/>.

144 The Secretariat of the Abidjan Convention also received support for implementation of the formal partnership agreement between GRID-Arendal and the Convention Secretariat. The specific objective of this agreement is to support the Secretariat in increasing the awareness and capacity of member states of the Abidjan Convention to: a) apply the ecosystem-based management approach; b) report on the state of the marine environment; c) implement a 'blue carbon' approach to coastal habitat protection (e.g. mangrove habitats) and the promotion of sustainable livelihoods; d) understand the socio-economics of the West African Coast and its marine and coastal communities; and e) enable first-hand marine research by young marine scientists from the Abidjan Convention region.

145 In late 2013, some coastal countries in West Africa agreed to a joint submission to the Commission on the Limits of the Continental Shelf (CLCS). A document for joint submission was prepared with the seven countries of the West African Continental Shelf Initiative. GRID-Arendal and Norwegian Petroleum Directorate (NPD) experts made excellent progress in analyzing and compiling the necessary technical information. There was agreement amongst all coastal states that the submission was ready to be lodged with the CLCS. The joint submission was lodged in September 2014 and will be presented to the CLCS in August 2015.

146 A submission for Somalia was prepared by GRID-Arendal as part of collaboration between Norway and Somalia. The submission was lodged with the CLCS in 2014, following an examination by the Somali government. Although no national experts were involved in the main submission preparation work, one national expert did receive technical training in the first quarter of 2015.

147 Blue carbon initiative: The Abu Dhabi Blue Carbon Demonstration Project was closed in 2014. One of the deliverables of the Abu Dhabi Blue Carbon Demonstration Project was a report entitled Building Blue Carbon Projects: An Introductory Guide. This report, put together with many international partners including UNEP, explores how blue carbon can work, by using the value of carbon stored and sequestered in coastal and marine ecosystems to support conservation and sustainable management. The international GEF/UNEP Blue Forests Project, with demonstrations and project work in five continents was launched. In November 2014, GRID-Arendal presented an invited webinar on the blue carbon initiative, through the Ecosystems-based Management (EbM) Tools Network and the Open Channels Forum for Ocean Planning and Management.

UNEP-World Conservation Monitoring Centre (WCMC)

148 UNEP-WCMC is the specialist biodiversity assessment arm of the UNEP based in Cambridge, UK. The focus of Marine Programme of the UNEP-WCMC is to develop and share data, tools, and analyses to inform decisions regarding the conservation of marine and coastal biodiversity. During the period under review, the Programme focused on three main areas: Improving and enhancing data, the effective use of data through

analysis and interpretation and supporting marine spatial planning for improved conservation and resource use.

149 The Programme has developed an Ocean Data Viewer, which provides easy access to a range of biodiversity-related datasets drawn from internationally-respected scientific institutions and organizations. The quality of datasets has been improved with detailed metadata and background information that accompany them.

150 The first global map of saltmarshes as well as an online tool to facilitate collection of coastal habitat data has been developed. The importance of such coastal habitats to communities was also highlighted in a recent report produced by the programme, entitled Importance of Mangroves to People: A Call to Action²². Tailored marine biodiversity information and analyses were provided to the business industry through UNEP-WCMC's industry collaboration, Proteus, with more than 25 oil and gas companies. Use of marine data in the course of screening for new projects was a key focus and a journal paper²³ investigated how 'Critical Habitat' could be mapped in accordance with the International Finance Corporation's Performance Standard six criteria.

151 The centre worked with The Nature Conservancy (TNC) and other collaborators to develop the first global map of marine ecosystem services using our protected area data and expertise. This was used to assess the extent to which marine ecosystem services are represented within protected areas. The project was presented at the World Parks Congress in November 2014. Significant work was undertaken to improve the marine protected areas (MPAs) data within UNEP-WCMC's World Database on Protected Areas which has resulted in a better understanding of the global number of MPAs. This formed the basis of a journal paper²⁴ which evaluated official marine protected area coverage in relation to Aichi Target 11 and was also presented at the World Parks Congress. In order to bridge the gap between biodiversity data and policy reporting needs, the marine programme published²⁵ the identification and analysis of 'Essential Biodiversity Variables'. Substantial improvements were made to the Madingley Model (the first general ecosystem model) by facilitating the integration of fisheries data in order to improve understanding of the holistic structure and function of ecosystems and of how to mitigate associated impacts.

152 Within a UNEP DEPI/GEF STAP funded initiative, the centre hosted a workshop and developed a global survey of MSP initiatives to establish the challenges

²² http://apps.unep.org/publications/index.php?option=com_pub&task=download&file=-The%20importance%20of%20mangroves%20to%20people_%20a%20call%20to%20action-2014Mangrove.pdf.

