Journal of Applied Hydrography

HYDROGRAPHISCHE NACHRICHTEN 06/2026 HN 134

 DOI: 10.23784/HN134-03

A healthy ocean with all

Transdisciplinary approaches to ocean sustainability

An article by TOSTE TANHUA and STEFFEN KNODT

ocean | transdisciplinarity | sustainability | blue economy | citizen science
Ozean | Transdisziplinarität | Nachhaltigkeit | Blue Economy | Bürgerwissenschaft

Authors
Dr. Toste Tanhua is Senior Scientist at Geomar Helmholtz Centre for Ocean Research Kiel.
Dr. Steffen Knodt is member of the German Ocean Decade Committee.

ttanhua@geomar.de

The ocean affects humans in many ways, regardless of where we live. It is the primary controller of the global climate that makes this planet habitable. It provides humans with food, materials, energy, transportation and recreation. The ocean is also a source of many potential hazards, both natural and anthropogenic, including increasingly strong hurricanes and severe coastal flooding, tsunamis, storm surges, sea level rise, harmful algal blooms and other man-made pollution. The ocean is facing many stressors such as warming, heat waves, overfishing, changing circulation, ocean acidification and pollution that all compromises the ocean as a healthy ecosystem and key regulator of Earth's climate and health.

As our oceans and seas are under significant human and anthropogenic pressure, with large and often accelerating changes in both the physical properties, as well as in chemistry and biodiversity. Addressing such complex marine challenges as compound effects of climate change, biodiversity loss and pollution requires collaboration across disciplines and sectors. More importantly, it also requires collaboration between science and industry, as well with civil society and policy makers. The role of science is to provide fact-based information on the state and projection of the state of the ocean and to suggest solutions. Transdisciplinary approaches are necessary to be able to capture the different aspects of ocean understanding and solutions for society. This presentation highlights the role of transdisciplinary approaches in developing integrated solutions by bringing together science, policy, industry and society.

We also highlight the role of the blue economy in shaping a sustainable ocean. The blue economy has a large potential role in supporting the monitoring and sustained observation of the ocean. Currently, vast parts of the ocean are not monitored at all and are widely unknown, and there is a significant need for more fit-for-purpose in-situ observations. Ocean observation systems are a market where standardisation and economies of scale are not always achievable. Science alone cannot observe the ocean, and thus provide adequate ocean information to the needed extent.

By placing the ocean observing value chain in an ocean enterprise context, we can see the interconnection and feedback between the different activities and how value is generated. Private and public organisations as well as public-private partnerships can contribute to these elements through commercial products, public services, data collection and provision and philanthropy. There is an element of innovation as well as business opportunities within all of these elements. Return can be gained from investments both within and across components. As the demand for ocean information increases, new business models can emerge, making the blue economy a profitable area for future investment.

In this context, marine citizen science is a growing potential for engagement and knowledge gathering. Citizen science enables the co-generation of knowledge and understanding of the current health of ocean systems, how these are being impacted and how they can be protected. It also promotes education of the general public regarding these issues and also makes the ocean seem more accessible, including in the context of its importance to human health. Here we will showcase one local marine citizen science project, Sailin4oxygen, that engages boaters in better understanding the oxygen conditions in the southwest Baltic.

Through selected project examples, it illustrates how co-creation of knowledge, stakeholder engagement and the integration of natural and social sciences can support sustainable ocean management. The talk also emphasises the importance of ocean literacy, capacity development and inclusive participation in line with the UN Ocean Decade's vision to »leave no one behind«. //