



GESAMP

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

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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 and UN Environment

Issue

1 Climate-change (CC) impacts, including deoxygenation (DO), ocean warming (OW), sea-level rise (SLR) and ocean acidification (OA) cause fundamental changes in ocean physics and chemistry, affecting the release, speciation, bioavailability and cycling of many contaminants, including **trace elements**, **radionuclides** and **organic pollutants**. The extent to which environmental changes will affect the source, behaviour and fate of these contaminants in the marine environment under future CC scenarios are still poorly understood. There is a pressing need to better understand the impact of CC on contaminants in the ocean to build resilience in coastal and marine ecosystems and their adjacent communities.

Background

2 Complex global and regional feedback mechanisms connect climate and environmental changes in the terrestrial and marine environments, affecting the water and climate patterns. The extent to which these changes will affect the speciation of trace elements and radionuclides, biogeochemical cycles in the water column and sediment–water interaction, will determine their distribution, balance between dissolved and particulate phases, transfer to marine biota and inventories in different marine compartments. Even subtle and slow changes in temperature and pH may affect coastal and fragile marine ecosystems (e.g. polar regions, coral reefs) the resilience of which is undermined by pollution. The evaluation of the impacts on the land-based, coastal, aeolian and underwater sources of anthropogenic contaminants under various predicted climate change scenarios is complex and still largely unknown (see IPCC reports and UNEP/AMAP report on CC and POPs)¹. 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 on 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 critically review all existing research and to make recommendations for future research directions. This review will also provide guidance to

¹ 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.

policy makers on how to deal with possible negative effects on important coastal and marine resources.

4 Some of the Regional Seas Programmes such as OSPAR have shown great interest in this topic, to better predict possible impacts of climate change on sources, behaviour and fate of radionuclides in the marine environment.

5 IAEA is seeking support from other Sponsoring Organizations such as UN Environment, FAO, IOC-UNESCO, ISA, and Regional Seas programmes such as OSPAR, HELCOM, MAP, as well as Parties to the Stockholm and Minamata Conventions. It is envisaged to concurrently apply for a Scientific Committee on Oceanic Research (SCOR) WG on this topic to raise its visibility in the science community and to facilitate expert meetings.

Scope of work

6 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 ocean warming and stratification, change in the chemical composition of seawater, ocean acidification, on the biogeochemical cycling of trace elements as well as the distribution and transport of organic contaminants. In particular, the WG will aim to 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 radionuclides in the ocean.

7 This will be done through engagement with key 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), Scientific Steering Committee members of GEOTRACES, in order to form a strong working group expertise. 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

8 This WG will support: a) the UN Sustainable Development Goals 2 (No Hunger), 13 (Climate Action) and 14 (Life Below Water), and 17 (Partnerships for the Goals) process; b) 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; c) 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 d) the mandate of OSPAR, who had specifically requested information on the impact of CC on radionuclides in the North-East Atlantic.

9 There are linkages with active GESAMP WGs on this issue including WG38 on Atmospheric Input of Chemicals to the Ocean and WG 41 on Marine Geoengineering.

Action requested of GESAMP

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