²³ A global map to aid the identification and screening of critical habitat for marine industries.

²⁴ Evaluating official marine protected area coverage for Aichi Target 11: appraising the data and methods that define our progress.

²⁵ Bridging the gap between biodiversity data and policy reporting needs: An Essential Biodiversity Variables perspective.

and enabling factors that influence MSP success. Preliminary results were published²⁶ in support of the Convention on Biological Diversity (CBD) Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA). As part of a 5-year GEF-funded FAO/UNEP project, UNEP-WCMC began work to test how existing area-based planning tools could be applied to ABNJ deep-sea conservation and resource use. The project will be piloted in the Southeast Pacific Ocean and Western Indian Ocean, in collaboration with CPPS and the Nairobi Convention respectively.

United Nations Division for Ocean Affairs and the Law of the Sea, (DOALOS)

Office of Legal Affairs

(Report covering June 2012 to June 2014)

Introduction

153 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), the 1995 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 January 2012.

United Nations Conference(s)

Rio+20 Conference and post-Rio implementation

154 The outcome of the 2012 United Nations Conference on Sustainable Development, entitled the “Future we want”, gives pre-eminence to the role of oceans and seas in achieving sustainable development. At the Conference, Member States recognized the 1982 United Nations Convention on the Law of the Sea (UNCLOS) as the legal framework for the conservation and sustainable use of the oceans and seas and their resources, as well as the importance of the Convention in advancing sustainable development. In addition, building on the work of the Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction (“the Working Group”), Member States committed to address, before the end of the sixty-ninth session of the General Assembly (September 2014-September 2015), on an urgent basis, the issue of the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, including taking a decision on the development of an international instrument under UNCLOS. In its resolution 68/70 of 9 December 2014, the General Assembly endorsed this commitment and established a process, within the Working Group, to facilitate its action on the matter (see information on the work of the Working Group below).

²⁶ Marine Spatial Planning in Practice—transitioning from planning to implementation.

155 The outcome document also mandated the development of sustainable development goals for incorporation in the post-2015 development agenda.²⁷ Upon the end of its work, the General Assembly Open-ended Working Group on Sustainable Development Goals (July 2014), adopted 17 goals and targets, including goal 14 entitled: “Conserve and sustainably use the oceans, seas and marine resources for sustainable development”. Its targets include references to the need to protect marine and coastal ecosystems to avoid significant adverse impacts, to address ocean acidification including through enhanced scientific cooperation, and to increase scientific knowledge, develop research capacities in order to improve ocean health and to enhance contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed States.²⁸

156 In this regard, the Rio+20 outcome also called for the convening of the third United Nations Conference on Small Island Developing States, which took place in Apia, Samoa, from 1 to 4 September 2014. Along with the United Nations Under-Secretary-General for Legal Affairs and the United Nations Legal Counsel, DOALOS participated in a number of events organized at the conference including a side event organized by the Pacific Island Forum to discuss some of the pressures on the oceans and the role of UNCLOS in addressing them, and another event by the Chief Executives Board for Coordination, which will discuss oceans and sea. The Legal Counsel, as focal point for UN-Oceans, also delivered a keynote speech on behalf of UN-Oceans during the Multi-stakeholder’s partnership dialogue on “Oceans, Seas and Biodiversity”, which place on Wednesday 3 September

General Assembly processes

United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea

157 In 2012, the thirteenth meeting of the Informal Consultative Process discussed the topic entitled: “Marine renewable energies”.²⁹ The fourteenth meeting of the ICP, which took place in June 2013, discussed the “Impacts of ocean acidification on the marine environment”.³⁰ In 2014, the fifteenth meeting focused its discussions on the “Role of seafood in global food

²⁷ See para. 162 of the outcome document, “The future we want” at: <http://www.uncsd2012.org/content/documents/727The%20Future%20We%20Want%2019%20June%201230pm.pdf>.

²⁸ See http://sustainabledevelopment.un.org/content/documents/4518SDGs_FINAL_Proposal%20of%20OWG_19%20July%20at%201320hrsver3.pdf.

²⁹ See Thirteenth Meeting document: Discussion Panel on Marine Renewable Energies, available at: http://www.un.org/depts/los/consultative_process/consultative_process.htm.

³⁰ See Fourteenth Meeting document: Discussion Panel on the impacts of ocean acidification on the marine environment, document available at: http://www.un.org/depts/los/consultative_process/consultative_process.htm.

security".³¹ As in the past, the meetings were organized around panel presentations by experts representing developed and developing countries and reflecting various perspectives and disciplines, followed by interactive discussions.

