

107



GESAMP

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

REPORT OF THE 47th SESSION OF GESAMP

8 to 11 September 2020

Convened remotely by the GESAMP Office



REPORTS AND STUDIES



IMO



FAO



UNESCO



IOC



WMO



UNIDO



IAEA



UN



UNDP



ISA



UN environment

107



GESAMP

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

REPORTS AND STUDIES

REPORT OF THE
47th SESSION OF GESAMP

8 to 11 September 2020

Convened remotely by the GESAMP Office

Published by the
INTERNATIONAL MARITIME ORGANIZATION
4 Albert Embankment, London SE1 7SR
www.imo.org

ISSN: 1020-4873

Notes:

GESAMP is an advisory body consisting of specialized experts nominated by the Sponsoring Agencies (IMO, FAO, UNESCO-IOC, UNIDO, WMO, IAEA, UN, UNEP, UNDP and ISA). Its principal task is to provide scientific advice concerning the prevention, reduction and control of the degradation of the marine environment to the Sponsoring Agencies.

The report contains views expressed or endorsed by members of GESAMP who act in their individual capacities; their views may not necessarily correspond with those of the Sponsoring Agencies.

Permission may be granted by any of the Sponsoring Agencies for the report to be wholly or partially reproduced in publication by any individual who is not a staff member of a Sponsoring Agency of GESAMP, provided that the source of the extract and the condition mentioned above are indicated.

Information about GESAMP and its reports and studies can be found at: <http://gesamp.org>

ISSN 1020-4873 (GESAMP Reports & Studies Series)

Copyright © IMO, FAO, UNESCO-IOC, UNIDO, WMO, IAEA, UN, UNEP, UNDP, ISA 2021

For bibliographic purposes this document should be cited as: GESAMP (IMO/FAO/UNESCO-IOC/UNIDO/WMO/IAEA/UN/UNEP/UNDP/ISA Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection), 2021. Report of the forty-seventh session of GESAMP, 8 to 11 September 2020. Rep. Stud. GESAMP No. 107, 34 p.

Contents

Page

EXECUTIVE SUMMARY	5
1 INTRODUCTION	6
2 REPORT OF THE CHAIR OF GESAMP	6
3 REPORT OF THE ADMINISTRATIVE SECRETARY OF GESAMP	6
4 PLANNING OF GESAMP ACTIVITIES	7
4.1 Evaluation of the hazards of harmful substances carried by ships (WG 1)	7
4.2 Report of the GESAMP Ballast Water Working Group (Working Group 34)	7
4.3 Atmospheric input of chemicals to the ocean (WG 38)	7
4.4 Sources, fate and effects of plastics and microplastics in the marine environment (WG 40)	7
4.5 Marine geoengineering (WG 41)	8
4.6 Impacts of wastes and other matter in the marine environment from mining operations, including marine mineral mining (WG 42)	8
4.7 Sea-based sources of marine litter including fishing gear and other shipping related litter (WG 43)	8
4.8 Biofouling management (WG 44)	8
5 CONTRIBUTION TO OTHER UN PROCESSES	9
5.1 The UN Regular Process, the UN Ocean Conference and BBNJ	9
5.2 The United Nations Decade of Ocean Science for Sustainable Development	9
6 IDENTIFICATION OF NEW AND EMERGING ISSUES	10
7 SCOPING ACTIVITIES	11
7.1 Causes and impacts of massive accumulations of the brown macro-algae Sargassum in the nearshore environment of the Caribbean and West Africa	11
7.2 Relevance of inputs of disinfection by-products (DBPs) into the marine environment	11
7.3 Sand and gravel mining in the marine environment: new insights on an growing environmental problem	11
7.4 Update the Information on Sources of the Main Pollutants Impacting the Global Marine Environment (The 80:20 Conundrum)	11
7.5 Impact of armed conflicts on the marine environment and sustainable development	11
7.6 Report of the Task Team on Exhaust Gas Cleaning Systems	12
7.7 Proposal to establish a GESAMP Working Group on climate change impacts on contaminants in the ocean	12
8 DATE AND PLACE OF GESAMP 48	12
9 FUTURE WORK PROGRAMME	12
10 ANY OTHER BUSINESS	12
11 ELECTION OF CHAIRPERSONS	13
12 CONSIDERATION AND ADOPTION OF THE REPORT OF GESAMP 47	13
13 CLOSURE OF THE SESSION	14
ANNEX I PROVISIONAL AGENDA	15
ANNEX II LIST OF DOCUMENTS	15

ANNEX III	LIST OF PARTICIPANTS	17
ANNEX IV	CURRENT WORKING GROUPS AND THEIR TERMS OF REFERENCE	19
ANNEX V	TEMPLATE FOR NEW GESAMP WORKING GROUPS	25
ANNEX VI	GESAMP REPORTS AND STUDIES	26

EXECUTIVE SUMMARY

0.1 Introduction: The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) held its 47th session from 8 to 11 September 2020, virtually. 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 issues, with a view to avoiding duplication of efforts within the United Nations system. The main topics considered at this session are described below.

0.2 Evaluation of the hazards of harmful substances carried by ships (WG 1): WG 1 met once since GESAMP 46 and had welcomed its new Chair and two new members. The revised Hazard Evaluation Procedure for Chemicals carried by ships, published in 2020, is available online as Reports and Studies No. 102.

0.3 Review of applications for 'active substances' to be used in ballast water management systems (WG 34): WG 34 convened twice since GESAMP 46 to evaluate new ballast water management systems, but due to the postponement of the seventy-fifth session of IMO's Marine Environment Protection Committee (MEPC 75), it was not certain at this point when the next meeting would be held.

0.4 Atmospheric input of chemicals to the ocean (WG 38): The Working Group was completing its work on peer-reviewed publications on past activities and expects to have these published by 2021. Progress on the convening of a workshop on ocean management and policy implications of the air/sea exchange, as well as a joint workshop with WG 40 on the atmospheric transport of microplastics and from the ocean was also noted.

0.5 Sources, fate and effects of plastics and microplastics in the marine environment (WG 40): In 2020, the Working Group published the publication titled 'Proceedings of the GESAMP International workshop on assessing the risks associated with plastics and microplastics in the marine environment' as Reports and Studies No. 103. The WG Chair and the co-sponsors were invited to continue the development of the terms of reference and workplan for the next phase, for possible consideration intersessionally.

0.6 Marine geoengineering (WG 41): GESAMP agreed to change the name of the working group to 'WG 41 on ocean interventions for climate change mitigation', approved the terms of reference and work plan for phase two and invited the Co-Chairs together with the co-sponsors to proceed with the preparations according to the work plan.

0.7 Impacts of wastes and other matter in the marine environment from mining operations, including marine mineral mining (WG 42): GESAMP noted that the WG report was in its final stages of preparation, and invited the Chair to initiate discussions with the co-sponsors on the possible terms of reference for continued work of the WG once the report was finalized.

0.8 Sea-based sources of marine litter including fishing gear and other shipping related litter (WG 43): GESAMP noted the working group's two interim reports and that the final report would be ready for peer review in December 2020. GESAMP also agreed to revise the WG's terms of reference.

0.9 Biofouling management (WG 44): GESAMP noted that the newly established working group was planning to hold its first meeting in September/October 2020, to discuss the terms of reference and workplan.

0.10 Contribution to other UN processes: GESAMP noted the postponement of many ocean related UN processes due to the pandemic but reiterated its readiness to support the Sponsoring Organizations as and when required.

0.11 The United Nations Decade of Ocean Science for Sustainable Development: GESAMP noted the progress made with the Implementation Plan for the Decade and expressed its commitment to contribute to the Decade. It was agreed that the dedicated Correspondence Group would continue its work, ensuring the bilateral cooperation and identification of new and ongoing activities that will contribute to the Decade.

0.12 Scoping activities: GESAMP considered the progress of its Correspondence Groups that had been developing scoping papers in the intersessional period, including: 1) Causes and impacts of massive accumulations of the brown macro-algae Sargassum in the near-shore environment of the Caribbean and West Africa; 2) Relevance of inputs of disinfection by-products (DBPs) into the marine environment; 3) Sand and gravel mining in the marine environment: new insights on a growing environmental problem; 4) Update the information on sources of the main pollutants impacting the global marine environment ('The 80:20 conundrum'); 5) Impact of armed conflicts on the marine environment and sustainable development and; 6) Report of the Task Team on Exhaust Gas Cleaning Systems.

0.13 Following a proposal by the IAEA, GESAMP also decided to establish a new working group on climate change impacts on contaminants in the ocean (WG 45) under the lead of IAEA (co-sponsored by UNEP, IOC-UNESCO and IMO).

0.14 Identification of new and emerging issues: GESAMP discussed a number of new and emerging issues, including the ocean and human health, light pollution, ocean crops and artificial alkalisation, and agreed to continue their consideration intersessionally, as relevant.

0.15 Any other business: GESAMP considered the revision of the Rules of Procedure, as prepared by the ExCom, and noted that these would be adopted by the ExCom following the annual session. In addition, GESAMP agreed to revise its process for peer review of its publications. Finally, GESAMP considered the outcome of a review of the current membership and gaps in expertise, which had been carried out prior to the session, and agreed to continue the process intersessionally, in dialogue with the ExCom.

