



GESAMP

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

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Agenda item 4

**PLANNING OF GESAMP ACTIVITIES:
ATMOSPHERIC INPUT OF CHEMICALS TO THE OCEANS
Management Implications**

A proposal for a workshop by GESAMP Working Group 38

Submitted by WG 38 Co-Chairs

Introduction

1 For several years GESAMP WG 38 has been successful at delivering valuable scientific synthesis and relevant advice on several issues related to air-sea exchange to its sponsors and the wider scientific community. In situations where GESAMP activities relate directly to specific international conventions, the translation of the scientific outcomes into national and international policymaking is relatively straightforward, but beyond the area of conventions, the connection between research and utilization of its outcomes by the user community is not necessarily straightforward. Indeed, the process of exchanging appropriate evidence-based advice, alongside the associated scientific uncertainties, is an ongoing challenge for all partners involved in GESAMP and not just in WG 38 activities (scientists, managers and policy makers)..

2 Thus, while this document is focussed around WG 38 activities, we anticipate it could highlight the ways to improve the translation of scientific findings into actionable information for users across GESAMP. As we have refined this idea to present a formal proposal to GESAMP, it has become clear that it raises a wider issue about the way GESAMP interacts with its user community, and we have therefore decided to present this proposal in a form designed to seek comment and advice from GESAMP. The key issues for discussion, as we see them, are summarised at the end of the document.

Proposed workshop

3 The proposal here is for GESAMP WG38 to organise a workshop involving members of WG 38 and other scientists involved in estimating atmospheric deposition and its impacts, alongside individuals involved in environmental management and governance. A tentative title for the workshop is “Atmospheric Input of Chemicals to the Ocean – Management Implications”. The draft “Terms of Reference” for the workshop are outlined in annex 1.

4 A preliminary planning meeting for this workshop was held on the 28 June 2019, at the University of East Anglia, United Kingdom. Attendees at the planning meeting are listed in annex 2.

5 During the planning meeting, the discussions identified two important issues which are particularly challenging for effective environmental management. The first issue is that atmospheric transport and deposition are trans-boundary in nature with emissions in one country affecting ecosystems in another. The second issue is that the key concern for policy makers is one of environmental impacts, rather than the deposition itself. There are analogies here to the issues addressed by the Convention on the Long Range Transboundary Air Pollution (CLRTAP) <https://www.unece.org/environmental-policy/conventions/envlrtapwelcome/convention->

[bodies/working-group-on-effects.html](#)), although their activities have not really focussed much on marine ecosystems.

6 The proposed workshop would focus on a particular selected group of issues designed to test ways to improve the dialogue between scientists and the user community (managers and/or policy makers) in order to deliver better marine environmental management. The workshop would utilize, to the extent feasible and where applicable, lessons learned from the work of other bodies such as CLRTAP concerning the trans-boundary issues.

7 In developing the plan for the workshop, we have deliberately decided to focus on environmental management challenges where scientific understanding and uncertainty span a wide spectrum, ranging from situations of high scientific confidence through to issues with high uncertainty. The management issues also embrace policy concerns which range from those which require a long-term societal change to alleviate long-term problems, through to recently emerging high-profile areas of environmental concern which are subject to large uncertainties in the available evidence and potentially of high environmental/societal risk. This range of environmental management issues should provide concrete examples with which to test the approaches scientists and managers/policy makers take in order to respond to issues where the confidence in scientific evidence is limited, but where scientists feel that the data or evidence are showing sufficiently strong trends to require further consideration. Specifically, we would test the most appropriate approaches for scientists to engage with the user community in order to convert scientific outcomes on environmental trends and their associated uncertainties into actionable information for environmental management or policy.

8 Such effective engagement should lead to appropriate and proportionate management guidelines and policy proposals, both in terms of environmental regulation and in terms of collecting appropriate additional evidence. The latter might necessarily involve a process beyond the normal relatively slow process of scientific paper review and publication. A proposed approach to this process is illustrated in Figure 1 and would be one of the approaches evaluated in the workshop. We are not proposing that this process necessarily leads to new treaties, but rather that the activities of WG38 and GESAMP itself are reaching its user community more effectively.

9 To evaluate the potential engagement mechanisms, WG38 plans to establish a group of 25-30 invited experts representing scientists and user communities, from both national and international organisations, and selected for their relevant expertise and enthusiasm for developing such new ways of working together in order to improve adaptive management strategies and the operation of the policy/evidence interface. This group would meet for approximately three working days with informal presentations and discussions, preceded by preliminary work by the participants preparing and reading various briefing documents. Some preliminary scientific work may be necessary such as deriving source apportionment for inputs to the geographic region in question. At the meeting one of the activities will involve the presentation of specific case studies by scientists who will explain what they see as the environmental concerns that arise from the case study. Managers would then consider if this information would lead them to recommend specific actions in response to the concerns (which may include something like closing a fishery and/or initiating further studies), and policy makers then consider if they would be willing to act on this advice.