Ad hoc Working Group of the Whole on the Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects

158 An updated timetable for the completion of the first World Ocean Assessment (WOA) was presented during the 2013 meeting of the Ad Hoc Working Group of the Whole. It established a new deadline for the submission of the final text of the first WOA in December 2014.³² At its meeting in April 2014, the Ad Hoc Working Group of the Whole decided on guidance for the Group of Experts and the secretariat of the Regular Process (DOALOS) concerning the preparation of the first WOA.³³ It was decided that the report would be sent in two instalments, one in June 2014, and a final draft containing all chapters, by the end of August 2014.³⁴ Member States were given until the end of October 2014 to complete their review.³⁵ On 29 August 2014 the Bureau of the Working Group decided to postpone the circulation of the entire draft, including updated initial draft chapters, to a date to be determined by the Bureau upon consultation with the Group of Experts and the revised timeline will be presented for information to Member States during the informal consultations on the draft resolution on oceans and the law of the sea. The Group of Experts nominated by Member States is currently assisted by a pool of experts of about 600 individuals representing all five continents.³⁶ As part of the WOA report, which was prepared under the guidance of the Bureau of the Ad Hoc Working Group of the Whole, the Group of Experts also prepared a Summary which aims to highlight in particular the needs for capacity building and effective approaches to meeting such needs.³⁷ In this regard, the Group is also preparing a preliminary inventory of existing opportunities and arrangement for capacity-building for assessments.

³¹ See Fifteenth Meeting document: Discussion Panel on the role of seafood in food security, available at: http://www.un.org/depts/los/consultative_process/consultative_process.htm.

³² See A/68/82 at annex 1, available at: <http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N13/334/83/PDF/N1333483.pdf?OpenElement>.

³³ The outcome of the meeting is available at: <http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N14/307/26/PDF/N1430726.pdf?OpenElement>.

³⁴ Ibid. paragraph 8.

³⁵ Ibid.

³⁶ See Regular Process, appointments to the pool of experts, updated August 22nd 2014, document available at: http://www.un.org/depts/los/global_reporting/chart_210814.pdf

³⁷ See "Report on the work of the Ad Hoc Working Group of the Whole on the Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects", available at: <http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N14/307/26/PDF/N1430726.pdf?OpenElement>.

Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction

159 In early May 2013, and pursuant to a request from the General Assembly, the Secretary-General convened two intersessional workshops aimed at improving the understanding of issues and clarifying key questions relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction as an input to the work of the Working Group: marine genetic resources; and conservation and management tools, including area-based management and environmental impact assessments.³⁸ In its resolution 68/70 of December 2013, the Assembly established a new process within the Working Group to prepare for the decision called for in paragraph 162 of the Future we want. In this regard, the Working Group was mandated to make recommendations on the scope, parameters and feasibility of an international instrument under UNCLOS. To that end, the Secretary-General was requested to convene three meetings of the Working Group, with the possibility of the General Assembly deciding that additional meetings would be held, if needed. The first two meetings of the Working Group took place respectively from 1 to 4 April and from 16 to 19 June 2014³⁹ and third meeting from 20 to 23 January 2015.

The 10th round of Informal Consultations of States Parties to the United Nations Fish Stocks Agreement

160 It took place in New York on 7 April 2014. Pursuant to General Assembly resolution 68/71 of 9 December 2013, the meeting considered regional, sub-regional and global implementation of the Agreement and initial preparatory steps for the resumption of the Review Conference on the Agreement. At the meeting, delegations agreed that the Review Conference should be resumed in 2016, and that another round of Informal Consultations should be held in 2015, primarily as a preparatory meeting for the resumed Review Conference.

161 In accordance with past practice, delegations also agreed on a Timeline and Programme of Work of preparations for the resumption of the Review Conference, on the understanding that there are elements that would need to be decided by the General Assembly in its annual resolution on sustainable fisheries, to be adopted at its sixty-ninth session. One such element is a request to the Secretary-General to prepare a report in advance of the resumed Review Conference, in cooperation with the Food and Agriculture Organization of the United Nations, with input from States and relevant intergovernmental organizations.

³⁸ See document A/A.C.276/6 at: <http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N13/359/12/PDF/N1335912.pdf?OpenElement>.

³⁹ See A/69/82. All other outcomes at <http://www.un.org/Depts/los/biodiversityworkinggroup/biodiversityworking-group.htm>.

162 In 2015 the General Assembly will conduct a further review of the actions taken by States and RFMOs in response to relevant resolutions to address the impacts of bottom fishing on vulnerable marine ecosystems and the long-term sustainability of deep sea fish stocks. This follows the previous reviews conducted by the General Assembly in 2006, 2009 and 2011.