1 INTRODUCTION

1.1 The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) held its 47th session from 8 to 11 September 2020, by virtual means. The session was chaired by Mr. David Vousden, with Mr. Manmohan Sarin and Ms. Tracy Shimmield as Vice-Chairs. The session was preceded by the GESAMP Executive Committee (ExCom) meeting held in parallel with an informal meeting of the GESAMP Members, on 8 September 2019.

1.2 Despite the exceptional circumstances during the ongoing COVID-19 pandemic, GESAMP noted that its work had progressed smoothly at the working group level, as well as within GESAMP, ExCom and the GESAMP Office. However, it was noted that the situation had influenced some of the working modalities, and that it would be useful to compile the working groups' experiences from working during the COVID-19 pandemic as guidance for future work.

Adoption of the agenda

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

1.4 Mr. Hiroyuki Yamada Administrative Secretary for GESAMP and Director, Marine Environment Division, IMO, welcomed GESAMP Members to the first ever virtual session of GESAMP. He noted that despite the challenging conditions this year, with most ocean-related intergovernmental processes being delayed or postponed, GESAMP had continued its work and delivered advice of its usual high quality to the ten Sponsoring Organizations.

2 REPORT OF THE CHAIR OF GESAMP

2.1 The Chair of GESAMP introduced document 47/2, providing a report of the intersessional work of GESAMP. He outlined the meetings that he and other GESAMP Members had been involved in, as well as the outcome of the two virtual intersessional Members' meetings in the reporting period.

Action by GESAMP

2.2 GESAMP noted the value of the intersessional meetings both for updates on the status of activities and for raising new issues and concerns and agreed to continue these as a worthwhile means of staying in touch and progressing work between annual meetings.

2.3 GESAMP also thanked two of Members that had recently retired from the group, Mr. Thomas Höfer (Germany) and Mr. Ahmad Abu Hilal (Jordan). Mr. Höfer had been active in WG 1 for 27 years as its Chair, and a GESAMP Member since 2014. Mr. Abu Hilal joined GESAMP as a Member in 2016 and had contributed to many activities, as well as leading the work of the Correspondence Group on the impact of armed conflicts on the marine environment and sustainable development. GESAMP thanked Mr. Höfer and Mr. Abu Hilal for their significant contributions to the work of GESAMP and wished them well in their future endeavours.

3 REPORT OF THE ADMINISTRATIVE SECRETARY OF GESAMP

3.1 The Administrative Secretary of GESAMP introduced document 47/3. GESAMP noted that the Report of the Administrative Secretary normally contained three main parts: an update on the work of the Executive Committee (ExCom); a report of the activities of the GESAMP Office; and a report of the activities of the Sponsoring Organizations of GESAMP in the area of marine environmental protection. However, due to the particular circumstances this year where many of the intergovernmental processes had slowed down or had been postponed, together with the very limited time available for the virtual annual session, the report this year only contained the first two items.

GESAMP noted that the ExCom had met twice in the intersessional period.

3.2 ExCom had also met on Monday 8 September 2020 and noted with appreciation the review by GESAMP of the current composition of the membership, the gaps in expertise and the proposal on how to fill these gaps. GESAMP noted that although the ExCom was positive about the proposed process going forward, it would need additional time to discuss the issue at its concluding meeting following the closure of the annual session on Friday.

3.3 GESAMP also noted that the ExCom had reviewed a near final version of the Rules of Procedure (RoP), which took into account the comments made by the Members, and that this would be shared with

the Members for a final review, prior to the anticipated adoption of the RoP at the concluding ExCom meeting on Friday.

4 PLANNING OF GESAMP ACTIVITIES

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

4.1.1 The Chair of Working Group 1 (WG 1), Mr. Richard Luit, introduced document 47/4, providing a report of the Working Group.

4.1.2 GESAMP noted that WG 1 had made good progress since the last session, and that two new experts had recently joined WG 1. It was also noted that the revised GESAMP Hazard Evaluation Procedure for Chemicals carried by Ships, which was finalized at EHS 56, had been made available online as GESAMP Reports and Studies No. 102¹.

Action by GESAMP

4.1.3 GESAMP noted with great appreciation the progress made by the Working Group in the intersessional period, and warmly welcomed Mr. Richard Luit as its new Chair and as a GESAMP Member.

4.2 Report of the GESAMP Ballast Water Working Group (Working Group 34)

4.2.1 The Chair of Working Group 34 (WG 34), Mr. Jan Linders, introduced document 47/4/1, providing a report of the Working Group.

4.2.2 The Chair of WG 34 presented the outcome of the two WG meetings held since GESAMP 46, and noted that, due to the postponement of the seventy-fifth session of IMO's Marine Environment Protection Committee (MEPC 75), it was not certain at this point when the next meeting would be held.

Action by GESAMP

4.2.3 GESAMP noted with great appreciation the progress made by the Working Group in the intersessional period and thanked the Chair and the WG members for their dedication and efforts.

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

4.3.1 The Co-Chair of Working Group 38 (WG 38), Mr. Robert Duce, introduced document 47/4/3, providing

¹ <http://www.gesamp.org/publications/gesamp-hazard-evaluation-procedure-for-chemicals-carried-by-ships-2019>

a report of the Working Group. He informed GESAMP of the group's ongoing work to complete the peer-reviewed publications based on previous WG activities, and it was expected that a final report on these activities would be completed in 2021.

4.3.2 GESAMP also noted the progress made with the development of two workshops:

- .1 a workshop on the ocean management and policy implications of the air/sea exchange of chemicals, scheduled for October 2021; and
- .2 a joint workshop with WG 40 on the atmospheric transport of microplastics to and from the ocean, scheduled to take place before the end of 2020 with its report released in early 2021.

Action by GESAMP

4.3.3 GESAMP noted with great appreciation the progress made by the Working Group in the intersessional period and thanked the Co-Chairs and the WG members for their dedication and efforts.

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

4.4.1 The Chair of Working Group 40 (WG 40), Mr. Peter Kershaw, introduced document 47/4/7, providing a report of the Working Group.

4.4.2 GESAMP noted with appreciation the publication of the 'Proceedings of the GESAMP international workshop on assessing the risks associated with plastics and microplastics in the marine environment', in the GESAMP Reports & Studies Series (No. 103) in early 2020². In addition, the work of WG 40 had recently been highlighted in the UNEP Foresight Brief on 'Unveiling plastic pollution in oceans' (<https://environmentlive.unep.org/foresight>).

4.4.3 GESAMP further noted that in the intersessional period, discussions had continued among the Chair, the lead organizations for the WG (IOC and UNEP) and potential new sponsors for the next phase.

² <http://www.gesamp.org/publications/gesamp-international-workshop-on-assessing-the-risks-associated-with-plastics-and-microplastics-in-the-marine-environment>

Action by GESAMP

4.4.4 GESAMP invited the WG Chair and the co-sponsors to continue the development of the TORs and workplan for the next phase, for possible consideration intersessionally. GESAMP expressed its appreciation to the Chair and the WG members for their continued dedication to the work of GESAMP.

4.5 Marine geoengineering (WG 41)

4.5.1 Mr. Chris Vivian, Co-Chair of Working Group 41 (WG 41), introduced document 47/4/5, providing a report of the Working Group, and document 47/4/5/Add.1, presenting the proposed terms of reference for the second phase of the working group.

4.5.2 Following discussion, some minor revisions to the proposal were made, as reflected in document 47/4/5/Add.1/Rev.1.

4.5.3 The linkages to the work of the UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA) were highlighted, and GESAMP invited the Co-Chairs and the co-sponsoring organizations to further explore possible cooperation.

Action by GESAMP

4.5.4 GESAMP expressed its strong support for the continuation of the working group, and:

- .1 noted the progress made with preparations for the second phase;
- .2 agreed to change the name of the working group to 'WG 41 on ocean interventions for climate change mitigation'; and
- .3 approved the terms of reference and work plan for phase two of WG 41, as set out at annex IV, and invited the Co-Chairs together with the co-sponsors (IMO, IOC and WMO) to proceed with the preparations according to the work plan.

4.5.5 GESAMP thanked the Co-Chairs and the co-sponsoring agencies for their commitment to the WG and its continued work in phase two.

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

4.6.1 Ms. Tracy Shimmield, Chair of Working Group 42 (WG 42), introduced document 47/4/4, providing a report of the Working Group.

4.6.2 GESAMP noted that the report of WG 42 was in its final stages, with the expectation that it would come to GESAMP Members for peer-review in the next month.

4.6.3 GESAMP also noted the potential interest from several Sponsoring Organizations for a second phase of the WG, and that this would require extensive consultations once the first report had been published. From the London Convention/Protocol perspective, the report would need to be reviewed and discussed by the LC/LP Contracting Parties.

Action by GESAMP

4.6.4 GESAMP thanked the Chair and the WG members for their work and emphasized the urgency to finalize the report.

4.6.5 GESAMP also invited the Chair, to initiate discussions with the co-sponsors on the possible terms of reference for the continued work of the WG once the report was finalized.

4.7 Sea-based sources of marine litter including fishing gear and other shipping related litter (WG 43)

4.7.1 Ms. Kirsten Gilardi, Chair of Working Group 43 (WG 43), introduced document 47/4/2, providing a report of the Working Group.

