How European Research Vessels Can Support a Sustainable Blue Economy

By the European Marine Board (EMB)

Research vessels are a vital infrastructure for enabling marine science through exploration and scientific understanding of the ocean and marine ecosystems. Coastal regions are easily accessible and marine research stations, coastal observatories, and even citizen science play a critical role in collecting experimental, observational and monitoring data. However, in offshore regions, marine science is heavily reliant on research vessels and their equipment, both for physical sampling and data collection, as well as the deployment, maintenance, and retrieval of *in situ* ocean observing equipment. This is even more difficult in the deep ocean and Polar regions.

However, the average age of the 99-vessel European fleet is 25 years old and hence many vessels are nearing and even exceeding the 30-year expected functional lifetime for a research vessel. At a time when we are looking to increase our reliance on the ocean in terms of resources and economic growth, and at this critical juncture in addressing climate change, we cannot afford to diminish our ability to conduct vital marine research. Therefore, we urgently need to modernize and renew the European fleet to continue our support for the science of today and take a strategic look at the capacity and capability of different regions and scientific areas to ensure support for the science of tomorrow.

If nations are to grow their blue economies in a truly sustainable way, an increased appreciation of marine resources and services is needed, along with an understanding of the impacts of their extraction and exploitation on marine ecosystems. We must fully grasp the meaning of sustainability in this context: Greater scientific understanding must inform policies that support the development of ocean industries within sustainable planetary boundaries.

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The deep seafloor is rich in deposits of metal resources including cobalt, manganese, zinc, and copper. These are of significant interest to industry as terrestrial sources are becoming depleted, and there is a rising demand for metals required for the development of renewable energy technologies. The deep-sea mining sector is still in an exploratory phase and calls have already been made for a moratorium on further activities. Deep-sea ecosystems are understudied and, at present, we do not have sufficient baseline knowledge of biodiversity and ecosystem functioning required for ecosystem-based management of the deep sea. We cannot fully assess and manage the impacts of deep-sea mining activities without first knowing what is there and what ecosystem services would be at risk. Research vessels deploying remotely operated vehicles (ROVs), autonomous underwater

vehicles (AUVs), submersibles and other systems are the only means we have to study these areas.

In Europe, only eight vessels out of a fleet of 99 can deploy a full set of equipment to study the deep sea, with a further eight having the capability to conduct some research in these areas, meaning that this capability is limited and may not be sufficient for growing scientific demand. The most capable vessels are owned by four countries: France, Germany, Norway and the UK. To ensure that the development of deep-sea scientific knowledge can keep up with fast-paced industrial development and provide the required evidence for policy, adequate access to deep-sea capable vessels must be ensured for all. While these specialized vessels are owned by a limited number of countries, scientific research on the deep sea is conducted far wider afield. This can mean that those researchers based in countries who do not own the required infrastructure have significant difficulties in accessing ship-time to conduct their research. This can be addressed through transnational access, which provides access to ship-time researchers based on scientific excellence, regardless of the country in which they are based, and should be strongly supported.

Deploying a plankton net from RV Simon Stevin, Credit: Artevelde Hogeschool

In political and civil debate, attention has increasingly focussed on the critical role that the ocean plays in climate regulation and the impact of global warming on ocean resources and services. The recent UN COP25 climate change conference (2-13 December 2019) held in Madrid has been referred to as a 'Blue COP' with a strong focus on the critical importance of the oceans in climate commitments. In addition, the Intergovernmental Panel on Climate Change (IPCC) clearly presented the urgency of taking action to "address unprecedented and enduring changes in the ocean and cryosphere" due to global warming in their Special Report on the Ocean and Cryosphere in a Changing Climate (https://www.ipcc.ch/srocc/home/) published in September 2019. The contribution the ocean makes to the blue economy in this context is as a service rather than a directly marketable resource; however, its importance is no less significant. We need observation and monitoring of physical, chemical and biological parameters over space and time to understand the changes occurring in the ocean. Again, the research vessel fleet plays a key role here, in deploying observatory systems, enabling ground-truthing of satellite data, and in the provision of data and samples. This is particularly important in Polar regions, which are disproportionately affected by increases in temperature, and impact on society, with melting ice increasing sea levels and altering ocean thermal currents. In Europe, nine vessels out of a fleet of 99 currently have ice-breaking capability, with a further 15 having some capacity to operate in Polar waters. The availability of ice-breaking vessels for science activities is also limited, as these vessels are also required to provide logistics support to Antarctic research stations. This means that the fleet is not able to supply additional ship-time in case of a growing demand for research in Polar waters. A limited number of countries, based almost exclusively in Northern and Western Europe, own Polar vessels, and therefore the wide-scale application of transnational access initiatives is required to ensure researchers can get the ship-time they need, regardless of where they are based.