Celebrations and other events

Anniversaries of UNCLOS

163 2012 and 2014, respectively, marked two important milestones for UNCLOS, namely and respectively, the thirtieth anniversary of its signature, and the twentieth anniversary of its entry into force. These occasions provided the opportunity to emphasize the role of UNCLOS as the legal framework within which all activities in the oceans and seas must be carried out, reiterate the need for further accessions and ratifications to reach the goal of universal participation and recall the need for effective implementation of UNCLOS and its Agreements to address the numerous challenges facing the oceans.

United Nations World Oceans Day celebrations

164 Celebrated each year since 2008 on 8 June, the Division organized the celebration of World Oceans Day in 2012, on the theme “UNCLOS at 30” and in 2013 on the theme “Oceans & People”. The theme for World Oceans Day 2014 was “Together let’s ensure oceans can sustain us into the future”.⁴⁰ This last celebration coincided with the Meeting of States Parties to UNCLOS and the commemoration of the 20th anniversary of the entry into force of UNCLOS and provided an opportunity to remind the international community of the status of UNCLOS as the “constitution for the oceans”, and the broad reach of its provisions.

2012 World Oceans Expo Yeosu

165 In August 2012, at Yeosu, DOALOS organized an international conference “Commemorating the 30th Anniversary of the Opening for Signature of the United Nations Convention on the Law of the Sea”.

World Meteorological Organization (WMO)

166 The activities of WMO dealing with ocean issues are of a multidisciplinary nature and are largely carried out through scientific and technical programmes in cooperation with other specialized agencies of the United Nations.

WMO/IOC/ICSU World Climate Research Programme (WCRP)

167 Research on physical oceanography and ocean ecosystems and biogeochemistry, which is of prime priority for GESAMP, are continuously becoming more integrated and interlinked within the World Climate Research Programme (WCRP), particularly through its CLIVAR (Climate and Ocean – variability, Predictability and Change) core project.

⁴⁰ See <http://www.un.org/Depts/los/wod/index.html>.

168 By consolidating 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 change, as well as the associated benefit to society and the environment in which we live. For example through predictive experiments on the future state of climate system and how it will evolve under different emission scenarios. As the follow-up to the discussion made at the Open Science Conference (OSC) entitled “Climate Research in Service to Society” (<http://conference2011.wcrp-climate.org>), Denver, Colorado, USA, October 2011, the WCRP has been implementing Grand Science Challenges on the following subjects (<http://www.wcrp-climate.org/index.php/grand-challenges>):

- .1 Cloud, Circulation and Climate Sensitivity;
- .2 Melting Ice and Global Consequences;
- .3 Understanding and Predicting Weather and Climate Extremes;
- .4 Regional Sea-level Change and Coastal Impacts; and
- .5 Changes in water availability.

169 These research topics are seen by WCRP as scientific challenges of particularly high societal importance and as areas of research in which it is possible to expect significant progress within five to ten years. The Grand Challenges serve as unifying themes across the four WCRP core projects, i.e. CLIVAR, CliC, GEWEX and SPARC, and the various working groups that develop implementation plans for the Grand Challenges. They are designed to be continuously evolving, with new Grand Challenges being discussed as others conclude.

170 CLIVAR (<http://www.clivar.org/>) is the main WCRP core project dealing with ocean-related climate research matters and aims at understanding the dynamics, the interaction, and the predictability of the coupled ocean-atmosphere system, in particular:

- Intraseasonal, seasonal and interannual variability and predictability of monsoon systems
- Decadal variability and predictability of ocean and climate variability
- Marine biophysical interactions and dynamics of upwelling systems
- Sea Level Rise and Regional Impacts
- Trends, nonlinearities and extreme events
- ENSO in a changing climate
- Consistency between planetary heat balance and ocean heat storage

171 Three of the Research Foci have been endorsed for implementation in 2015 by the CLIVAR Scientific Steering Group (SSG), namely Decadal Climate

Variability and Predictability, Consistency Between Planetary Energy Balance and Ocean Heat Storage and ENSO in a Changing Climate. The Research Foci on Monsoons and on Marine Biophysical Interactions and Dynamics of Upwelling Systems (in collaboration with the Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) project) will further develop their plans, to be reviewed by the SSG by the end of 2015 with a view towards implementation in 2016. The CLIVAR Research Focus areas on Sea Level Rise and Extremes are being implemented as WCRP Grand Challenges previously mentioned.

172 CLIVAR will be holding a major Open Science Conference on September 16-23, 2016 in Qingdao, China entitled "Charting the course for future climate and ocean research" as well as an associated Early Career Scientists Symposium on the 15-18, September (<http://www.clivar2016.org>).