4.7.2 GESAMP noted that since GESAMP 46, the WG had completed two interim reports, the first submitted to IMO's MEPC, and the second to FAO's Committee on Fisheries (COFI). Both had been peer-reviewed by GESAMP. The WG was now preparing the full technical report, which was expected to be ready for review by GESAMP in December 2020. The WG Chair informed GESAMP of her intention to convene a subset of WG members for a writing workshop to complete its report, depending on the COVID-19 travel restrictions.

4.7.3 In the discussion that followed, the possibility to include an assessment of military sources of marine plastic litter was considered. It was agreed that this would not be possible in the first phase of the WG but could call for a discussion in a possible second phase.

4.7.4 GESAMP considered the request by the WG to change its TOR 7 to '*Review and compare strategies for preventing and mitigating ALDFG*'.

Action by GESAMP

4.7.5 Following discussion, GESAMP approved the revised terms of reference for WG 43, as set out at annex IV.

4.7.6 GESAMP thanked the Chair of the WG and its members for their dedication and hard work, resulting in a highly productive year with two outputs so far.

4.8 Biofouling management (WG 44)

4.8.1 Ms. Katja Broeg, Chair of Working Group 44 (WG 44), introduced document 47/4/6, providing a report of the Working Group.

4.8.2 GESAMP noted that since the establishment of WG 44 at GESAMP 46 in 2019, accomplishments to date have centred on:

- .1 identification of chair for WG 44, administrative coordination and leadership, and identification and invitation of the WG 44 membership; and
- .2 development of a preliminary work plan, based on the approved terms of reference.

4.8.3 It was further noted that a first meeting of WG 44 is scheduled for September-October 2020, where the WG members will be introduced, a Vice-chair/co-Chair will be elected and the terms of reference and work plan will be discussed.

Action by GESAMP

4.8.4 GESAMP expressed its appreciation to the Chair and the co-sponsoring agencies for their preparatory work, and warmly welcomed Ms. Broeg as Chair of the WG and as a GESAMP Member.

5 CONTRIBUTION TO OTHER UN PROCESSES

5.1 The UN Regular Process, the UN Ocean Conference and BBNJ

5.1.1 The DOALOS Technical Secretary for GESAMP provided an overview of the current state of preparations of the UN Regular Process and the preparation of the second World Ocean Assessment, and noted that the process, including the preparations for the third World Ocean Assessment continued by correspondence.

5.1.2 The DOALOS Technical Secretary for GESAMP also informed the meeting that the UN Ocean Conference to support the implementation of SDG 14, initially scheduled for UN 2020, had been postponed, including its preparatory processes. No new date had been set yet.

5.1.3 GESAMP was also informed that the fourth session of the Intergovernmental Conference on an international legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ), had also been postponed but that work would commence intersessionally in anticipation of a new date for the fourth and final session.

Action by GESAMP

5.1.4 GESAMP reiterated its readiness to support the Sponsoring Organizations within the abovementioned processes, as and when required.

5.2 The United Nations Decade of Ocean Science for Sustainable Development

5.2.1 The IOC-UNESCO Technical Secretary for GESAMP provided an overview of the current state of preparations for the United Nations Decade of Ocean Science for Sustainable Development.

5.2.2 GESAMP noted that the Decade Implementation Plan (IP) had been launched and sent to members of the UNGA informal consultations on the oceans and law of the sea resolution. Due to COVID-19 the IP would be considered through online procedural negotiations on the resolution text for the omnibus resolution for the ocean between September and November 2020.

A final decision was expected to come out with the omnibus resolution by December 2020. The IP is available at:

<https://www.oceandecade.org/news/72/Version-20-of-the-Ocean-Decade-Implementation-Plan-submitted-for-presentation-to-the-United-Nations-General-Assembly>

5.2.3 In addition, a 'Call for Action' was planned for 15 October 2020.

5.2.4 A series of webinars, titled 'the Decade Virtual Series' had been launched, and GESAMP Members were encouraged to follow the series at: <https://www.oceandecade.org/events/129/The-Ocean-Decade-Virtual-Series>

5.2.5 The Decade launch conference was scheduled to be held in Berlin in June 2021. It was noted that GESAMP could consider attending to present its current and future contributions to the Decade.

5.2.6 The IOC-UNESCO Technical Secretary for GESAMP informed that IOC/the Decade secretariat had held meetings with other entities and organizations on how to align with and how to prepare their contributions for the Decade and proposed to hold a similar on-line meeting between GESAMP and the Decade secretariat. It was noted that it is foreseen that the Decade actions/contributions are specific and targeted (not intended to endorse entire organisations or entities as Decade contributors).

5.2.7 The coordinator for the GESAMP Correspondence Group to support the Decade, Mr. Mike Huber, presented the activities of the correspondence group since GESAMP 46, stressing the importance of the Decade as being an initiative of great significance for the future of marine science. Therefore, GESAMP's activities need to be considered in light of this. He also stressed the need to identify GESAMP's specific role in the Decade as one of its main advisory bodies.

5.2.8 In the discussion that followed, it was noted that it would be relevant to match GESAMP activities and potential ones against the Decade plan. Both existing WGs as well as new working groups' activities could potentially be considered as contributions to the Decade, as well as other activities such as the joint WG 38/WG 40 workshop. The relevance of activities that are closely linked to a specific convention or regulatory work, may need further consideration.

Action by GESAMP

5.2.9 Following discussion, GESAMP re-emphasized its readiness to contribute to the Decade, and stressed the importance of the Decade in relation to its work. It was also agreed that:

- .1 the Correspondence Group should continue its work, under the lead of Mr. Mike Huber. Other Members were also invited to join, as appropriate;
- .2 a bilateral meeting between GESAMP and the Decade secretariat/IOC would be arranged to discuss GESAMP's role/contribution in detail;

- .3 the possibility for GESAMP to host a session of the Virtual Seminar series would be investigated;
- .4 new and ongoing activities to contribute to the Decade would be identified, as appropriate; and
- .5 GESAMP's role in the Decade would be clearly stated on the website.

6 IDENTIFICATION OF NEW AND EMERGING ISSUES

6.1 This agenda item is intended to provide an opportunity for GESAMP Members to bring new topics related to the status of the marine environment to the attention of the Sponsoring Organizations, and to discuss issues arising during the course of the current annual session. In the period leading up to the annual session, several new and emerging issues had been discussed among the Members. During the informal meeting of GESAMP Members, held in the morning session on Tuesday 8 September 2020, the following three topics had been selected for presentation to the annual session.

Ocean and human health

6.2 Members discussed issues related to the oceans and human health as well as animal health, e.g. harmful algal blooms, toxicity, bacteria and other infectious pathogens (e.g. viruses, fungi), coral bleaching, etc. However, it was acknowledged that this is a broad subject, essentially an "umbrella subject," and there would have to be a narrowing of focus if GESAMP was to develop a scoping paper. Suggestions included looking at recent changes/trends, transport pathways and/or climate change impacts. There was general support from the membership that this would be a topic that GESAMP should consider further, while also acknowledging that each of the current working groups may already include aspects within their work and this should be assessed as a first step. It was also noted that the topic may be of potential interest to WHO, who had previously been a Sponsoring Organization of GESAMP.

6.3 GESAMP also noted that an international symposium on the subject was planned to be held in Monaco from 2 to 4 December 2020, under the patronage of H.S.H. Prince Albert II of Monaco, see <http://www.oceanhealthmonaco.org>, and acknowledged that the outcome of this meeting would be of considerable value to inform future discussions on this issue.

Light pollution

6.4 This was recognised as an important subject within the marine environmental field and points highlighted were excessive lighting from ships and subsurface and seabed lighting related to commercial activities. The issue of electromagnetic radiation was also discussed.

Ocean crops

6.5 Members had noted information and studies that recognised plans indicating the use of the ocean to grow crops normally intended for the terrestrial environment, on a massive scale and its substantial impact on the oceans.

Artificial ocean alkalisation

6.6 The issue on artificial ocean alkalisation was also discussed as a new and emerging issue for GESAMP's consideration and one of potential concern. However, it was noted that this effectively already falls under WG 41 on (Ocean intervention for climate change mitigation) (previously 'Marine geoengineering') and therefore it did not need further consideration as an emerging issue as such, but could be 'earmarked' for consideration by that WG.

Action by GESAMP

6.7 In the discussion that followed, interest was expressed by Members and Sponsoring Organizations, in particular for the topic of the ocean and human health, which was deemed to be of interest to several of the Sponsoring Organizations, as well as potential future partners.

6.8 In conclusion, GESAMP agreed to pursue all three topics in the intersessional period, under the coordination of the Vice-Chairs and report back to the next Members' intersessional meeting.

6.9 In addition, GESAMP noted the discussion in the Members' informal meeting on diversity in the membership. GESAMP reiterated the importance of these

issues and emphasized that increasing and maintaining a balance in all aspects (gender/geography/experience levels) is at the core of its priorities.

