

Executive summary

Development of the ocean economy is facing an increasingly acute dilemma. On the one hand, marine resources are essential to help meet the planet's growing needs in food, energy, jobs, medicines, transport and so on. On the other, increasing use of our seas and ocean, the natural resources and the services they provide, adds to mounting pressures on marine ecosystems. The marine environment is already straining under the weight of pollution, rising water temperatures, loss of biodiversity, rising sea levels, growing acidification and other impacts associated with climate change, with the result that unsustainable growth in ocean-related economic activity risks yet further undermining the very foundations on which the ocean economy stands.

As the OECD report on *The Ocean Economy in 2030* underlined, realising the full potential of our seas and ocean demands responsible, sustainable approaches to their economic development. A durable balance between increasing ocean uses and marine ecosystems' integrity requires actions on multiple fronts, and new thinking and fresh approaches are required in many areas.

This need for new thinking and actions is occurring at a time when science, technology and innovation activities themselves are undergoing major changes. Galvanised by digitalisation, the transformation of scientific research and innovation processes is speeding up in almost all disciplines and sectors of the economy, while the adoption of disruptive technologies and new collaborative and open innovation mechanisms are gaining ground in many parts of the world.

In this context, this follow-up report *Rethinking Innovation for a Sustainable Ocean Economy* explores the role played by science, technology and innovation (STI) to propel growth in the ocean economy, while contributing possible solutions to its long-term sustainability challenges.

What innovations are on the horizon that may benefit both economic growth and environmental sustainability?

Ocean innovations in the pipeline – especially those building on generic advances in science (e.g. biochemistry, physics) and technology (e.g. artificial intelligence, robotics, big data) – appear set to enhance knowledge and understanding of marine ecosystems and their functions and improve ocean industries' performance markedly.

Economic progress in ocean activities has to become environmentally sustainable, and so this report devotes special attention to recent and forthcoming advances in a number of maritime sectors, which have the potential to deliver win-win solutions, i.e. strengthening economic development while at the same time supporting ecosystem preservation and restoration. Four in-depth case studies are provided. They feature cross-sector innovations, and were selected in view of their different degree of technical and business maturities, and their possible impacts. They include:

- Progress in ballast water treatment in ships, to combat the spread of (alien) marine species;
- Floating offshore wind power and its capacity for generating renewable energy and reducing greenhouse gases;
- Innovations in the marine aquaculture sector which may contribute to making the industry economically and environmentally more sustainable;
- Conversion of decommissioned oil and gas rigs and energy renewables platforms into artificial reefs.

The preliminary assessment suggests that the innovations presented in the case studies have the potential to foster sustainable ocean economic activity, with possible positive impacts beyond the marine environment, although some face more challenges than others. In addition, while science has led to many of the actual developments under consideration, one important lesson from all case studies – taking into account many differences in their operational and business models – is that major knowledge gaps in marine ecosystems’ biophysical characteristics exist today, which constrain future developments and call for precautionary approaches. A continued effort is therefore required to deliver progress on both scientific and technological fronts, as to ensure win-win situations that benefit both economic growth and environmental sustainability.

Ocean economy innovation networks: a new kind of organisational innovation among marine and maritime actors?

As developments in many other sectors of the economy illustrate, successful innovation in science and technology often requires fresh thinking in the organisation and structure of the research process itself. And so it is with ocean-related research, development and innovation. This report focuses on a particular type of collaboration among marine and maritime actors: innovation networks in the ocean economy.

Ocean economy innovation networks are initiatives that strive to bring together a diversity of players (e.g. public research institutes, large enterprises, small and medium sized enterprises, universities, other public agencies) into flexibly organised networks. They work on a range of scientific and technological innovations, in many different sectors of the ocean economy (e.g. marine robotics and autonomous vehicles, aquaculture, marine renewable energy, biotechnologies, offshore oil and gas). Such networks are springing up in many parts of the world in response to changes in the national and international ocean research environment, and leveraging their organisational and skill diversity to benefit their partners and research in the ocean economy more generally.

The OECD has designed and administered a survey of ten selected networks with publicly (at least partially) funded organisations at their core. Such organisations often play a crucial role in orchestrating activity on behalf of the rest of the network. Facilitating effective collaboration is a central feature of a network’s success, but multiple challenges are associated with doing this effectively. Three insights emerged from the survey in particular:

- Where independent assessments of the impact of ocean economy innovation networks have been carried out, they have shown generally positive impacts within and beyond the ocean economy. However, more effort to assess the cost-effectiveness of public expenditure on innovation network centres, in more locations, is required if their value to society is to be better understood.