WMO Marine Meteorology and Oceanography Programme (MMOP)

173 MMOP plays a vital role in supporting human activities on and adjacent to the world's oceans and in contributing to the sustainable use of ocean resources. MMOP coordinates, regulates, and facilitates the sustained provision of global and regional coverage observational data, products and services to address the continued and expanding requirements of the maritime user community for met-ocean services and information, focusing on safety of life and property at sea, integrated coastal management and societal impacts. The overall technical guidance and governance for MMOP is provided by the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), jointly sponsored by WMO and IOC of UNESCO (<http://www.jcomm.info/>).

WMO World Weather Research Programme (WWRP)

Sub-seasonal to Seasonal Prediction Project

174 Ocean-sea-ice-atmosphere interaction is one of the key challenges of weather and climate prediction from days to seasons. The WMO World Weather and World Climate Research Programme's Sub-seasonal to Seasonal Prediction Project aims to provide predictions from two weeks to two months ahead. The sub-seasonal to seasonal timescale is a very important one as many management decisions in agriculture and food security, water disaster risk reduction and health fall into this range. Improved weather-to-climate forecasts tailored to key social needs promise to be of significant socio-economic value. The representation of atmospheric phenomena – such as the Madden Julian Oscillation (MJO) and improved coupling with, and initialization of, the land-ocean-cryosphere and stratosphere – has been proved to extend predictability beyond 20 days. A sub-seasonal to seasonal database gathering most of the global prediction systems has been organized under this WMO initiative and is has been hosted by the European Center for Medium-Range Weather Forecast and the China Meteorological Administration since May 2015.

WMO Global Atmosphere Watch Programme (GAW)

175 The Global Atmosphere Watch Programme (GAW) is the only existing long-term international global programme that coordinates observations and analysis of changes in the chemical composition of the atmosphere. GAW also helps improve understanding of interactions between the atmosphere, the oceans and the biosphere.

176 GAW is in the process of developing a new Implementation Plan for the period 2016-2023. Programme development is aimed at delivery of enhanced products and services through cross-cutting application areas including the assessment of human health and ecosystem impacts from atmospheric pollution, atmospheric composition forecasting at regional and global scales, urban services, numerical weather prediction and climate applications.

177 Several groups within the GAW Programme perform research relevant to the ocean, including research on atmospheric aerosols that can help to estimate the transport of nutrient materials to the ocean, research on precipitation chemistry and atmospheric deposition of major ions, research on the global nitrogen and sulphur cycle through several expert groups, and research on greenhouse gases that address the global carbon cycle.

Event on aerosol related impacts and applications

178 During the 17th World Meteorological Congress held in Geneva from 25 May to 12 June 2015, a one-hour side event on aerosol related impacts and applications was held. The event highlighted the role of aerosols on weather, climate, ocean productivity, and adverse human health effects. Alex Baker (University of East Anglia, UK and member of GESAMP) delivered a presentation about the impacts of aerosol deposition on terrestrial and marine ecosystems. Key messages were that aerosol nutrient deposition is important on land and in the ocean, that the significance of their impact varies depending on the receiving ecosystem, and that the indirect effects of aerosol chemistry (e.g. acidification of dust surfaces) can increase solubility and hence nutrient supply.

Extension of scope of GAW Precipitation Chemistry observations and analysis to Total Atmospheric Deposition

179 A major recent product of GAW's Scientific Advisory Group for Precipitation Chemistry is the publication of "A global assessment of precipitation chemistry and deposition of sulfur, nitrogen, sea salt, base cations, organic acids, acidity and pH, and phosphorus" (Vet et al., 2014, *Atmospheric Environment* Vol. 93, available online at <http://dx.doi.org/10.1016/j.atmosenv.2013.10.060>). The assessment concludes that although some inorganic ions (namely sulfate, nitrate and ammonia) are reasonably well characterized globally, major regions of the world remain insufficiently monitored for important ions in precipitation (including South America, parts of North America, much of Asia, Africa, Oceania, the polar regions, and the oceans). Recommendations from the assessment confirm that

a strategic approach to long-term observations is required for future improvements in global concentration and deposition estimates. This will require increased spatial coverage of long term wet and dry deposition measurements of acidifying species, mineral base cations, sea salt, organic acids and nutrients such as phosphorus in regions of the world that are data sparse, highly sensitive, or affected by changing regional emissions. The database of quality-assured ion concentration and wet deposition data gathered from regional and national monitoring networks that formed the basis for the assessment is available for download from the World Data Centre for Precipitation Chemistry (<http://wdcpc.org/>).

180 The assessment also clearly establishes that total (wet plus dry) atmospheric deposition characterizes the exchange process between the atmosphere and the underlying surface, while precipitation chemistry and wet deposition capture only part of this exchange. In order to be able to better address environmental relevant issues, an expansion of the scope of the SAG from precipitation chemistry and wet deposition to include dry and total atmospheric deposition as well as a renaming to SAG for Total Atmospheric Deposition was approved at the 17th World Meteorological Congress (25 May to 12 June 2015). This expansion in scope will necessitate more active collaboration with the deposition modelling community as well as the aerosol and reactive gas scientific communities.