7 SCOPING ACTIVITIES

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

7.1.1 The coordinator of the Correspondence Group, Mr. Peter Kershaw, introduced document GESAMP 47/7/1, providing an update on progress made in the intersessional period. Following the decision to form a Task Team, a list of potential experts was assembled. However, it quickly became apparent that a great deal of work had been undertaken since the revision of the previous scoping report in 2017. A number of collaborative groups have formed or been reinforced. In these circumstances, it seemed unnecessary, and possibly presumptuous, for a formal Task Team to be formed. Instead, GESAMP had been working closely with the *Sargassum* sub-committee of SCOR-IOC GlobalHAB. One of the main aims is to help organise an Open Science Meeting (OSM) on *Sargassum*. This was originally planned to take place in November 2020, hosted by the Government of Mexico. However, the emergence of the Covid-19 pandemic means that a face-to-face meeting will not be possible, at least until sometime in 2021. The other main strand has been to assist GlobalHAB, IOC and UNEP to organise and help to run a series of webinars. Two of these had taken place already, dealing mostly with the underlying science. The third webinar was scheduled for 22 September, with a focus of management of the issue in West Africa. The fourth and final webinar was due to take place in November, with a focus on the Caribbean.

Actions by GESAMP

7.1.2 It was noted that there are several actors already involved on this topic, and that GESAMP should engage with those rather than duplicating ongoing work, and that this could be an important contribution to the Decade of Ocean Science.

7.1.3 Following extensive discussion, GESAMP agreed to continue the work of the Correspondence Group, under the lead of Mr. Peter Kershaw.

7.2 Relevance of inputs of disinfection by-products (DBPs) into the marine environment

7.2.1 GESAMP noted that the report of the workshop hosted by the Government of Germany in 2019 had been peer-reviewed and was being updated by the

authors, where after it would be ready for approval by GESAMP for publication. A discussion followed about the review process (see further under item 10 below).

Action by GESAMP

7.2.2 In anticipation of the finalization of the report and its publication in the GESAMP Reports & Studies series, GESAMP agreed to keep the Correspondence Group active until its next intersessional meeting of the Members.

7.3 Sand and gravel mining in the marine environment: new insights on an growing environmental problem

7.3.1 The coordinator of the Correspondence Group, Mr. Chris Vivian, presented an update since the last annual session. GESAMP noted that the expected UNEP workshop on this matter had not yet taken place, but that the issue was still of interest to GESAMP and the Sponsoring Organizations. GESAMP therefore agreed to keep the Correspondence Group active, and to consider intersessionally whether to publish the scoping paper in the GESAMP Reports and Studies series.

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

7.4.1 The coordinator of the Correspondence Group, Mr. David Vousden, presented the progress made intersessionally. GESAMP noted that before a full consideration on this topic takes place, it would be valuable to await some of the current Working Group reports, not least WG 43 on sea-based sources of marine litter.

Action by GESAMP

7.4.2 GESAMP noted that the topic is of high interest to both GESAMP and the Sponsoring Organizations, but that there was a need for in depth discussions of some of the fundamental aspects, prior to developing any formal document or advice. It was therefore agreed to continue the work of the Correspondence Group, and to arrange an intersessional meeting dedicated to this discussion.

7.5 Impact of armed conflicts on the marine environment and sustainable development

7.5.1 GESAMP noted that an early version of a scoping document had been circulated prior to the meeting. Following the retirement of the coordinator for the Correspondence Group, Mr. Ahmed Abu-Hilal, the group discussed the feasibility of continuing work on the issue.

Action by GESAMP

7.5.2 GESAMP thanked Mr. Abu-Hilal for his efforts and dedication in leading the Correspondence Group, and agreed to continue its work, under the interim lead of Mr. Chris Vivian.

7.6 Report of the Task Team on Exhaust Gas Cleaning Systems

7.6.1 The coordinator of the Task Team, Mr. Jan Linders, introduced document GESAMP 47/7, providing a report of the Task Team on Exhaust Gas Cleaning Systems (EGCS). Since its establishment, the Task Team had met three times, two times by teleconference (1 October and 21 November 2019) and one time in person during a workshop at IMO Headquarters from 29 October to 1 November 2019. By early December 2019 the draft report had been sent to GESAMP for peer review, and on 16 December 2019 the report was submitted to the seventh session of IMO's Sub-Committee on Pollution Prevention and Response (PPR 7), which was held from 17 to 21 February 2020.

7.6.2 PPR 7 concluded to report the outcomes on this matter to MEPC 75 (initially scheduled for March 2020, but postponed due to the pandemic), advising MEPC to "request the Secretariat to explore the possibility of involving GESAMP in the development of different parts of the agreed scope for scientific advice, as appropriate" (document MEPC 75/10, paragraph 2.22).

7.6.3 GESAMP was informed that MEPC 75 was now scheduled for October 2020, but that due to the revised agenda and meeting priorities it was unclear if and when the Committee would conclude on this matter, and if GESAMP would be requested to provide further advice.

Action by GESAMP

7.6.4 GESAMP noted that the Task Team had fulfilled its terms of reference, as requested by MEPC. It was therefore agreed to dissolve the Task Team and await the outcome of MEPC. Should IMO request further input from GESAMP, the Task Team could be re-established with new terms of reference.

7.6.5 GESAMP thanked all the experts who provided input to the Task Team, and in particular Mr. Linders for leading the team in the successful fulfilment of its terms of reference. The group also thanked the IMO Member States and observers for providing both financial assistance and technical input to the Task Team.

7.7 Proposal to establish a GESAMP Working Group on climate change impacts on contaminants in the ocean

7.7.1 The IAEA Technical Secretary for GESAMP presented document 47/7/2, containing a proposal to establish a working group on climate change impacts on contaminants in the ocean, submitted on behalf of IAEA, UNEP and IOC-UNESCO. The idea for the new working group had originally been presented to GESAMP 46, when IAEA had been invited to present a full proposal.

7.7.2 GESAMP noted the support for the establishment of the working group and made several suggestions for revisions to the terms of reference and workplan, including a possible change of the name of the Working Group.

7.7.3 IMO and WMO also expressed their interest in co-sponsoring the working group, in-kind or in cash.

Action by GESAMP

7.7.4 Having noted the strong support for the working group from both GESAMP Members and the Sponsoring Organizations, GESAMP agreed to establish, in principle, Working Group 45 (WG 45) on climate change impacts on contaminants in the ocean, under the lead of IAEA, with co-sponsorship from UNEP, IOC-UNESCO, WMO and IMO, subject to the revision, approval of the terms of reference and its workplan in the intersessional period.

7.7.5 GESAMP invited IAEA to submit the revised and final terms of reference and workplan as its earliest opportunity, for approval by GESAMP by correspondence in the intersessional period.

8 DATE AND PLACE OF GESAMP 48

8.1 GESAMP accepted with appreciation the offer by IAEA to host the forty-eighth session of GESAMP in Monaco in 2021 and agreed that the exact dates would be confirmed by the Executive Committee as soon as possible.

IMO also indicated its intention to host the 49th session in 2022, at its Headquarters in London.

9 FUTURE WORK PROGRAMME

9.1 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 IV.

10 ANY OTHER BUSINESS

Revision of the GESAMP Rules of Procedure

10.1 The Administrative Secretary informed GESAMP of the progress with the revision of the Rules of Procedure (ROP), which had benefited greatly from the input from GESAMP Members. It was noted that, following final comments and input by GESAMP during the annual session, the ExCom would adopt the revised ROP, and circulate to the Members. It was also noted that, in addition to the ROP themselves, the GESAMP Office would prepare supporting flow-charts and supporting guidance, to assist GESAMP and ExCom in their work.

Review process for GESAMP reports and publications

10.2 A discussion followed on the review process for GESAMP reports and publications, and in particular the need to improve the review form. The group noted that the form (and process) needs to be optimized both for the reviewers and the authors and be manageable for the GESAMP Office to administer. Several options for possible modifications were discussed.

10.3 GESAMP agreed to address the issue intersessionally, and that a group of Members would work with the GESAMP Office and report back to the next intersessional meeting.

Review of the GESAMP membership

10.4 GESAMP noted that, following the review of the current membership carried out by GESAMP in the intersessional period, the Chair had proposed to the ExCom that, based on this analysis of current strengths, gaps and future needs, a small number of experts could be invited to become Members, initially on a trial basis.

10.5 The ExCom, through the Administrative Secretary, expressed great appreciation to GESAMP for the hard work in developing a list of potential candidates and noted that GESAMP had agreed to continue this discussion intersessionally. The ExCom therefore invited GESAMP to continue its process of identifying suitable candidates to fill the expertise gaps, emphasizing the need to ensure the best possible geographical and gender balance, and submit its revised list of candidates to the ExCom for consideration at its earliest opportunity.

Action by GESAMP

10.6 To support the selection of experts, GESAMP noted the request from the ExCom, and agreed to continue its work to identify suitable candidates in the intersessional period.

11 ELECTION OF CHAIRPERSONS

11.1 GESAMP unanimously re-elected David Vousden (South Africa) as Chair and Manmohan Sarin (India) and Tracy Shimmield (United Kingdom) as Vice-Chairs for

the intersessional period and the forty-eighth session of GESAMP.

12 CONSIDERATION AND ADOPTION OF THE REPORT OF GESAMP 47

12.1 The report of the forty-seventh session of GESAMP was considered and approved.

13 CLOSURE OF THE SESSION

13.1 The Chair of GESAMP, Mr. David Vousden, closed the forty-seventh session of GESAMP on Friday, 11 September 2020 at 14:00 hrs.