- Benefits associated with the networks are generated in response to the challenges posed by increasingly multi-faceted research and development in the ocean economy. Examples of benefits produced include those accruing to network participants, such as improved cross-sector synergies; access to once inaccessible research facilities and specialised knowledge; and, dedicated support for maritime start-ups. Other associated broader benefits include the building of marine scientific capacity and knowledge, and contributions to sustainable regional and national economic activity in general.
- Challenges faced by the innovation network centres include successfully building bridges between organisations with differences in purpose and objectives; balancing opportunities for fundamental research and commercial potential; and, maintaining a culture of innovation among all partners.

What new approaches to ocean economy measurement and monitoring should be pursued?

Governments' policies towards science and research guide and influence business development and marine preservation; moreover they are instrumental in matters of stewardship, regulation and management of our seas and ocean. To perform those multiple assignments effectively, their policies increasingly need to be evidence-based. However, a long journey lies ahead to gather the information, data, analysis and knowledge that is vital for decision making in the ocean economy at all levels, from local to global.

Advances in economic measurement and monitoring could signify decisive breakthroughs in offering public authorities (but also many other stakeholders) the evidential support they require. Three areas that could markedly improve decision-making are:

1. Standardising approaches to measuring and valuing ocean-based industries, and integrating them into national accounting via satellite accounts;
2. Measuring and valuing marine natural resources and ecosystem services, and exploring ways also to integrate them into national accounting frameworks;
3. Better identifying and measuring the benefits of public investment in sustained ocean observation systems.

Some countries already have in place economic data sets that attempt to measure and value their ocean-based industries. However, methods, definitions, classification systems and measurement approaches vary considerably over time and from country to country. This makes it difficult for decision makers to develop a consistent grasp of the value of ocean-based economic activity, track its contribution to the overall economy, and compare the size, structure and impacts of ocean economies internationally. Still, many countries are beginning to commit resources to collecting more robust ocean economy data within their national accounts.

- ▶ Ocean economy satellite accounts could offer a way forward. Building up on existing data collection efforts, satellite accounts offer a robust framework for monitoring aspects of a country's economy not shown in detail in the core national accounts, while allowing for greater flexibility for those industries not covered by industrial classifications. Satellite accounts for the ocean economy would provide a highly organised method for collecting consistent ocean economy data. Should a critical mass of countries develop such accounts then international comparability would be enhanced.

Measuring the economic value of marine ecosystems is a complex exercise, currently far more complicated than estimating the value of ocean-based industries. Comprehensive biophysical assessments of the marine environment have not been carried out in most parts of the world, let alone in the deep-sea where knowledge is even thinner. Nonetheless, much academic research on environmental valuation is under way, with the intention of increasing awareness of the significance of healthy ecosystems to society and improving environmental management. At this stage, marine ecosystem accounting is still in its infancy and few examples of established experimental accounts exist. However, several countries have begun the process of understanding their marine ecosystem services better through the implementation of national ecosystem assessments.

- ▶ Given the strong interdependency between ocean industry activities on the one hand and marine ecosystem health on the other, ultimately it is a national accounts framework that offers a future path to integrating the measurement of both pillars of the ocean economy in a meaningful and policy-relevant way. As the knowledge base on marine ecosystems build-ups, more efforts to share experiences internationally would greatly benefit the process of refining both the international environmental accounting guidelines and marine ecosystem service classifications.

Finally, systems for sustained ocean observations are an essential part of worldwide efforts to better understand the ocean and its functioning. These observing systems comprise fixed platforms, autonomous and drifting systems, submersible platforms, ships at sea, and remote observing systems such as satellites and aircraft, using increasingly efficient technologies and instruments to gather, store, transfer and process large volumes of ocean observation data. The data derived from such instruments are crucial for many different scientific communities and for a wide range of public and commercial users active in the ocean economy. They underpin a wide range of scientific research, and critically support the safe, effective and sustainable use of ocean resources and the ocean environment. Developing and sustaining them requires significant public investment, the justification for which calls for rigorous assessment of the associated costs and benefits and value to society.

- ▶ The report proposes fresh approaches to close the gaps. Solutions include improved tracking of users (both scientific and operational), the mapping of value chains, and improvements to methodologies through the development of international standards or guidelines for the valuation of ocean observations.

A focal point of this OECD publication has concerned innovation in many areas, and combinations of innovations, which may have the capacity to foster both economic development and ocean sustainability. Further OECD work to provide more evidence on the development of a sustainable ocean economy will continue in 2019-20.



From:
Rethinking Innovation for a Sustainable Ocean Economy

Access the complete publication at:
<https://doi.org/10.1787/9789264311053-en>

Please cite this chapter as:

OECD (2019), "Executive summary", in *Rethinking Innovation for a Sustainable Ocean Economy*, OECD Publishing, Paris.

DOI: <https://doi.org/10.1787/35309746-en>

This document, as well as any data and map included herein, are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area. Extracts from publications may be subject to additional disclaimers, which are set out in the complete version of the publication, available at the link provided.

The use of this work, whether digital or print, is governed by the Terms and Conditions to be found at <http://www.oecd.org/termsandconditions>.