

18 May 2018

## Submission to the Environmental Audit Committee inquiry into sustainable seas

### Key points

- **Exploration for minerals and new sources of chemicals from the oceans is now active in many parts of the world, and it is likely that activity will increase significantly in the coming years.**
- **It is important to consider the drivers, opportunities, challenges, and wider consequences of utilising these emerging classes of resource. Sustainable use of these novel resources could have significant benefits, but involves interaction with a natural environment that is challenging to access and less well understood than that on land.**

### Introduction

1. The Royal Society welcomes the opportunity to submit evidence to the Committee's inquiry into Sustainable Seas. The Society is the National Academy of Science for the UK and the Commonwealth. It is a self-governing Fellowship of many of the world's most distinguished scientists working across a broad range of disciplines in academia and industry. The Society draws on the expertise of its Fellows and Foreign Members to provide independent and authoritative scientific advice to UK, European and international decision makers.
2. This response focuses on the Committee's questions about marine industries, drawing on the Society's recent 'Future of oceans' project<sup>1</sup> that considers how we might use the mineral and genetic wealth of the oceans, as well as the drivers and wider consequences of doing so. This project recognises that sustainable use of these novel resources could have significant benefits, but involves interaction with a natural environment that is challenging to access and less well understood than that on land. It highlights the drivers, opportunities, challenges, and wider consequences of utilising these emerging classes of resource, including an interactive map that illustrates where deep sea mining might happen in the future and where some of the diverse ocean ecosystems are located and an evidence pack.

### **The environmental impact of marine industries and the role of regulators in mitigating their environmental impact**

3. Terrestrial mining activity has had significant local and regional environmental impacts. These impacts are now mostly strongly regulated and mitigated against during all stages of exploration and exploitation. The oceans have minerals and new sources of chemicals that could offer significant benefits but the deep-sea ecosystem is unusual, fragile, and under-studied, but provides many valuable ecosystem services.
4. For deep sea mining both the action of mining and shipboard processing could have a significant, and potentially permanent, impact on local and regional deep-sea ecosystems and may occur over 1 – 2 km from the site of extraction. Rigorous impact assessments and monitoring requirements will be essential to limit the scale of negative impacts. However, future mining and processing mechanisms are not well constrained, and as such there is high uncertainty around potential impacts. Local and regional distributed impacts can be significantly different. The broader impact of mining a single mineral site (e.g. a polymetallic sulphide) is likely to be limited, but the cumulative impact of multiple, adjacent activities is

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<sup>1</sup> <https://royalsociety.org/topics-policy/projects/future-ocean-resources/> [Accessed 11 May 2018]

unknown and difficult to predict from pilot or lab-based studies

5. Major local and long-term impacts of metal resources have been identified by a number of experiments using simulations and include: removal of the unique sea-floor habitat over a wide area, dispersion of sediment plumes, sediment compression limiting recolonization and toxicity from substrate break-down, potential acute toxicity of the mining by-products and tailings, and removal of unusual geological features of potential scientific interest. Regional impacts include sub-lethal effects on the ecosystem and individuals and possible bioaccumulation of metals in the ecosystem.
6. Marine Protected Areas and designated 'Significant Areas of Particular Environmental Interest' will play an important role in conserving deep-sea ecosystems. In the Clarion Clipperton Zone, polymetallic nodule exploration is subject to a management plan which creates zones where mining will not occur. However the effectiveness of this system is not yet known, particularly in terms of connectivity and recolonisation post-mining. In general, the management plan is hampered by significant unknowns in the ecology and biogeography of these unique deep-sea biological communities.
7. These uncertainties highlight the continuing importance of a precautionary approach and the need for regional scale testing of mining activity impact on the environment and ecosystem function over long timescales. Furthermore, the effectiveness of protected areas beyond national jurisdiction will also be limited by the difficulty of effective monitoring and enforcement.
8. In developing regulations for the exploitation of deep sea mineral resources the international seabed authority will need to consider the significant number of uncertainties that still exist. These regulations will need agreement on: requirements for environmental impact assessments; regional management plans; area-based management; monitoring, evaluation and reporting; emergency response; supervision; and enforcement. Regulating exploitation would require a number of tasks including monitoring and enforcement which the international seabed authority does not currently undertake.
9. In contrast with deep sea mining, the access to and utilisation of 'marine genetic resources', seeking useful products from the genes and molecules of marine species relies on biological, biochemical and medical expertise. It presents much less risk to the ocean environment than deep sea mining, though the lack of knowledge of the deep-sea environment does limit confidence of the impacts, particularly in locations where other human actions may contribute to environmental perturbation.
10. The environmental considerations for marine genetic resources depend on the sampling method and the way in which natural products are obtained. In general, the environmental impacts of bioprospecting are limited by the comparatively small amount of biomass that needs to be harvested for use. Marine genetic resource products, although originally discovered in living organisms, are typically synthesised, rather than requiring the organisms themselves as a source. In some cases, however, the desired natural products are present in such low concentrations that large amounts of the source organism must be collected and there is potential for over-exploitation. Improvements in chemistry will reduce the need for excessive collection in future.
11. Some of the most valuable products still rely on continued harvesting of natural resources to extract the product. In 2014, of the nine prescription and over-the-counter marine-derived drugs available, six were synthesised chemically and/or produced by microbial fermentation, but three still relied on extracting the genetic resource from natural environments.

**How the deep sea mining industry is likely to grow in the years ahead**

12. One challenge in exploitation of both deep sea mineral and marine genetic resources is that, in the area beyond national jurisdiction, they are subject to international legal agreements under active discussion through UN bodies. Until these are clarified, there remains uncertainty about the extent to which both resources can be pursued, and the transnational implications of doing so. International agreement will need to consider the environmental impact of activities: exploitation of metal resources will require international agreement on the nature of a formal environmental impact assessment, while the typically low level of impact for utilisation of genetic resources may not require this level of formality.
13. Given technological and regulatory development it is possible that exploitation activity could begin in the next decade. The 26 mining exploration licences granted by the international seabed authority and the environmental permit granted for seabed mining off the coast of Papua New Guinea highlight a significant amount of activity around deep sea mining at present.
14. The Royal Society worked with the Foreign and Commonwealth Office to host an informal workshop in London in February 2018 on the subject of deep sea mining regulation. Representatives of individual nations, bodies of the International Seabed authorities, contractors, scientists and other practitioners discussed the development and uncertainties yet to be clarified.<sup>2</sup>

For further information, please contact Becky Purvis, Head of Public Affairs on [becky.purvis@royalsociety.org](mailto:becky.purvis@royalsociety.org)

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<sup>2</sup> <https://www.isa.org.jm/files/documents/EN/Regs/2018/RegsWShop.pdf>