ANNEX I – PROVISIONAL AGENDA

AGENDA

47th session of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) by remote participation, from 8 to 11 September 2020

- 1 Adoption of the agenda
- 2 Report of the Chair of GESAMP
- 3 Report of the Administrative Secretary of GESAMP
- 4 Planning of GESAMP activities:
 - .1 Evaluation of the hazards of harmful substances carried by ships (WG 1: IMO leading)
 - .2 Review of applications for 'active substances' to be used in ballast water management systems (WG 34: IMO leading)
 - .3 Atmospheric input of chemicals to the ocean (WG 38: WMO leading)
 - .4 Sources, fate and effects of micro-plastics in the environment – a global assessment (WG 40: IOC-UNESCO and UN Environment co-leading)
 - .5 Marine geoengineering (WG 41: IMO leading)
 - .6 Impacts of wastes and other matter in the marine environment from mining operations, including marine mineral mining (WG 42: IMO and UN Environment co-leading)
 - .7 Sea-based sources of marine litter (WG 43: FAO and IMO co-leading)
 - .8 Biofouling management (WG 44: IOC-UNESCO leading)
- 5 Contributions to other UN processes
- 6 Identification of new and emerging issues regarding the degradation of the marine environment of relevance to governments and sponsoring organizations
- 7 Scoping activities (Correspondence Groups and Task Teams)
- 8 Date and place of GESAMP 48
- 9 Future work programme
- 10 Any other business
- 11 Elections
- 12 Consideration and adoption of the report of GESAMP 47

ANNEX II – LIST OF DOCUMENTS

Agenda item 1

- | | |
|----------|---------------------------------------|
| 47/1 | Provisional agenda |
| 47/1/1 | Annotations to the provisional agenda |
| 47/INF.1 | Provisional list of participants |

Agenda item 2

- | | |
|------|-------------------------------|
| 47/2 | Report of the Chair of GESAMP |
|------|-------------------------------|

Agenda item 3

- | | |
|------|--|
| 47/3 | Report of the Administrative Secretary of GESAMP |
|------|--|

Agenda item 4

- | | |
|--------|--|
| 47/4 | Evaluation of the hazards of harmful substances carried by ships – report of the Chair of Working Group 1 |
| 47/4/1 | Review of applications for 'Active Substances' to be used in ballast water management systems – report of the GESAMP Ballast Water Working Group – report of the Chair of Working Group 34 |

- 47/4/2 Sea-based sources of marine litter – report of the Chair of Working Group 43
- 47/4/3 Atmospheric input of chemicals to the oceans – report of the co-Chairs of Working Group 38
- 47/4/4 Impacts of wastes and other matter in the marine environment from mining operations, including marine mineral mining – report of the Chair of Working Group 42
- 47/4/5 Marine Geoengineering – report of the co-Chairs of Working Group 41
- 47/4/5/Add.1 Marine Geoengineering – terms of reference and work plan for the second phase of the GESAMP Working Group 41 on ocean interventions for climate mitigation
- 47/4/5/Add.1/Rev.1 Terms of reference and work plan for the second phase of the GESAMP Working Group 41 on ocean interventions for climate change mitigation
- 47/4/6 Biofouling management and non-indigenous species – report of the Chair of Working Group 44
- 47/4/7 Sources, fate and effects of plastics and micro-plastics in the marine environment – report of the Chair of Working Group 40

Agenda Item 5

No documents

Agenda Item 6

No documents

Agenda Item 7

- 47/7 Report of the Task Team on Exhaust Gas Cleaning Systems
- 47/7/1 Report of the Task Team on causes and impacts of massive accumulations of the brown macro-algae Sargassum in the nearshore environment of the Caribbean and West Africa
- 47/7/2 Proposal to establish a GESAMP Working Group on climate change impacts on contaminants in the ocean - submitted by IAEA, UNEP and IOC-UNESCO

ANNEX III – LIST OF PARTICIPANTS

A. MEMBERS

David Vousden
Chair of GESAMP
Department of Ichthyology
and Fisheries
Science
Rhodes University
16 Frances Street
Grahamstown 6139
South Africa
Email: david.vousden@asclme.org

Manmohan Sarin
Vice-chair of GESAMP
Physical Research Laboratory
Geosciences Division
Navrangpura 380009
Ahmedabad
India
Email: sarin@prl.res.in;
manmohan_sarin@yahoo.com

Tracy Shimmield
Vice-chair of GESAMP
Director of the Lyell Centre
The Lyell Centre
Research Avenue South
Edinburgh
EH14 4AP
United Kingdom
Email: tms@bgs.ac.uk

Alex Baker
School of Environmental Sciences
University of East Anglia
Norwich Research Park
Norwich
NR4 7TJ
United Kingdom
Email: Alex.Baker@uea.ac.uk

Jan Linders
De Waag 24
NL - 3823 GE Amersfoort
The Netherlands
Email: jan@familielinders.nl;
jbj.linders@gmail.com

Robert Duce
145 Pioneer Passage
Bastrop, Texas 78602
United States
Email: robertduce@hotmail.com

Chris Vivian
20 Barnmead Way
Burnham-on-Crouch
Essex CM0 8QD
United Kingdom
Email: chris.vivian2@btinternet.com

Peter Kershaw
Kachia House
The Street
Hapton
Norfolk NR15 1AD
United Kingdom
Email: peter@pjkershaw.com

Mike Huber
Member Emeritus
Global Coastal Strategies
32 Beneteau Place
Lota, Brisbane, QLD 4179
Australia
Email: mhuber@bigpond.net.au

Lawrence Awosika
Member Emeritus
7417 Quail Ridge Lane
Bowie
Maryland
USA 20720
Email: lfolawo@gmail.com

Kirsten Gilardi
Karen C. Drayer Wildlife Health Center
Health Sciences Clinical Professor,
Dept. of Medicine & Epidemiology
School of Veterinary Medicine
University of California, Davis
1 Shields Ave.
Davis, California 95616
United States
Email: kvgilardi@ucdavis.edu

Wendy Watson-Wright
1355 Oxford Street/1355 rue Oxford
PO Box 15000
Halifax, Nova Scotia B3H 4R2
Canada
Email: watsonwrightw@gmail.com

Richard Luit
Antonie van Leeuwenhoeklaan 9,
3721 MA, Bilthoven,
The Netherlands
Email: Richard.luit@rivm.nl

Katja Broeg
German Federal Maritime and
Hydrographic Agency (BSH)
Department Environment Protection in Maritime Traffic
Hamburg
Germany
Email: Katja.Broeg@bsh.de

B. SECRETARIAT

Alice Hiciburundi
DOALOS Technical Secretary of GESAMP
Senior Legal Officer
Division for Ocean Affairs and
the Law of the Sea (DOALOS)
Office of Legal Affairs
United Nations
Room DC2-0422
New York, NY 10017
United States
Email: hiciburundi@un.org

Bart Smit Duijzentkunst
Legal Officer, DOALOS
Office of Legal Affairs
United Nations
Room DC2-0470C
New York, NY 10017
United States
Email: smitduijzentkunst@un.org

Henrik Enevoldsen
IOC of UNESCO Technical Secretary of GESAMP
IOC Science and Communication Centre
University of Copenhagen
Universitetsparken 4
2100 Copenhagen Ø
Denmark
Email: h.enevoldsen@unseco.org

Sylvia Sander
IAEA Technical Secretary of GESAMP
Section Head
Marine Environmental Studies Laboratory
Division of IAEA Environmental Laboratories
Department of Nuclear Sciences and Applications
IAEA Environment Laboratories
4 Quai Antoine 1er
MC 98000
Monaco
Email: s.sander@iaea.org

Iolanda Osvath
Marine Environmental Studies Laboratory
Division of IAEA Environmental Laboratories
Department of Nuclear Sciences and Applications
IAEA Environment Laboratories
4 Quai Antoine 1er
MC 98000
Monaco
Email: I.Osvath@iaea.org

Oksana Tarasova
Head, Atmospheric Environment Research Division
Science and Innovations Department
World Meteorological Organization (WMO)
7 bis, Avenue de la Paix
BP2300, 1211 Geneva 2
Switzerland
Email: llabrador@wmo.int

Andrew Hudson
UNDP Technical Secretary of GESAMP
Head, UNDP Water and Ocean Governance
Programme
FF-928, 1 United Nations Plaza
New York, NY 10017
United States
Email: andrew.hudson@undp.org

Joana Akrofi
UNEP Technical Secretary of GESAMP
UNEP
P.O. Box 30552, Nairobi
00100 Kenya
Tel: +254-20-7623503
Email: joana.akrofi@unep.org

Uwe Barg
FAO Technical Secretary of GESAMP
Aquaculture Officer
Fisheries and Aquaculture Policy and Resources
Division
Food and Agriculture Organization of the United
Nations (FAO)
Rome, Italy
Email: uwe.barg@fao.org

Hiroyuki Yamada
Administrative Secretary of GESAMP
Director, Marine Environment Division
International Maritime Organization (IMO)
4 Albert Embankment
London SE1 7SR
United Kingdom
Email: hyamada@imo.org

Fredrik Haag
IMO Technical Secretary of GESAMP
Head, Office for London Convention/Protocol and
Ocean Affairs, Marine Environment Division
IMO
4 Albert Embankment
London SE1 7SR
United Kingdom
Email: fhaag@imo.org

Chrysanthe Kolia
GESAMP Office
IMO
4 Albert Embankment
London SE1 7SR
United Kingdom
Email: ckolia@imo.org

ANNEX IV – CURRENT WORKING GROUPS AND THEIR TERMS OF REFERENCE

WORKING GROUPS

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

Lead Organization: IMO
Co-sponsors: None
Chair: Richard Luit (Netherlands)
Members: Stéphane le Floch (France), Wenxin Jiang (China), Mattias Grote (Germany), Bette Meek (Canada), Michael Morrisette (United States)

Terms of reference for WG 1

The terms of reference of the Working Group 1, as amended at its 46th session in 2019, are:

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

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

Planning and outputs: As per terms of reference.