10 The outcome of the workshop would be a report, for publication, in a science and policy focused journal, plus an associated report for GESAMP and its sponsors with recommendations for best practice and user engagement. in these areas of science.

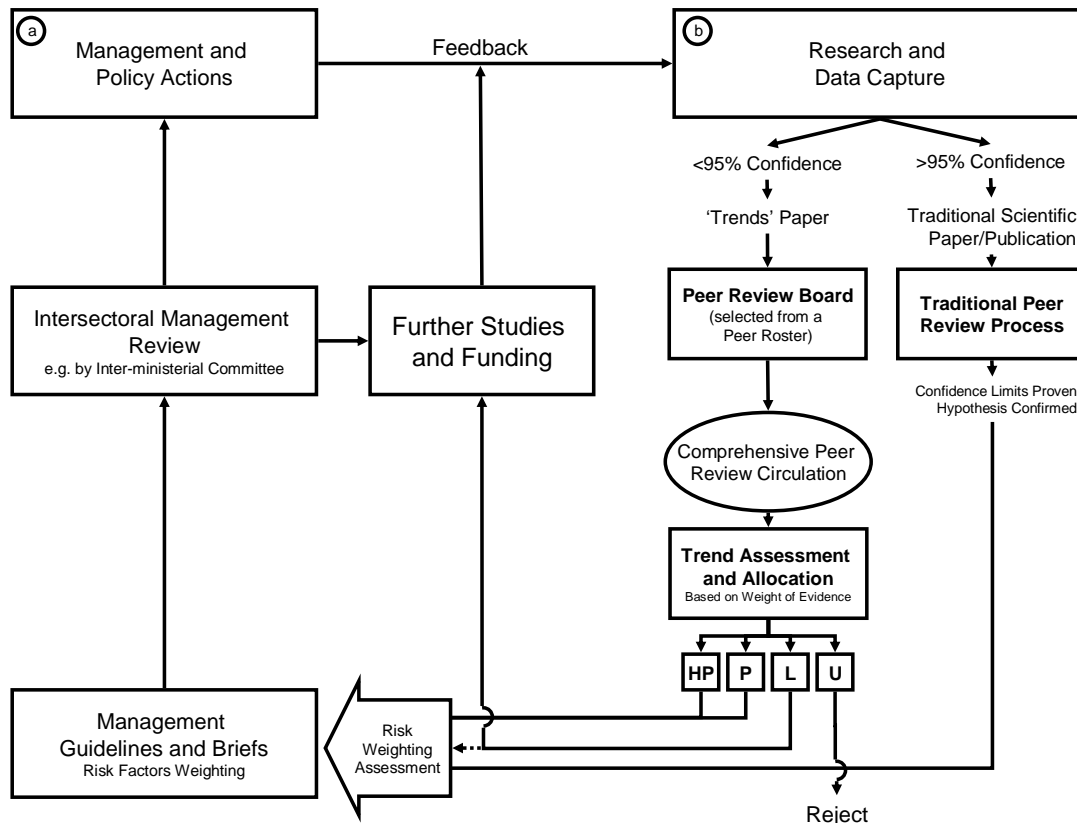


Figure 1: A theoretical Proactive Adaptive Management Approach for both research (a) and management (b)
 (Taken from Large Marine Ecosystems and Associated New Approaches to Regional, Transboundary and 'High Seas' Management. Vousden D. Chapter 18. Pp.385-410. In International Marine Environmental Law Research Handbook series. Ed Rayfuse. R. Edward Elgar Publishing. 2015. ISBN: 9781781004760)

11 We believe that the best way to approach this meeting is to consider specific examples of contrasting environmental management challenges. Given that this proposal will be led by WG38 (although designed to be more generally relevant across GESAMP), the focus of this initial workshop would be on air-sea exchange issues. We propose to focus on one specific region and three pollutants (See Figs 2 & 3), although we would welcome comments on whether this activity should initially focus on a subset of these examples.