Ocean acidification

181 WMO is partnering with other organizations involved in ocean science to coordinate atmospheric and marine research and increase awareness about ocean acidification. A section on ocean acidification and trends in ocean pCO₂ was published in 2014 in the WMO Greenhouse Gas Bulletin No. 10, and jointly produced

by the International Ocean Carbon Coordination Project of the Intergovernmental Oceanographic Commission of UNESCO, the Scientific Committee on Oceanic Research, and the Ocean Acidification International Coordination Centre of the International Atomic Energy Agency with support from WMO. Also, an article on monitoring of ocean carbon and ocean acidification was published in the WMO Bulletin Vol 64 (1) - 2015.

182 To ensure better coordination of CO₂ observations between atmospheric and ocean communities, a special session on ocean measurements of pCO₂, other greenhouse gases, and related tracers will be held at the 18th WMO/IAEA Meeting on Carbon Dioxide, Other Greenhouse Gases, and Related Measurement Techniques (GGMT-2015) on September 13-17, 2015 in La Jolla, California.

183 WMO's WCRP maintains its sponsorship of the fruitful IGBP/SCOR/WCRP/iCACGP Surface Ocean – Lower Atmosphere Study (SOLAS, <http://www.solas-int.org>).GAW is also actively pursuing additional coordination and collaboration with the marine research community through SOLAS. WMO and GESAMP representatives will be participating in a side meeting with SOLAS and other groups at the SOLAS Open Science Conference on September 7-11, in Kiel, Germany.

GESAMP Working Group 38: Atmospheric Input of Chemicals to the Ocean

184 WMO continues its support of GESAMP Working Group 38 (Atmospheric Input of Chemicals to the Ocean) in particular through the trust fund established to manage financial contributions of GESAMP partners for the support of WG 38.

185 The Progress Report of the Working Group 38 has been submitted to GESAMP 42 by the Chairman of WG 38.

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: T. Höfer (Germany)

Members: S. le Floch (France), T. Höfer (Germany), D. James (United Kingdom), W. Jiang (China), R. Luit (Netherlands), M. Morrissette (United States), H. Saito (Japan), P.H. Rodriguez (Chile), (one vacancy), K. McDonald (consultant)

Products:

- a) Hazard profiles of new substances and correspondence with the industry.
- b) Maintenance and update of 900 GESAMP hazard profiles
- c) GESAMP Reports and Studies 64, 2nd edition

Planning: 53rd session in 2016

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) (96) and amended at its 8th session in Rome (1976) (97) are:

“To examine and evaluate data and to provide such other advice as may be requested, particularly by IMO, for evaluating the environmental hazards of harmful substances carried by ships, in accordance with the rationale approved by GESAMP for this purpose”.

These terms of reference remain unchanged.

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

Lead Agency: IMO

Co-sponsors: None

Chairperson: J. Linders (Netherlands)

Vice-Chair: A. Dock (Sweden)

Members: T. Borges (Portugal), B. Werschkun (Germany), S. Hanayama (Japan), K. Rhie (Republic of Korea), D. Smith (United Kingdom), G. Ziegler (United States), C. Rouleau (Canada) F. da Costa Fernandes (Brazil).

Consultants: Ms. A. Dock (dual function)

Products: 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

Planning: A minimum of three meetings are planned before GESAMP 43 in 2016.

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));s4 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)).

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 37: Metals (formerly mercury) Working Group

Lead Agency: UNEP

Co-sponsors: None

Chairperson: None

Members: (P. Kershaw, A. Baker) G. Gold-Bouchot

Products: Preparation and publishing of an Executive Summary of the contribution to the 'Global Mercury Assessment Report No. 86' on the GESAMP website.

WG 38: Atmospheric input of chemicals to the oceans

Lead Agency: WMO

Co-sponsors: IMO, US National Science Foundation

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

Members: Katie Altieri (United States), Alex Baker (United Kingdom), Doug Capone (United States), Frank Dentener (Italy), Katja Fennel (Canada), Jim Galloway (United States), Timothy Jickells (United Kingdom), Maria Kanakidou (Greece), Julie LaRoche (Canada/Germany), Kitack Lee (Korea), Jack Middelburg (Netherlands), Keith Moore (United States), Slobodan Nickovic (Serbia), Greg Okin (United States), Andreas Oeschler (Germany), Joseph Prospero (United States), Manmohan Sarin (India), Sybil Seitzinger (Sweden), Jonathan Sharples (United Kingdom), Parv Suntharalingam (United Kingdom), Mitsuo Uematsu (Japan), Lauren Zamora (United States)

Products: a) Completion of peer reviewed papers in the scientific literature Planning:

New scientific issues to be discussed by the Working Group intersessionally and approved by GESAMP 43.