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

Lead Organization: IMO
Co-sponsors: None
Chair: Jan Linders (Netherlands)
Vice-Chair: Annette Dock (Sweden)
Members: Teresa Borges (Portugal), Barbara Werschkun (Germany), Shinichi Hanayama (Japan), Kitae Rhie (Republic of Korea), David J. D. Smith (United Kingdom), Gregory Ziegler (United States), Claude Rouleau (Canada), Flavio da Costa Fernandes (Brazil), Assad Ahmed Al-Thukair (Saudi Arabia).
Consultant: Annette Dock (dual function)

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)) by MEPC;

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

In particular, the Group should undertake:

- .1 scientific evaluation of the data set in the proposal for approval (see paragraphs 4.2, 6.1, 8.1.2.3, 8.1.2.4 of Procedure (G9));
- .2 scientific evaluation of the assessment report contained in the proposal for approval (see paragraph 4.3.1 of Procedure (G9));
- .3 scientific evaluation of the risks to the ship and personnel to include consideration of the storage, handling and application of the Active Substance (see paragraph 6.3 of Procedure (G9));
- .4 scientific evaluation of any further information submitted (see paragraph 8.1.2.6 of Procedure (G9));

- .5 scientific review of the risk characterization and analysis contained in the proposal for approval (see paragraph 5.3 of Procedure (G9));
- .6 scientific recommendations on whether the proposal has demonstrated a potential for unreasonable risk to the environment, human health, property or resources (see paragraph 8.1.2.8 of Procedure (G9)); and
- .7 preparation of a report addressing the above-mentioned aspects for consideration by MEPC (see paragraph 8.1.2.10 of Procedure (G9)).

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

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

Planning and outputs: As per terms of reference.

WG 38: Atmospheric input of chemicals to the oceans

Lead Organization: WMO

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

Chairs: Robert Duce (United States), Tim Jickells (United Kingdom)

Members: Alex Baker (United Kingdom), Robert A. Duce (United States), Tim Jickells (United Kingdom), Manmohan Sarin (India), more names to be inserted

Terms of Reference for WG 38

Atmospheric input of chemicals to the ocean—management implications:

- 1 Test the most appropriate approaches for scientists to engage with policymakers and managers in order to evaluate scientific evidence of environmental trends and their associated uncertainties related to the atmospheric input of certain chemicals to the ocean.
- 2 Use current information and/or modelling on the atmospheric deposition of the nutrients nitrogen and iron in the regions of the Southwest Indian Ocean as an example of an area where such deposition may be particularly important to biological productivity.

3 Have extensive involvement of students and early career scientists from the local region as part of a significant capacity-building effort.

4 Evaluate what type of additional scientific information might be necessary for managers and policymakers to feel comfortable about recommending specific actions in response to the identified trends.

5 Publish the outcomes of the workshop in a science- and policy-focused journal, as well as a document in the GESAMP Reports and Studies series, with recommendations for good practice in these areas of science and policy engagement.

Planning and outputs: To complete the peer-reviewed publications based on previous WG activities, with a final report on these activities completed in 2021. Also, to carry out the delivery of two workshops. One on the ocean management and policy implications of the air/sea exchange of chemicals; and one workshop jointly with WG 40 on the atmospheric transport of microplastics to and from the ocean.

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

Lead Organization: IOC-UNESCO and UNEP

Co-sponsors: To be determined in the inter-session period

Chair: Peter Kershaw (United Kingdom)

Members: To be determined in the inter-session period.

Planning: WG 40 will seek to revise its terms of reference and work programme, and secure funding from the co-sponsors and partners.

Terms of reference for fourth phase of WG 40:

(Terms of reference 1 to 5 to include social, environmental and economic aspects)

- 1 Review and further develop risk assessment methods for marine litter and microplastics & identify data needs – based on the outcome of the 2019 GESAMP risk workshop
- 2 Assess the effects of marine litter and macroplastics – e.g. human wellbeing, biodiversity & animal welfare, food security, direct & indirect cost to different sector, risk perception & communication. This will include consideration of Covid-19 related litter, especially material used for medical and hygiene purposes.
- 3 Assess the effects of nano- & micro-plastics – e.g. chemical contaminants, biodiversity, human health, risk perception & communication
- 4 Assess the effects of transfer of biota by marine litter and microplastics – e.g. human welfare, biodiversity, direct & indirect costs, pathogens, risk perception & communication
- 5 Carry out initial risk assessment (based on terms of reference 1 to 4)

Planning and outputs:

- To prepare a more detailed work plan taking account of:
- The need to revise the membership of the WG to reflect changes in the expertise required
- The increased in the range of expertise required, meaning the need for a relatively large membership
- The need to operate within the constraints of Covid-19, specifically the practicality of running an active virtual workshop, with a new membership, and the option of working with sub-groups covering each ToR in parallel or the WG tackling the ToRs in series.
- To plan for the time when face-to-face meetings are practical, and seek sufficient financial support to permit this.

WG 41: Ocean interventions for climate change mitigation³

Lead Organization: IMO
Co-Sponsors IOC-UNESCO and WMO
Chairpersons: Chris Vivian (United Kingdom), Philip Boyd (Australia)
Members: To be confirmed

Terms of reference for second phase of WG 41

1 The overall aims of GESAMP Working Group 41 for the second phase are:

- .1 to better understand the potential environmental and societal impacts of different ocean interventions for climate change mitigation on the ocean;
- .2 to develop a framework to integrate inputs from natural sciences and societal disciplines into a holistic assessment of ocean interventions for climate change mitigation or other purposes; and
- .3 to provide advice to the London Protocol Parties to assist them in identifying those ocean interventions for climate change mitigation, or other purposes, consistent with the London Protocol's definition of marine geoengineering, that it might be prudent to consider for listing in the new Annex 4 of the Protocol.

2 The second phase of the GESAMP Working Group 41 study should:

- .1 Develop a flow chart and questionnaire with associated guidance to elicit information from proposers of ocean interventions for climate change mitigation or other purposes

es consistent with the London Protocol's definition of marine geoengineering, to enable a preliminary assessment (including constructive feedback) of their techniques by regulators, policy makers, funders or anyone considering or permitting proposals. The flow chart and questionnaire with associated guidance will be aimed to facilitate the London Protocol 'Guidance for consideration of marine geoengineering activities' (IMO, 2015). The Working Group should also consider additional incentives that can be provided to proposers of ocean interventions for climate change mitigation to comprehensively report their approaches in the permanent public record, drawing upon the discussions of these incentives in the Working Group report. Examples of such incentives to proposers of ocean interventions for climate change mitigation include modelling assessments (externally funded) that straddle conceptual, box models on to more complex approaches such as CDRMIP (Carbon Dioxide Removal Model Inter-comparison Project).

.2 Develop a framework to integrate inputs from natural sciences and societal disciplines into a holistic assessment of ocean interventions for climate change mitigation or other purposes consistent with the London Protocol's definition of marine geoengineering, to be used by regulators, policy-makers, funders or anyone considering or permitting proposals, exploring the use of a systems approach framework such as that presented at the March 2019 workshop (see Elliott et al., 2015; Cormier and Elliott, 2019; Barnard and Elliott, 2015).

.3 Provide advice to the London Protocol Parties:

- a. identifying promising ocean interventions for climate change mitigation or other purposes i.e. those consistent with the London Protocol's definition of marine geoengineering, that might be worthwhile to consider for listing in the new Annex 4 of the Protocol, including techniques having the potential to move to field testing;
- b. developing an outline of the specific issues to be addressed in an assessment framework for each of a subset of techniques identified 2.3(a) above, using the London Protocol Assessment Framework for Scientific Research Involving Ocean Fertilization as a template;
- c. providing an initial assessment of monitoring and verification approaches, including the difficulties and challenges, for each of the techniques, meriting detailed scrutiny, identified under 2.3(a) above; and

³ Note that the Working Group will still address non-climate related techniques that fall within the London Protocol's definition of marine geoengineering e.g. fisheries enhancement.