12 The proposed region is the Southwest Indian Ocean – This is a region of relatively high atmospheric deposition driven by emissions in central Africa and one with important local fisheries and periodic algal blooms, clearly identifiable by satellite. There is a distinct upper atmospheric flow path, associated at least in part with biomass burning, which brings nitrogen, iron and other atmospheric pollutants into the Mozambique channel region from central Africa and on into the southern Indian and Southern Ocean region. This is a region where utilisation of marine resources is of considerable societal importance to a large population and where industrial/societal impacts are otherwise low compared to many regions in the northern hemisphere. However, the scientific evidence of a significant environmental impact of atmospheric deposition is currently uncertain.

13 We propose to focus on the atmospheric deposition of three components and their impacts to provide contrasting management challenges.

1. Nitrogen deposition. A recent report by WG38 identified sources and impacts of this deposition (Figure 2 shows one component of this nitrogen deposition). The nitrogen emissions generally arise from agricultural and combustion (both industrial

and biomass burning) sources and upon deposition can increase marine algal production, contributing to widespread chronic long-term environmental problems associated with nitrogen enrichment. The scientific evidence base in terms of the atmospheric deposition pattern at least is relatively strong. However, discussions of the management of this issue, may require some work on source apportionment ahead of the workshop.

2. Iron deposition. Iron is an essential nutrient and is required for algal production. Sources to the atmosphere include desert dust and combustion sources from both industrial activity and biomass burning. Hence controls on sources are not straightforward. WG38 has previously considered iron deposition so the evidence base is relatively mature (Figure 3), but again source apportionment work may be required ahead of the workshop.
3. Atmospheric deposition of microplastics. Microplastics in the ocean is a recently emerging issue of high public and policy concern. Sources are generally not well-understood and the role of atmospheric transport has been little studied. GESAMP has a relatively new working group (WG 40) studying marine microplastics, but it is not currently focussing on atmospheric transport. Our own preliminary calculations suggest that atmospheric transport may be important and some further preliminary work in this area may be required before the workshop. Hence this issue will provide a test of developing appropriate policy in an area of high societal concern and great uncertainty.

14 The planned workshop attendees would be selected for the relevant expertise and interest in this geographic and subject work area with appropriate gender and geographic balance. We suggest inviting, in addition to the chairs, roughly twelve scientists with relevant atmospheric and oceanic expertise in deposition and/or impacts, and approximately the same number of individuals from the management/user community with an interest in the subject.

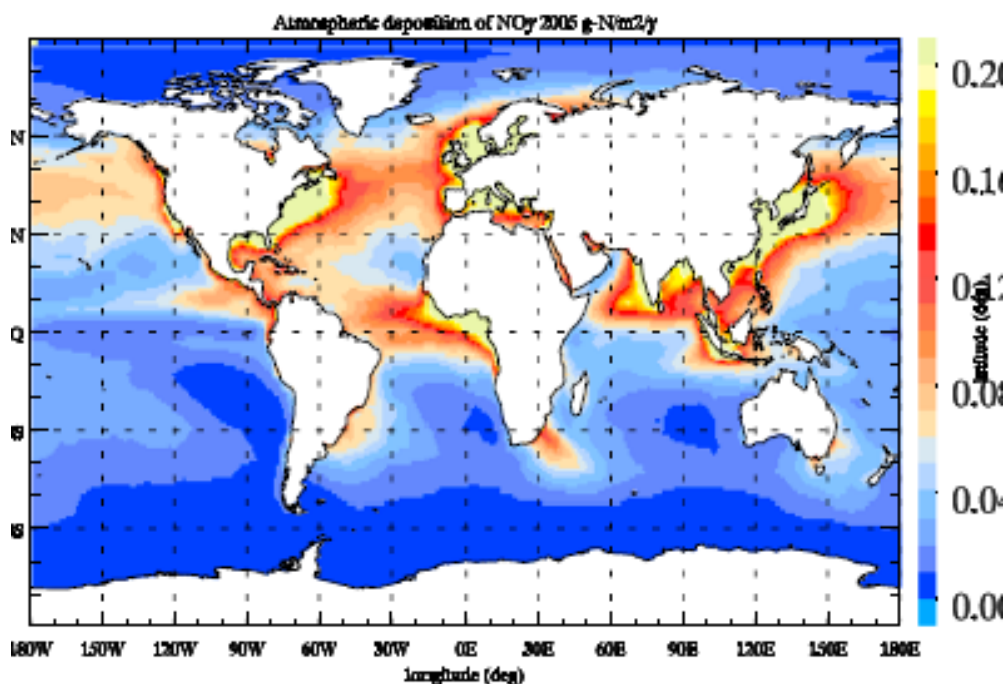


Figure 2. Oxidised nitrogen deposition to the ocean, from Jickells et al., 2017 *Global Biogeochemical Cycles* 31, doi:10.1002/2016GB00558

