Executive Summary

Global Ocean Science Report 2020

Charting Capacity for Ocean Sustainability

UNESCO
United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

Sustainable Development Goals

Published in 2020 by the United Nations Educational,
Scientific and Cultural Organization
7, place de Fontenoy, 75352 Paris 07 SP, France

The report should be cited as follows: IOC-UNESCO. 2020. *Global Ocean Science Report 2020–Charting Capacity for Ocean Sustainability, Executive Summary. K. Isensee (ed.), Paris, UNESCO Publishing (IOC Policy Series, 2020-1).*

More information on the Global Ocean Science Report 2020 at: https://gosr.ioc-unesco.org

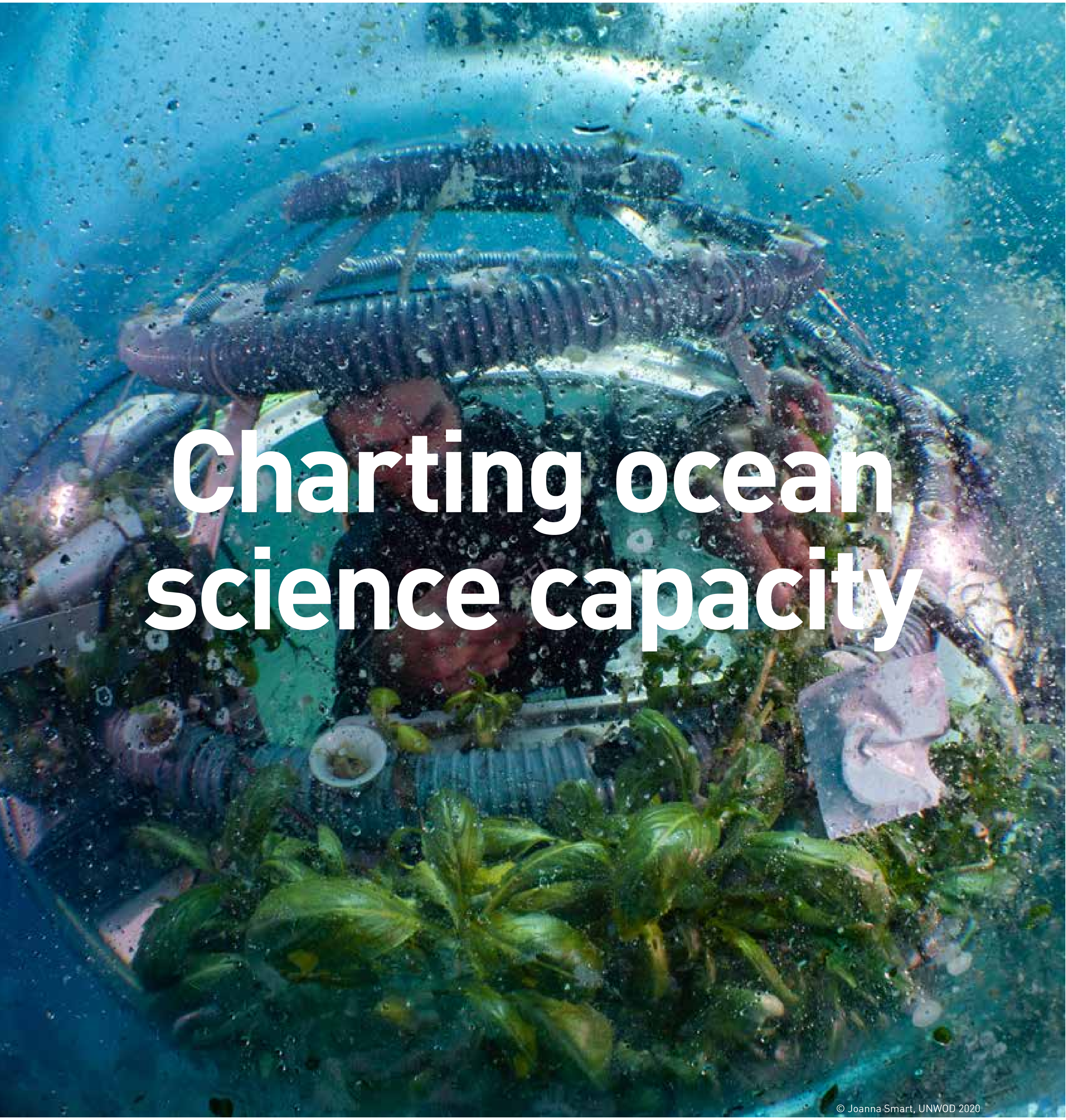
Graphic Design: UNESCO
Cover design and typeset: Marie Moncet
Art Cover Illustration: Hugo Salais / Metazoa Studio
Printed at UNESCO Paris, France
CLD 1128.20 IOC/POL/2020/1