Terms of Reference for WG 38

1 Update the geographical estimates of anthropogenic nitrogen deposition to the global ocean made in the SCOR-sponsored 2008 paper in Science (Duce, R.A., et al., "Impacts of atmospheric anthropogenic nitrogen on the open ocean", Science, 320, 893-897, 2008), which were based on data from 2005 or earlier. This

would utilize newer and more geographically distributed data on anthropogenic atmospheric nitrogen concentrations and deposition over the global ocean as well as improved models of these processes and impacts;

2 Considering issues related to Task 1 above, re-evaluate the impact of atmospheric nitrogen deposition on marine biogeochemistry, including re-estimating the amount of CO₂ that could be drawn down from the atmosphere into the ocean as a result of the increased productivity in the ocean derived from the additional anthropogenic nutrient nitrogen deposited. This would allow an update on the impact of the atmospheric nitrogen deposition on atmospheric radiative properties outlined in the 2008 Science paper;

3 Provide a more reliable estimate of the impact of atmospheric anthropogenic nitrogen deposition on the production of additional nitrous oxide in the ocean and its subsequent emission to the atmosphere. This was one of the greatest uncertainties in the 2008 Science paper;

4 Evaluate the extent to which anthropogenic nitrogen delivered to the coastal zone via rivers, atmospheric deposition, etc. is transported to the open ocean, in which regions this may happen, and what its impact is there. In the 2008 Science paper it was assumed that all nitrogen delivered to the coastal zone was sequestered there and did not reach the open ocean, but this may not be true in all locations; and

5 Make a more detailed estimate of the input and impact of anthropogenic nitrogen in the area of the Northern Indian Ocean (Arabian Sea, Bay of Bengal) and the South China Sea - the areas that are expected to show the greatest increase of anthropogenic nitrogen deposition over the next few decades.

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)

Planning: Complete the digitization of core profile figures from the papers in the data base (currently 560 documents); and continue with the data analysis as they are available. Report to GESAMP 43

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
- 5 Dissemination activities: Website, press releases, preparation of educational materials, presentation at stakeholder meetings

WG 40: Sources, fate and effects of microplastics in the marine environment: a global assessment

Lead Agency: UNESCO-IOC

Co-sponsors: IMO, UNEP, FAO Plastics Europe, American Chemistry Council,

Co-chair: P. Kershaw (United Kingdom), C.Rochman (United States)

Members: T. Andrady (United States), W. Joon Shim (Republic of Korea), H. Takada (Japan), R. Thompson (United Kingdom), A. Turra S. Pahl (United Kingdom), A. Lusher (United Kingdom), E. Zettler (United States), L. Amaral Zettler (United States), V. Hidalgo Ruz (Chile), M. Thiel (Chile), D. Vethaak (Netherlands), J Seager (United States), L. van Cauwenberghe (Belgium), R. Naryan (United States), P. Ziveri (Spain), J. Fabres (Norway), P. ten Brink (Belgium), S. Sherif (Liberia), D. Hardesty (Australia), P. Sobral (Portugal), S. Dudas (Canada), K. Whyles (United Kingdom), L. Lebreton (New Zealand), F. Galgani (France), S. Hong (Republic of Korea), J. Potemra (United States), E. van Sebille (Netherlands).

Products: Complete and publish the initial assessment report, of the 2nd phase of WG 40, to inform the United Nations Environment Assembly (May 2016).

Planning: Secure funding to complete the agreed programme of work under the ToRs, up to the end of 2018.

Terms of reference for WG 40

- 1 To assess the main sources and categories of plastics and microplastics entering the ocean.
- 2 To assess and utilize a range of physical and chemical models to simulate the behaviour of plastics and microplastics in the ocean in order to improve current assessment technologies.
- 3 To assess the occurrence and effects of microplastics in commercial fish and shellfish species, including associated additive chemicals and contaminants in the edible fractions.

4 To assess local, regional and global scales of accumulation of plastics and associated chemicals (additives and absorbed contaminants), including SIDS and regional hotspots.

5 To assess the effects of nano-sized plastics on marine organisms

6 To assess the risk of physical and chemical effects of ingested microplastics on marine organisms.

7 To assess the significance of plastics and microplastics as a vector for organisms, facilitating the spread of non-indigenous (alien) species.

8 To develop guideline covering terminology and methodologies: i) size and shape definitions of particles; ii) sampling protocols for the whole spectrum of particle sizes in surface and sub-surface seawater, seabed sediments, shorelines and biota; and, iii) methodologies for physical and chemical identification and analysis of polymers and associated chemicals.