- d. identifying significant gaps in knowledge and uncertainties associated with each of the small suite of techniques identified under 2.3(a) above that need to be addressed to assess their implications for the marine environment and, where appropriate, the atmosphere.
- .4 Provide brief updates, based on new scientific evidence since the WG 41 report was published in March 2019 (in particular from the IPCC ‘Special Report on the Ocean and Cryosphere in a Changing Climate’ published in 2019, and the forthcoming IPCC 6th Assessment Reports) on:
- a. any new proposed ocean interventions that may have potential for climate change mitigation or other purposes consistent with the London Protocol’s definition of marine geoengineering such as fisheries enhancement, and their scientific practicality and efficacy; and
 - b. the potential environmental and societal impacts of ocean interventions for climate change mitigation or other purposes consistent with the London Protocol’s definition of marine geoengineering, on the marine environment and, where appropriate, the atmosphere.
- .5 Produce reports and potentially peer-reviewed scientific papers on the points above at appropriate points in the work plan.

Planning and outputs: Detailed workplan to be finalized.

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

Lead Organization: IMO

Co-Sponsors: UNEP, ISA

Chairperson: Tracy Shimmield

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

Terms of reference for WG 42

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

- 1 Identify and provide a better understanding of potential environmental impacts of marine disposal of tailings and associated wastes from land-based mining operations (hereinafter referred to as “mine tailings”), taking into account potential linkages between deep water ecosystems at the disposal site and other (e.g. ecological, biological) resources in the water column. The impacts could include, but are not limited to, those identified in the report of the workshop on mine tailings provided to GESAMP at its last meeting (GESAMP 42/7/1);
- 2 Review the extent and suitability of baseline assessments (prior to any construction or discharge) conducted to date and identify the key elements for comprehensive surveys of baseline conditions from which abiotic and biotic impacts can be assessed, taking into account the latest detection technologies of marine pollution and its impact to the organisms;
- 3 Review and identify the best practices in modeling the physical and chemical behavior of discharged mine tailings (e.g. slurries), including the shearing and upwelling of both the solids and soluble fractions, as well as the significance of tidal dispersion and potential for long-range transport of fine materials, and determine whether existing models are adequate or further development is needed;
- 4 Review and evaluate the processes of exposure and effect and the pathways for mine tailings disposal operations, including those related to the physical presence of the wastes, exposure to associated contaminants, their accumulation, and the potential effects at community level;
- 5 Implications arising from the fact that marine organisms normally used for toxicity testing are from upper layers of marine water, not the deep sea;
- 6 Review and identify physical and ecological models to estimate the recovery processes of deep-sea ecosystems around the possible impacted area; and
- 7 Produce a report on the above work under a time frame and any other reporting requirements to be agreed between LC/LP and the GESAMP.

Planning and Outputs: Finalize and publish the report addressing first term of reference to be published by end of 2020. This will be followed by a review of the rest of the terms of reference in order to allow further work on the issue.

Sea-based sources of marine litter including fishing gear and other shipping related litter (WG 43)

Lead Organizations: FAO, IMO
Co-Sponsors: UNEP
Chairperson: Kirsten Gilardi (United States)
Members: Pingou He (United States), Kylie Antonelis (United States), Li Wang (China), Sally N. Thomas (India), Kelly Richardson (Australia), Emilie Grilly (Australia), Peter Van Den Dries (Belgium), David Santillo (United Kingdom), Raffaella Piermarini (Italy), Olof Linden (Sweden), Francois Galgani (France)

Terms of reference for WG 43

The Working Group has two concurrent work-streams: Work-stream 1, with an overarching scoping study which would, amongst other objectives, support the initial information requirements of IMO's *Action plan to address marine litter from ships* and help identify priorities within this overarching scope.

Work-stream 2, with recognition that some types of sea-based sources of marine litter, such as Abandoned, Lost or otherwise Discarded Fishing Gear (ALDFG), are further progressed in terms of available information but require more focussed scientific attention to inform interventions. The work-stream will focus on specific areas of research to fulfil this requirement. ALDFG will be the focus based on the existing knowledge that this is a major source of marine litter from ships and the fishing sector specifically. It is also already identifiable as a key area of work for both FAO and IMO whose Members have highlighted an urgent need to address this issue.

Work-stream 1 – Global overview

A global overview of sea-based sources of marine litter, including fishing gear and other shipping related litter, which should include:

- ToR 1: An identification of sources of marine litter from sea-based sources, including but not limited to:
- fishing operations (e.g. gear, packaging material, strapping bands);
 - aquaculture (e.g. cages, buoys, netting, packaging materials structures);
 - shipping (garbage, hull scrapings, containers, spoilt cargo, grey water, ropes and cargo nets);
 - dumping of waste and other matter at sea, derelict fibreglass (FRP) vessels;
 - other (e.g. recreational boating, recreational fishing)

ToR 2: An estimate of the relative contribution and impacts of different sea-based sources of marine litter.

ToR 3: An analysis of how much plastic is produced and used by the fishing and shipping industries. This would include what kind of plastic is manufactured and used by these industries, as well as an overview of the existing waste management streams for these plastics and how these vary by region.

ToR 4: An assessment of data gaps, as identified under ToR 1 to 3 above, and prioritization for further work.

Work-stream 2 - ALDFG

Phase 1: Distribution, trends and impacts

ToR 5: Identification of ALDFG hotspots – utilizing data collected in various platforms including the Global Ghost Gear Initiative (GGGI) data portal and building upon work done in CSIRO gear loss study (pending publication)

ToR 6: Quantification of the impacts of ALDFG – environmental, social and economic

Phase 2: Interventions

ToR 7: Review and compare strategies for preventing and mitigating ALDFG.

Planning and Outputs: Completion of the final report, which will be due to GESAMP for peer-review by 1 December 2020.

Biofouling Management (WG 44)

Lead Organizations: IOC-UNESCO
Co-Sponsors: IMO, UNDP
Chairperson: Katja Broeg (Germany)
Members: To be confirmed

Terms of reference for WG 44

1 Comprehensive identification and description of both primary and secondary pathways for the transfer of non-indigenous species (NIS), including, but not limited to:

- fishing (e.g. ships, gear, lines);
- aquaculture (e.g. structures, cages, buoys, netting);
- shipping (e.g. hulls, niche areas, propellers, ropes, anchors);
- other shipping (e.g. recreational boating, recreational fishing, Aids to Navigation);

- e. marine offshore operations (e.g. offshore platforms and structures);
- f. ocean renewable energy generation (e.g. underwater turbines, shafts);
- g. ocean monitoring (e.g. measuring instruments); and
- h. coastal industry infrastructure (e.g. ports, marinas, cooling towers, water purifying units)

2 Description and assessment of impacts on biodiversity (alteration of biodiversity) of the introduction and/or spread of NIS via the identified pathways.

3 Description and assessment of impact of and costs resulting from the introduction and/or spread of NIS via the identified pathways (economic loss and/or alteration of assets; management costs including cost of preventative and reactive measures/mitigation strategies) on human health, social activities and the economy (such as fisheries, aquaculture, fish processing, tourism and related activities and businesses).

4 Provision of an analysis of best management approaches within impacted industries, including the use of emerging technologies, techniques and methods to prevent or reduce the introduction and/or spread of NIS and water contamination resulting from cleaning activities.

5 Provision of recommendations to reduce or prevent the introduction or spread of NIS.

6 Identification of data gaps, in relation to ToR 1 to 4 above, and prioritization for further work:

- a. Consider additional work that may be useful to be carried out by the Working Group beyond what is listed above;
- b. Peer review of the draft report required; and
- c. Provisions for publication, dissemination and outreach.

Planning and outputs: First meeting of the working group by end of 2020.

Climate change impacts on contaminants in the ocean (WG 45)

WG 45 was established in principle by GESAMP at the forty-seventh session, with the terms of reference and work plan to be approved intersessionally.

CORRESPONDENCE GROUPS

Correspondence Group on causes and impacts of massive accumulations of the brown macro-algae *Sargassum* in the nearshore environment of the Caribbean and West Africa.

Lead: Peter Kershaw

Members: Jan Linders (Netherlands) others to be confirmed

Planning and outputs: The Correspondence Group will continue supporting, and liaising with, the current actors on the topic, including SCOR-IOC GlobalHAB, UNEP and regional stakeholders.

Correspondence Group to update the information on sources of the main pollutants impacting the global marine environment – “The 80:20 Conundrum”

Lead: David Vousden

Planning and outputs: At the 46th annual session GESAMP also that it would be advisable to await the outcome of the work of WG 43 (sea-based sources if marine litter including fishing gear and other shipping-related litter) before taking the next steps. It would then be possible to review the figures and produce a short and more accurate ‘Brief’ for use by the Sponsoring Organizations. The intention would be to prepare a press release or briefing document for the next UN Oceans Conference.

Correspondence Group on sand and gravel mining in the marine environment – new insights on a growing environmental problem

Lead: Chris Vivian (United Kingdom)

Planning and outputs:

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

Planning and outputs: Publish report of the correspondence group in the GESAMP R&S Series by the last quarter of 2020. The Correspondence Group is expected to be dissolved following the completion of the report.

Correspondence Group on impact of armed conflicts on the marine environment and sustainable development

Lead: Chris Vivian

Correspondence Group to support the Decade of Ocean Science for Sustainable Development

Lead: Mike Huber

Members: David Vousden, Peter Kershaw

Planning and outputs: To hold bi-lateral discussions with the Decade secretariat on the future involvement of GESAMP in the activities of the Decade.