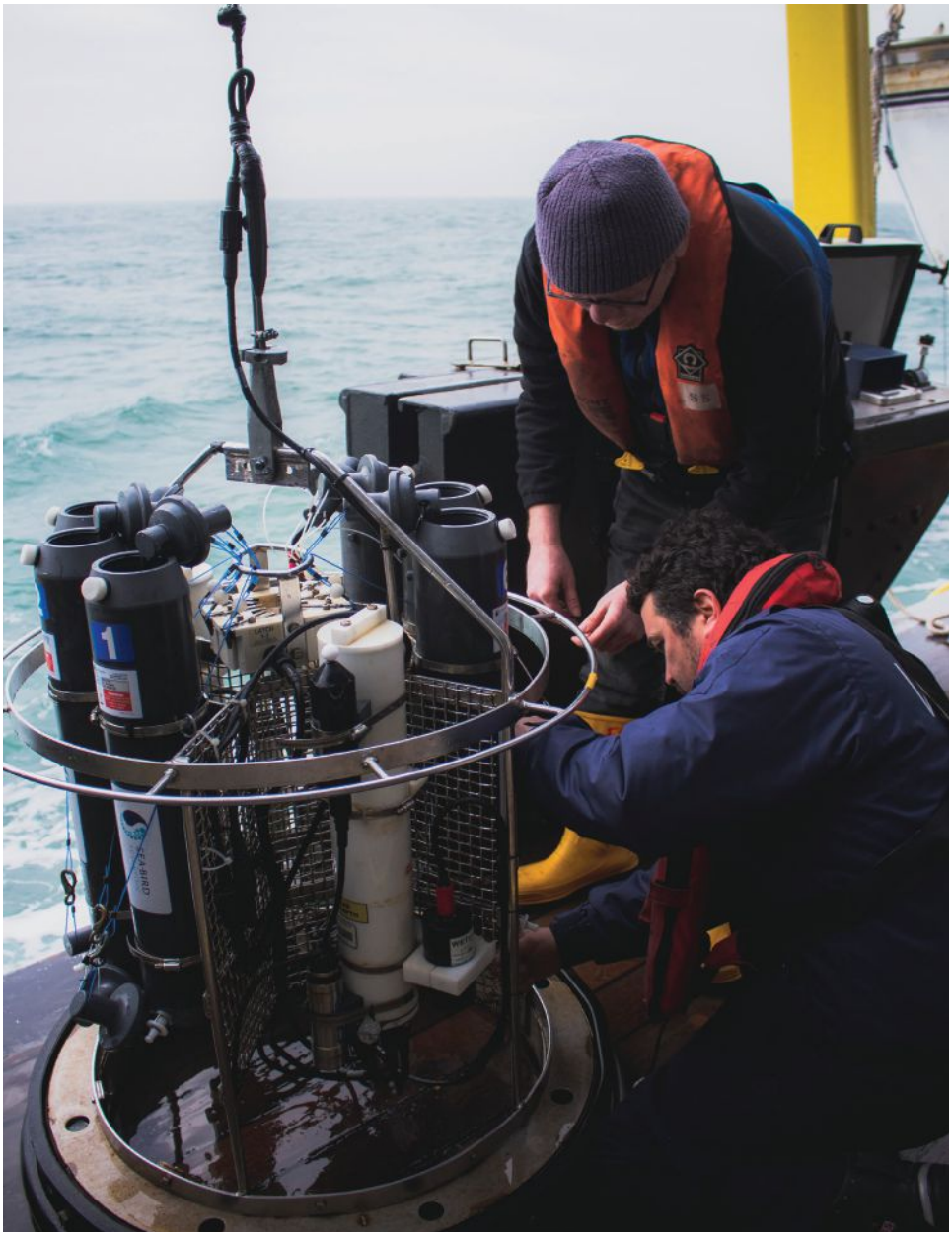
Changes in climate will also give rise to increased risk of extreme weather events and increased risk of geohazards such as submarine earthquakes and tsunamis. These events can be deadly for populations living in coastal areas and can cause catastrophic damage to businesses and other coastal economic activities. We, therefore, need to better understand these events and develop early-warning systems to limit their impact. Research vessels are critical to enabling these developments through seafloor and sub-seafloor mapping, and studying these regions using physical, optical and acoustic means, in addition to deploying, recovering and servicing monitoring systems such as landers, observatories, buoys, moorings and other stationary equipment for tsunami warnings, etc.

Established blue economy sectors on which national economies already rely, such as fisheries and tourism, will be impacted not only by increasing ocean temperature and climate change but also by other stressors such as acidification and pollution. We do not yet fully understand the impacts that these multiple stressors will have on marine ecosystem functioning, and hence on these economically important resources. Monitoring across different spatial areas and long-term data series covering significant portions of time are needed. Research vessels are the ideal tools to conduct measurements at a wide range of locations, while marine research stations and other fixed-point observing systems provide long-term data.

Within Europe the most capable and specialized vessels are owned by a limited number of countries, however scientific questions related to the blue economy are relevant for all countries. Excellent science in these fields is being conducted across Europe but difficulties in accessing ship-time, especially for researchers based in countries who do not own the required infrastructure, limits progress. Transnational access provides access to ship-time for researchers based on scientific excellence, regardless of the country in which they are based, and should be applied widely. Appropriate funding should also be provided to cover associated costs. While several former and ongoing EU-funded projects such as EUROFLEETS / EUROFLEETS 2 / EUROFLEETS+ (https://www.eurofleets.eu/) and ARICE (https://arice.eu/) have embedded a culture of transnational access into their projects, such initiatives should be extended beyond these projects. At a time when this research is so urgently needed, we should do all we can to enable it.

The European Marine Board (EMB) position paper *"Next Generation European Research Vessels: Current status and foreseeable evolution"* provides a comprehensive overview of the current fleet and its capabilities. The position paper was launched on November 6th, 2019 and can be downloaded from the EMB website

🔗 www.marineboard.eu/publications/next-generation-european-research-vessels-current-status-and-foreseeable-evolution



A CTD rosette on board RV Simon Stevin, Credit: Artevelde Hogeschool