9 To assess social and economic aspects influencing both the entry of plastics/microplastics into the ocean and the potential consequences from the resulting contamination.

10 To develop and utilize effective mechanisms for communicating the progress and conclusions of the Working Group to a wide audience (public and private sector).

WG 41: Marine Geoengineering

Lead Agency: IMO

Co-Sponsors UNESCO-IOC and WMO

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

The GESAMP study should provide an overview to GESAMP Agencies 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:
 - The main rationale, principle and justification of the techniques
 - Their potential scientific practicality and efficacy for climate mitigation purposes
 - The potential impacts of different marine geoengineering approaches on the marine environment and the atmosphere where appropriate
 - 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:
- The potential environmental and social/economic impacts of those marine geoengineering approaches on the marine environment and the atmosphere where appropriate.
 - 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.
 - Their potential scientific practicality and efficacy for climate mitigation purposes.
 - An assessment of monitoring and verification issues for each of those marine geoengineering techniques.
 - 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: Produce reports on the above work at appropriate points as reflected in the workplan. Produce final report by end January 2018 and make provisions for publication, dissemination and outreach.

TASK TEAMS AND CORRESPONDENCE GROUPS

Task Team on the assessment of open ocean pollution

Lead Agency: IOC

Chair: R. Boelens

Members: P. Kershaw, I. Hedgecock, D. Bakker, P. Tyack, A. Baker, G. Gold-Bouchot, T. Bowmer, M. Angelidis

Products: Report to the TWAP and publication in GESAMP Reports & Studies for publication late 2015/early 2016.

Correspondence Groups

The following activities will continue during the intersessional period:

Correspondence Group on the impacts of mine tailings in the marine environment

The Correspondence Group will await the input from the Sponsoring Organizations, in particular the governing bodies of the London Convention and Protocol, with a view to establishing a working group intersessionally.

Lead: M. Huber (Australia)

Members: R. Delfanti (Italy), E. Ajao (Nigeria), A.C. Ruiz Fernandez (Mexico)

Correspondence Group on the biomagnification of contaminants in marine top predators and its ecological and health implications

The Correspondence Group will continue, on the basis of the scoping paper provided (see GESAMP 38, Annex VIII), to: a) develop ToR and a programme for an international workshop on the ecological consequences of bioconcentration; b) prepare with CIESM a high level meeting with stakeholders on the human health issues of biomagnification; and c) establish contacts with FAO/WHO.

Lead: P. Kershaw

Correspondence Group on disinfection by-products

The Correspondence Group to prepare a revised scoping document, and the interest to pursue the issue through a working group will be discussed intersessionally. Emphasis should be given on discharge from power plants, sewage plants and cooling facilities in conjunction with other industrial activities.

Lead: A. Dock (Sweden)

Members: M. Huber (Australia), C. T. Bowmer (Netherlands), P. Kershaw (United Kingdom)

Correspondence Group on the 'Impact of residues of chronic oil spills'

Lead: F. Mogo (Nigeria), G. Gold-Bouchot (United States), A. C. Ruiz Fernandez (Mexico)

The Correspondence Group to develop a scoping paper in the intersessional period ensuring its viability and involve potentially interested Sponsoring Organizations.

Correspondence Group on the issue of the Arrival of Pelagic Sargassum

Lead: A. C. Ruiz Fernandez (Mexico)

A small group to prepare a small submission in the next annual session on the issue of the arrival of pelagic sargassum to the Caribbean beaches the Gulf of Mexico and North Atlantic.

ANNEX VI — TEMPLATE FOR NEW GESAMP WORKING GROUPS

BACKGROUND & CONTEXT

- The subject: Brief general background on subject of the study
- The issue/problem: Why the subject is of concern or interest to the international community from the perspective of marine environmental protection
- The need: 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

- Specific, concrete, point-by-point tasks to be carried out by the WG, and/or specific information to be included in the report
- Defined scope: what will and won't be done
- Not open-ended: focus on a specific product to be produced (usually a report)
- If additional tasks are envisioned they may be identified as future work for the WG, but the TOR should focus on the specific task being proposed
- Identify expertise required for the WG

WORK PLAN

- Work methods (usually meetings and intersessional work/correspondence)
- Provisional timeline, including:
 - Meeting dates
 - Milestones (drafts, reviews, revisions, etc.)
 - Deliverables and delivery date (usually publication of a report)
- Provisions for peer review
- Provisions for publication, dissemination and outreach (PR)

ADMINISTRATIVE ARRANGEMENTS

- Sponsors
- Budget & funding
- WG Chairperson(s) & members if available at time of proposal
- Technical secretary for the WGw

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 sea-bed. (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
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