ANNEX V – TEMPLATE FOR NEW GESAMP WORKING GROUPS

BACKGROUND AND CONTEXT

The subject:

Brief description subject of the study

The nature of the issue:

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

The justification:

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

TERMS OF REFERENCE

The Terms of Reference should:

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

WORK PLAN

Describe the proposed work programme and methods to carry it out, such as workshops, intersessional activities, electronic communications and online platforms.

Devise a provisional timeline, including:

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

ALIGNMENT WITH SUSTAINABLE DEVELOPMENT GOALS

Proposals for the establishment of new Working Groups should indicate how the proposed Working Group will support specific SDGs and their targets.

CONFLICTS OF INTEREST

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

ADMINISTRATIVE ARRANGEMENTS

The following information should be provided:

- .1 Sponsoring Organization(s)
- .2 Additional supporting organizations
- .3 Proposed budget and funding sources
- .4 Working Group Chair(s) and members if available at time of proposal
- .5 Proposed Technical Secretary for the Working Group.

ANNEX VI – 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
- 52 Anthropogenic influences on sediment discharge to the coastal zone and environmental consequences. (1994). Rep. Stud. GESAMP, (52):67 p.
- 53 Report of the twenty-fourth session, New York, 21-25 March 1994. (1994). Rep. Stud. GESAMP, (53):56 p. Available also in French, Spanish and Russian
- 54 Guidelines for marine environmental assessment. (1994). Rep. Stud. GESAMP, (54):28 p.
- 55 Biological indicators and their use in the measurement of the condition of the marine environment. (1995). Rep. Stud. GESAMP, (55):56 p. Available also in Russian

- 56 Report of the twenty-fifth session, Rome, 24-28 April 1995. (1995). Rep. Stud. GESAMP, (56):54 p. Available also in French, Spanish and Russian
- 57 Monitoring of ecological effects of coastal aquaculture wastes. (1996). Rep. Stud. GESAMP, (57):45 p.
- 58 The invasion of the ctenophore *Mnemiopsis leidyi* in the Black Sea. (1997). Rep. Stud. GESAMP, (58):84 p.
- 59 The sea-surface microlayer and its role in global change. (1995). Rep. Stud. GESAMP, (59):76 p.
- 60 Report of the twenty-sixth session, Paris, 25-29 March 1996. (1996). Rep. Stud. GESAMP, (60):29 p. Available also in French, Spanish and Russian
- 61 The contributions of science to integrated coastal management. (1996). Rep. Stud. GESAMP, (61):66 p.
- 62 Marine biodiversity: patterns, threats and development of a strategy for conservation. (1997). Rep. Stud. GESAMP, (62):24 p.
- 63 Report of the twenty-seventh session, Nairobi, 14-18 April 1997. (1997). Rep. Stud. GESAMP, (63):45 p. Available also in French, Spanish and Russian
- 64 The revised GESAMP hazard evaluation procedure for chemical substances carried by ships. (2002). Rep. Stud. GESAMP, (64):121 p.
- 65 Towards safe and effective use of chemicals in coastal aquaculture. (1997). Rep. Stud. GESAMP, (65):40 p.
- 66 Report of the twenty-eighth session, Geneva, 20-24 April 1998. (1998). Rep. Stud. GESAMP, (66):44 p.
- 67 Report of the twenty-ninth session, London, 23-26 August 1999. (1999). Rep. Stud. GESAMP, (67):44 p.
- 68 Planning and management for sustainable coastal aquaculture development. (2001). Rep. Stud. GESAMP, (68):90 p.
- 69 Report of the thirtieth session, Monaco, 22-26 May 2000. (2000). Rep. Stud. GESAMP, (69):52 p.
- 70 A sea of troubles. (2001). Rep. Stud. GESAMP, (70):35 p.
- 71 Protecting the oceans from land-based activities - Land-based sources and activities affecting the quality and uses of the marine, coastal and associated freshwater environment. (2001). Rep. Stud. GESAMP, (71):162p.
- 72 Report of the thirty-first session, New York, 13-17 August 2001. (2002). Rep. Stud. GESAMP, (72):41 p.
- 73 Report of the thirty-second session, London, 6-10 May 2002. Rep. Stud. GESAMP, (73)
- 74 Report of the thirty-third session, Rome, 5-9 May 2003 (2003) Rep. Stud. GESAMP, (74):36 p.
- 75 Estimations of oil entering the marine environment from sea-based activities (2007), Rep. Stud. GESAMP, (75):96 p.
- 76 Assessment and communication of risks in coastal aquaculture (2008). Rep. Stud. GESAMP, (76):198 p.
- 77 Report of the thirty-fourth session, Paris, 8-11 May 2007 (2008), Rep. Stud. GESAMP, (77):83 p.
- 78 Report of the thirty-fifth session, Accra, 13-16 May 2008 (2009), Rep. Stud. GESAMP, (78):73 p.
- 79 Pollution in the open oceans: a review of assessments and related studies (2009). Rep. Stud. GESAMP, (79):64 p.
- 80 Report of the thirty-sixth session, Geneva, 28 April - 1 May 2009 (2011), Rep. Stud. GESAMP, (80):83 p.
- 81 Report of the thirty-seventh session, Bangkok, 15 - 19 February 2010 (2010), Rep. Stud. GESAMP, (81):74 p.
- 82 Proceedings of the GESAMP International Workshop on Micro-plastic Particles as a Vector in Transporting Persistent, Bio-accumulating and Toxic Substances in the Oceans (2010). Rep. Stud. GESAMP, (82):36 p.
- 83 Establishing Equivalency in the Performance Testing and Compliance Monitoring of Emerging Alternative Ballast Water Management Systems (EABWMS). A Technical Review. Rep. Stud. GESAMP, (83):63 p, GloBallast Monographs No. 20.
- 84 The Atmospheric Input of Chemicals to the Ocean (2012). Rep. Stud. GESAMP, (84) GAW Report No. 203.
- 85 Report of the 38th Session, Monaco, 9 to 13 May 2011 (pre-publication copy), Rep. Stud. GESAMP, (85): 118 p.
- 86 Report of the Working Group 37: Mercury in the Marine Environment (in prep.). Rep. Stud. GESAMP, (86).
- 87 Report of the 39th Session, New York, 15 to 20 April 2012 (pre-publication copy), Rep. Stud. GESAMP, (87):92 p.

- 88 Report of the 40th Session, Vienna, 9 to 13 September 2013, Rep. Stud. GESAMP, (88):86p.
- 89 Report of the 41st Session, Malmö, Sweden 1 to 4 September 2014, Rep. Stud. GESAMP, (89) :90p.
- 90 Report of Working Group 40: Sources, fate and effects of microplastics in the marine environment: a global assessment. Rep. Stud. GESAMP (90) :96 p.
- 91 Pollution in the Open Ocean 2009-2013: A Report by a GESAMP Task Team, (2015) Rep. Stud. GESAMP (91):85 p.
- 92 Report of the forty-second session, Paris, 31 August to 3 September 2015. Rep. Stud. GESAMP, (2015): 58 p.
- 93 Sources, fate and effects of microplastics in the marine environment: part two of a global assessment (2016). Rep. Stud. GESAMP, (93): 220 p.
- 94 Proceedings of the GESAMP international workshop on the impacts of mine tailings in the marine environment (2016). Rep. Stud. GESAMP (94): 83 p.
- 95 Report of the forty-third session, Nairobi, 14 17 November 2016. Rep. Stud. GESAMP, (2017): 72 p.
- 96 Report of the forty-fourth session, Geneva, 4-7 September 2017. Rep. Stud GESAMP (2018): 66 p.
- 97 The magnitude and impacts of anthropogenic atmospheric nitrogen inputs to the ocean (2018). Rep. Stud. GESAMP (97): 47 p.
- 98 High level review of a wide range of proposed marine geoengineering techniques (2019). Rep. Stud. GESAMP (98):143 p.
- 99 Guidelines for the monitoring and assessment of plastic litter in the ocean (2019). Rep. Stud. GESAMP (99):123 p.
- 100 Report of the forty-fifth session, Rome, 17-20 September 2018. Rep. Stud. GESAMP (2019): 70 p.
- 101 Methodology for the evaluation of ballast water management systems using Active Substances (2019). Rep. Stud. GESAMP (101):110 p.
- 102 GESAMP Hazard Evaluation Procedure for Chemicals carried by Ships, 2019. Rep. Stud. GESAMP (102): 97 p.
- 103 Proceedings of the GESAMP international workshop on assessing the risks associated with plastics and microplastics in the marine environment (2020) Rep. Stud. GESAMP (2020): 60 p.
- 104 Report of the forty-sixth session, New York, 9-13 September 2019. Rep. Stud. GESAMP (2020): 104 p.
- 105 Impacts of wastes and other matter in the marine environment from mining operations including deep sea mining, (in preparation) Rep. Stud. GESAMP (105).
- 106 Global Pollution Trends: Coastal Ecosystem Assessment for the Past Century (2020) Rep. Stud. GESAMP (106): 103 p.
- 107 Report of the forty-seventh session, held remotely 8-11 September 2020. Rep. Stud. GESAMP (107): 29 p.



Science for Sustainable Oceans

ISSN 1020-4873