Global Ocean Science Report 2020

Charting Capacity for Ocean Sustainability

Executive Summary

Charting ocean science capacity



The *Global Ocean Science Report* (GOSR) is a resource for a wide range of stakeholders, including policymakers and academics, seeking to understand and harness the potential of ocean science for addressing global challenges. The GOSR can inform strategic decisions related to funding for ocean science, reveal opportunities for scientific collaborations and foster partnerships for further developing capacity in ocean science. This capacity is illustrated through a set of eight integrative, interdisciplinary and strategic themes for national and international ocean science strategies and policies:

1. Blue growth (ocean economy)
2. Human health and well-being
3. Marine ecosystems functions and processes
4. Ocean crust and marine geohazards
5. Ocean and climate
6. Ocean health
7. Ocean observation and marine data
8. Ocean technology

A total of 45 countries, responsible for 82% of ocean science publications over the time period 2010–2018, contributed data and information directly to the second edition of the GOSR (GOSR2020). This allowed analyses to be conducted at the global, regional and national scales.

Building on the success of the first edition of the GOSR in 2017, and the broad interest generated by that report, the GOSR2020 addresses four additional topics:

I. Contribution of ocean science to sustainable development
II. Science applications reflected in patents
III. Extended gender analysis in ocean science human resources
IV. Capacity development in ocean science.

The international community has aligned around the UN 2030 Agenda, a blueprint for peace and prosperity for people and the planet, now and into the future, as outlined by the Sustainable Development Goals (SDGs). These 17 goals reflect the shared societal, economic and environmental aspirations of all countries and chart the journey towards a future that is free of poverty and hunger, one that adapts to the impacts of climate change and to the increasing human demand for natural resources. Progress on this journey is reported through SDG targets and indicators. The GOSR is the recognized method and repository of related data to measure progress towards the achievement of SDG target 14.a: 'Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology (TMT), in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries'. Reporting ocean science capacity in a transparent and timely manner is a significant responsibility for IOC-UNESCO, and an opportunity to support and measure progress in capacity development globally.

The ambition of the 2030 Agenda is also evident in the upcoming UN Decade of Ocean Science for Sustainable Development (2021–2030, hereafter 'the Ocean Decade'), where the definition of 'ocean science' encompasses natural and social science disciplines, including interdisciplinary approaches; the technology and infrastructure that supports ocean science; the application of ocean science for societal

