



**GESAMP**

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

GESAMP 47/7/2  
28 August 2020  
ENGLISH ONLY

47th session  
Agenda item 7

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## SCOPING ACTIVITIES

### Proposal to establish a GESAMP Working Group on Climate Change Impacts on Contaminants in the Ocean

Submitted by IAEA, UNEP and IOC-UNESCO

#### Rationale

1 Global marine climate-change (CC) impacts, including deoxygenation (DO), ocean warming (OW), sea-level rise (SLR) and ocean acidification (OA) occur together and cause fundamental changes in ocean physics and chemistry, potentially affecting the speciation, cycling and bioavailability of many diverse contaminants, including **trace elements, radionuclides, organic pollutants and nutrients**. The extent to which these future CC impacts will affect the fate and uptake of these contaminants in the marine environment are still not well quantified. There is thus a pressing need to better understand the extent of future CC effects on marine contaminants for improving impact assessment models that can lead to enhanced resilience in coastal and marine ecosystems and their adjacent communities.

#### Background

2 Complex global, regional and local biogeochemical processes connect climate and environmental change that affect the health and sustainability of many coastal and marine ecosystems and their communities. The extent to which these changes will affect the physico-chemical nature (e.g., speciation, complexation, redox, sorption properties) of diverse contaminants, such as trace elements, radionuclides and organic compounds, will determine their eventual fate and biological availability. A sustained change in ocean deoxygenation, temperature and pH may affect biogeochemical cycles in non-linear ways; for example, the Arctic Ocean appears to be most impacted by the effects of ocean acidification while tropical coral reefs have been ravaged by global thermal stress. The evaluation of the impacts on the land-based, coastal, aeolian and otherwise introduced anthropogenic contaminants under future climate change scenarios is complex and still largely unknown (see recent IPCC reports and UNEP/AMAP report on CC and POPs)<sup>1</sup>. Increased temperature, acidity, precipitation, hypoxia, sea level rise, changes in the ice cover, ocean circulation patterns and the chemical speciation of trace elements and radionuclides, as well as organic compounds alike, require advanced understanding and complex modelling. Likewise, there still exists a pressing need to carry out comprehensive climate change related multi-stressors' studies on the effects of contaminants in seawater and sediments on marine organisms at various complexity scales in order to better understand the effect of contaminants and CC on the marine ecosystem.

3 Given the limited understanding we have of the impacts of climate change on trace element cycling, and even less so for radionuclides and organics, IAEA proposes the establishment of a new GESAMP Working Group to:

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<sup>1</sup> IPCC, 2014: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1132 pp.

- .1 critically review all existing research, and
- .2 make recommendations for future research directions.

4 This review will provide guidance to policy makers on how to deal with possible negative effects of changes in ocean physics and chemistry on the speciation, cycling and bioavailability of diverse contaminants on important coastal and marine resources.

### **Scope of work**

5 The overall objective of the GESAMP Working Group: "Climate Change Impacts on Contaminants in the Ocean" will be to get a better understanding of the role the major stressors of climate change, such as i) ocean warming and stratification, ii) change in the chemical composition of seawater, and iii) ocean acidification, will have on the distribution, transport and biogeochemical cycling of trace elements, radioactive isotopes, organic contaminants and nutrients. In particular, the WG will assess the potential impact of changes in circulation and sea-level rise, as well as frequency and intensity of extreme events on the sources and transport of these contaminants in the ocean.

6 The WG will review existing literature, conduct a gap analysis, and recommend targeted research to close the knowledge gaps and synthesize its findings in a GESAMP report.

### **Inter-agency and external cooperation**

7 This WG will support:

- .1 the UN Sustainable Development Goals 2 (No Hunger), 13 (Climate Action) and 14 (Life Below Water), and 17 (Partnerships for the Goals) process;
- .2 the mandate of the IAEA, that serves Member States in their monitoring of radioactive and non-radioactive pollution and potential resulting impacts of pollution and climate change to the environment;
- .3 the mandate of the UN Environment Programmes on sound management of chemicals and proper waste disposal, Stockholm Convention on POPs, the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA), and
- .4 the mandate of IOC UNESCO to provide the scientific knowledge base to its Member States for informed decisions.