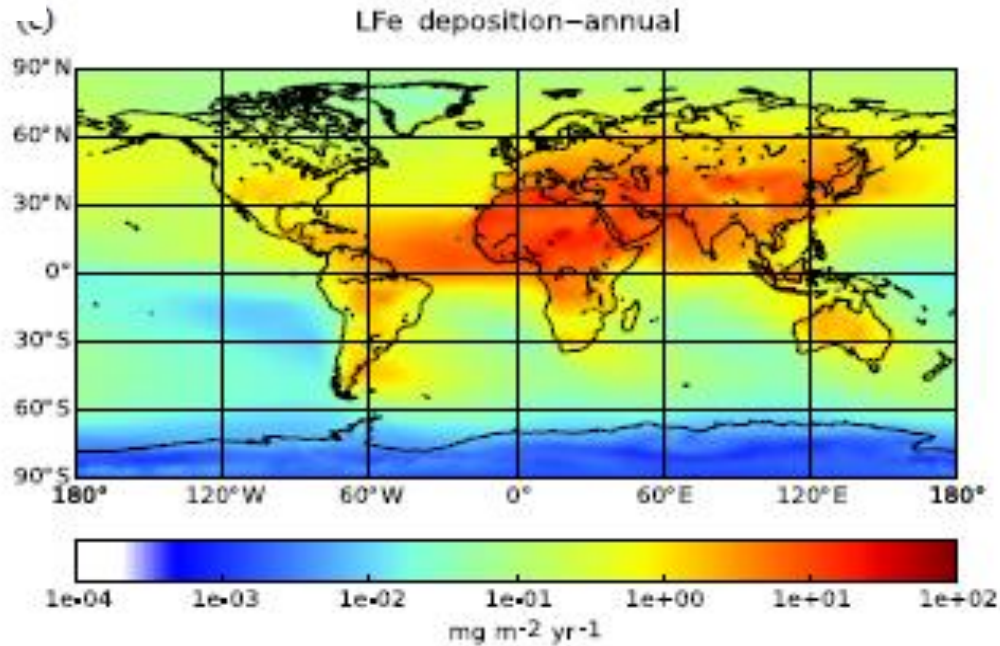


Figure 3. Labile iron deposition to the ocean, Myriokefalitakis et al., (2018), *Biogeosciences* 15, 6659-6684.

Key issues for discussion

15 The issues on which we would particularly welcome feedback from the GESAMP members are identified below:

1. Is it appropriate for GESAMP and WG38 to undertake such an initiative on the effective interaction with the user community, or have others already done this?
2. If we do develop the workshop, which GESAMP sponsoring agencies would wish to be involved?
3. Is the workshop route focussing on specific issues the best way to address the broader goal of improving interactions with the user community?
4. If we develop the workshop, should it consider all three proposed atmospheric deposition components, or a subset and if so which? Is the suggested regional site appropriate? and
5. Are the numbers of invitees appropriate to the scale of the task?

Action requested of GESAMP

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

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ANNEX 1

Atmospheric Input of Chemicals to the Ocean – Management Implications

Workshop proposed Terms of Reference

- Test the most appropriate approaches for scientists to engage with users in order to evaluate scientific evidence of environmental trends and their associated uncertainties related to the atmospheric input of certain chemicals to the ocean.
- Utilize current information on the atmospheric deposition of the nutrients nitrogen and iron in the Southwest Indian Ocean as an example of a region where such deposition may be particularly important. In addition, use whatever information can be found to try and estimate the importance of the atmospheric route for microplastics entering the ocean in general, and in the particular region.
- Evaluate how to convert scientific information into the information that can support decision making.
- 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.

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ANNEX 2

Attendees at the workshop planning meeting held on the 28th of June 2019 in Norwich, United Kingdom:

Name	Affiliation and Title
Alex Baker	University of East Anglia, UK, Member of GESAMP and WG 38
Robert Duce	Texas A&M University, USA, WG 38 Co-Chair, Member of GESAMP
Timothy Jickells	University of East Anglia, UK, WG 38 Co-Chair
Peter Kershaw	Chair of GESAMP and Chair of GESAMP WG 40, "Sources, fate and effects of microplastics in the marine environment: a global assessment"
Peter Liss	University of East Anglia, UK, Former WG 38 Co-Chair
Michael Roberts	Nelson Mandela University, South Africa and National Oceanography Centre, UK
David Vousden (by Skype)	Rhodes University, South Africa, Member of GESAMP