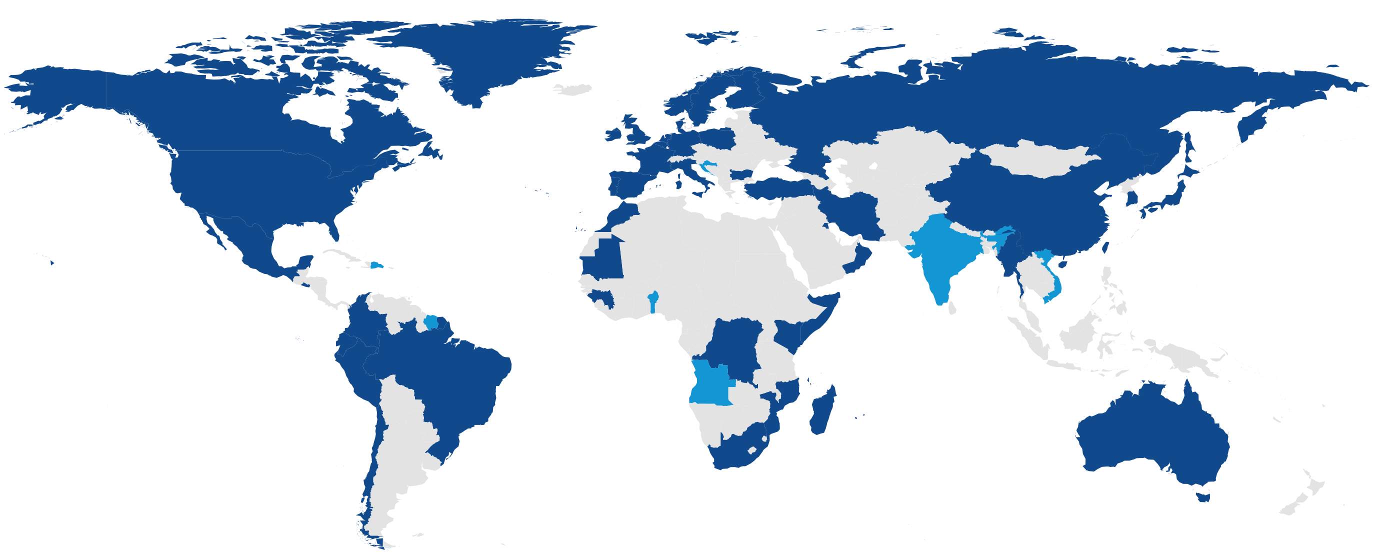


Figure ES.1. Global map indicating the Member States that responded to the GOSR2020 questionnaire (dark blue); countries where data from the GOSR2017 are used in the GOSR2020 assessments are shown in light blue. *Sources*: GOSR2017 and GOSR2020 questionnaires.

benefits, including knowledge transfer and applications in regions that are currently lacking science capacity; as well as science-policy and science-innovation interfaces.

There is an increased demand from relevant policy processes for easier access to the findings of ocean science, and for information on ocean science efforts and capacity related to research and observations. This is reflected, for example, in the agreement of the Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC) at its 25th session to establish an Ocean and Climate Dialogue under the auspices of the Convention's Subsidiary Body for Scientific and Technological Advice. The data, information and analyses presented in the GOSR can inform the discussions and deliberations of the Parties to the UNFCCC and the 2015 Paris Agreement, as well as other relevant policy forums, including the Convention on Biological Diversity and the process related to an international legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction.

Data and information presented in the GOSR2020, in future editions of the report and in the new GOSR online portal[1] will form part of the monitoring and evaluation process to track the progress of the Ocean Decade in achieving its vision 'The science we need for the ocean we want', via the objectives, challenges and seven goals outlined in the Ocean Decade Implementation Plan. The baseline information collected and published in the GOSR2020 immediately before the start of Ocean Decade will guide all ocean science actors, support the involvement of all countries in the Ocean Decade and help to remove barriers related to gender, generation and origin for all participants.

[1] See https://gosr.ioc-unesco.org.

Top findings

I. The findings of ocean science have direct implications for sustainable development policies and are applied in the management strategies and action plans of multiple societal sectors. They are converted into numerous applications of direct societal benefit, such as the production of new pharmaceuticals and applications in industry; however, their potential remains underused.

II. Despite its relevance to society, funding for ocean science is largely inadequate; this lack of support undermines the ability of ocean science to support the sustainable provision of ocean ecosystem services to humanity.

III. Women in ocean science continue to be under-represented, particularly in the highly technical categories.

IV. Recognition of young ocean scientists, and the level of support offered to them, differs widely among countries. In general, early career ocean scientists and professionals are not appropriately recognized as the intellectual source and workforce that will confront the challenge of ocean sustainability in the next decade and beyond.