8 Several Regional Seas Programmes such as the Oslo-Paris Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), the Helsinki Convention (HELCOM) and the Barcelona Convention – Marine Action Plan (MAP), have shown great interest in having a better understanding of the potential impacts of climate change on sources, behaviour and fate of radionuclides in the marine environment. Other stakeholders are GEOTRACES, as well as Parties to the Stockholm and Minamata Conventions. The WG will actively seek the involvement with these groups and assume that in that case in-kind support through the delegation of experts in the field to become WG members, would be supported by the respective organization.

9 There are linkages with GESAMP WGs on this issue, including WG 38 on atmospheric input of chemicals to the ocean, and WG 41 on marine geoengineering.

### **Administrative arrangements**

10 The Working Group will be set up with the following structure and initial sponsorship, with further sponsorship contributions welcome upon establishment.

<i>Name of working group:</i>	Working Group on climate change impacts on contaminants in the ocean
<i>Lead agency:</i>	IAEA with OC-UNESCO and UNEP
<i>Sponsoring agencies:</i>	IAEA, UNEP and IOC-UNESCO
<i>Budget:</i>	USD 60,000
<i>WG Technical Secretary:</i>	Sylvia Sander (IAEA)

### **Resource considerations**

11 The core source of funding will be provided by the IAEA, IOC-UNESCO and UNEP. The IAEA will commit at least EUR 10 000 per annum for the support of this WG, financial commitments of IOC UNESCO and UNEP were still pending confirmation at the current date. However, the sponsoring agencies/programmes have already committed to be contributing on an in-kind basis by providing their in-house expertise, recommending relevant experts to be involved, participating in workshops, providing comments on technical documents where relevant.

### **Tentative three-year budget**

12 Funding of three workshops to bring together WG members and invited external experts to deliver the terms of references within a three-year timeframe. Workshops will be held either virtual or face-to-face, depending on funds available and the travel restrictions due to covid-19. A virtual workshop is scheduled at no real cost, and a face-to-face workshop at 30,000 for travel support of approx. 12 experts. A maximum total budget of USD 60,000 is assumed, anticipating two face-to-face and one virtual meeting.

### **Tentative work plan**

13 The working method of the Working Group will be a mix of meetings and intersessional work/correspondence, including videoconferencing/telephone conferencing, where appropriate. The proposed timeline is as follows:

- .1 Identification of two WG Co-chairs and approx. Ten WG members: January 2021;
- .2 First meeting of the WG: April 2021;
- .3 Deliver interim report (including provisional structure) by June 2021;
- .4 Second (virtual) meeting of the WG: January-February 2022;
- .5 Deliver first draft report by April 2022;
- .6 Third meeting of the WG: January-February 2023;
- .7 Deliver draft final report by end October 2023; and
- .8 Deliver final report by end of 2023.

**Proposed Terms of Reference**

14 The WG will fulfil the following tasks:

- .1 critically review existing research on:
  - .a the effect of changes in ocean physics and chemistry on the speciation, cycling and bioavailability of diverse contaminants including trace elements, radionuclides, organic pollutants and nutrients;
  - .b the effect of such changes on important coastal and marine resources;
  - .c identify data gaps;
- .2 make recommendations for future research directions on the effect of changes in ocean physics and chemistry on the speciation, cycling and bioavailability of diverse contaminants including trace elements, radionuclides, organic pollutants and nutrients;
- .3 prepare a list of potential reviewers of the reports of the WG;
- .4 develop a plan for publication and dissemination of the findings of the WG; and
- .5 propose additional work that may be useful to the sponsoring agencies and which could be carried out by the WG beyond what is listed above.

**Proposed profile for Working Group members**

15 The expertise required by the Working Group includes: Marine scientists with expertise in chemical and/or physical oceanography, biogeochemistry, element speciation, nutrient cycling, modelling and who preferably have worked specifically with effects of changes in ocean physics and chemistry on the speciation, cycling and bioavailability of diverse contaminants.

16 Suggestions for candidates will be sought from already existing international activities such as experts in the field of sea water speciation modelling, e.g. from SCOR WG 145 MARCHEMSPEC, multiple stressor biogeochemists, e.g. from SCOR Working Group 149 Changing Ocean Biological Systems (COBS) and the IOC UNESCO Group of Experts on Multiple Ocean Stressors), ocean/climate change modellers, key lead scientists of GEOTRACES, and experts on nutrient pollution from GPNM and IOC UNESCO N-CIRP in order to form a strong international and interdisciplinary working group expertise.

17 A balance in terms of geographic and gender representation, as well as levels of scientific experience will be aspired.

**Action requested of GESAMP**

18 GESAMP is invited to consider the information provided and take action as appropriate.

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