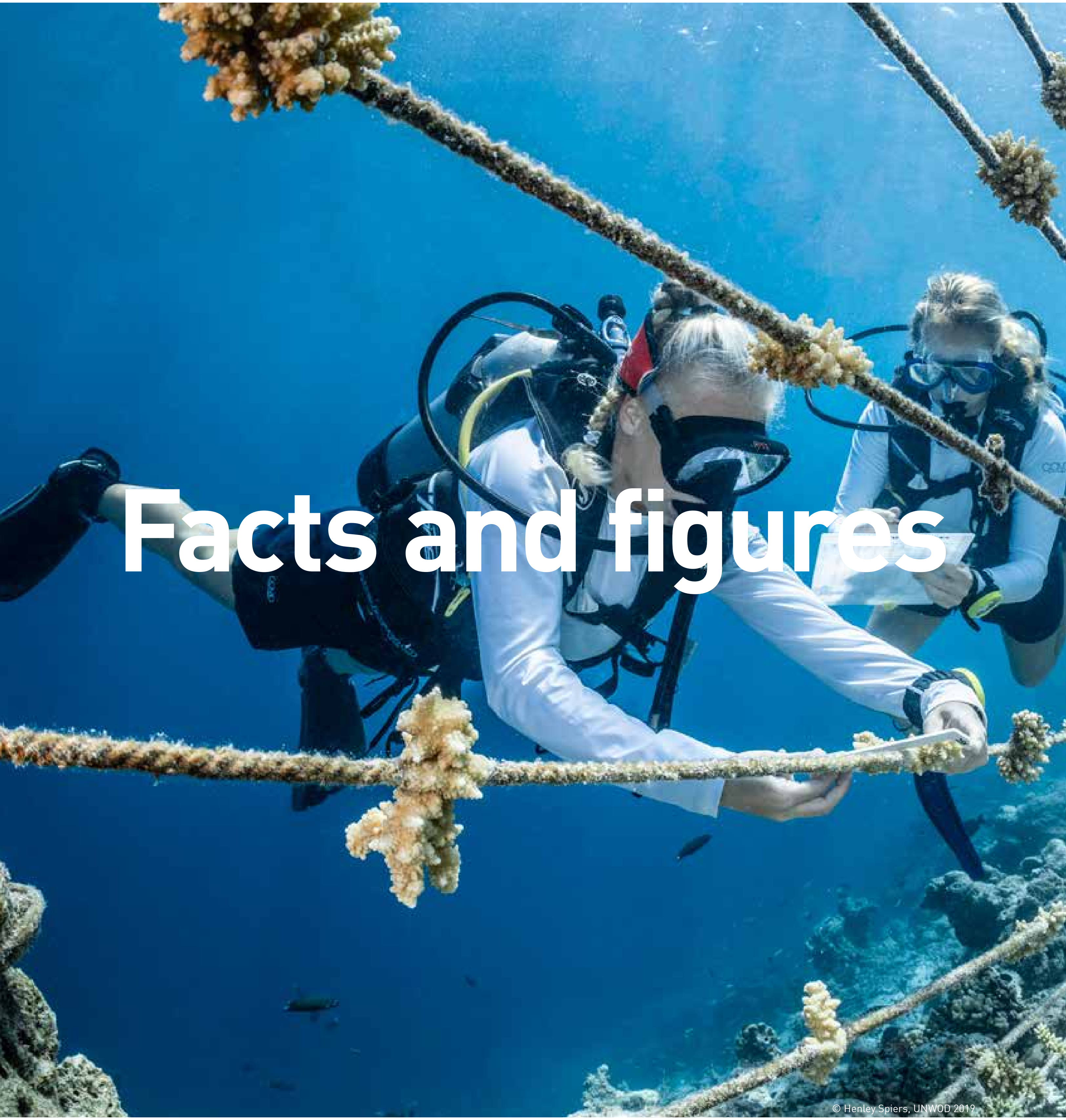
V. The technical capacity of ocean science remains unequally distributed among countries and regions; this imbalance is further accentuated by short-term or ad hoc funding for ocean science.

VI. The number of ocean science publications[2] worldwide continues to increase, especially in countries of Eastern and South-Eastern Asia.

VII. Countries are inadequately equipped to manage their ocean data and information, which hampers open access and data sharing.

VIII. The GOSR process offers a systematic approach to measure ocean science capacity internationally (SDG target 14.a). Similar mechanisms need to be put in place to measure progress towards the achievement of the 2030 Agenda as a whole, and SDG 14 in particular. To date, this has been done in an ad hoc manner; systematic enabling frameworks and strategies are missing in many parts of the world.

[2] Bibliometric indicators are based on one type of research output, namely peer-reviewed articles published in journals. Other forms of research output, which may or may not be peer-reviewed, such as patents, conference presentations, national reports and technical series, are not considered. In addition, articles that are not written in English, or do not at least have an English abstract, are not included in the database and are therefore not part of this study.



Facts and figures

Ocean science human capacity

Ocean science thrives when the people behind it thrive

There is a growing understanding of the critical role of the human component in the ocean science enterprise and in the science-to-management and science-to-innovation value chains. There is also an increased recognition of the important contribution of ocean science to a sustainable blue economy, and to sustainable development in general.

National numbers of ocean science researchers vary between <1 to >300 employees per million inhabitants – these ratios do not relate directly to GDP

European countries have the highest ratio of researchers as a proportion of the total population. For example, Norway and Portugal have more than 300 employed researchers per million inhabitants (Figure ES.2). However, if measured in relation to the gross domestic product (GDP), the numbers of ocean researchers in some developing countries (e.g. Benin, Guinea, Mauritania and South Africa) are comparable to or even higher than numbers in some developed countries (e.g. Belgium, Denmark, Ireland and Sweden, Figure ES.3).

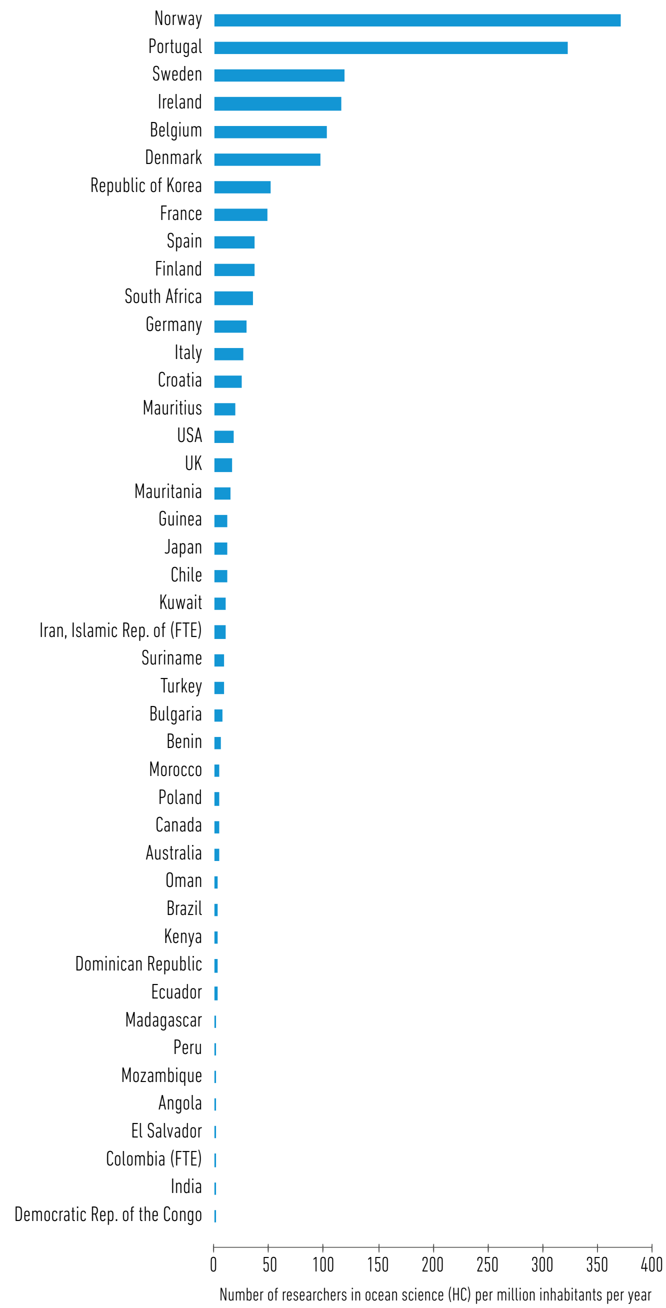


Figure ES.2. Number of national ocean science researchers (headcount – HC; full time equivalent – FTE, for the Islamic Republic of Iran and Colombia) employed per million inhabitants. Based on the subset of data presented in Table 4.1. (see GOSR2020 Chapter 4), researchers employed in ocean science per million inhabitants were extracted for the year indicated for each country.
Sources: Data based on the GOSR2017 and GOSR2020 questionnaires (researchers) and World Bank DataBank (inhabitants).[3]

[3] See https://databank.worldbank.org/source/world-development-indicators (accessed 17 December 2019).

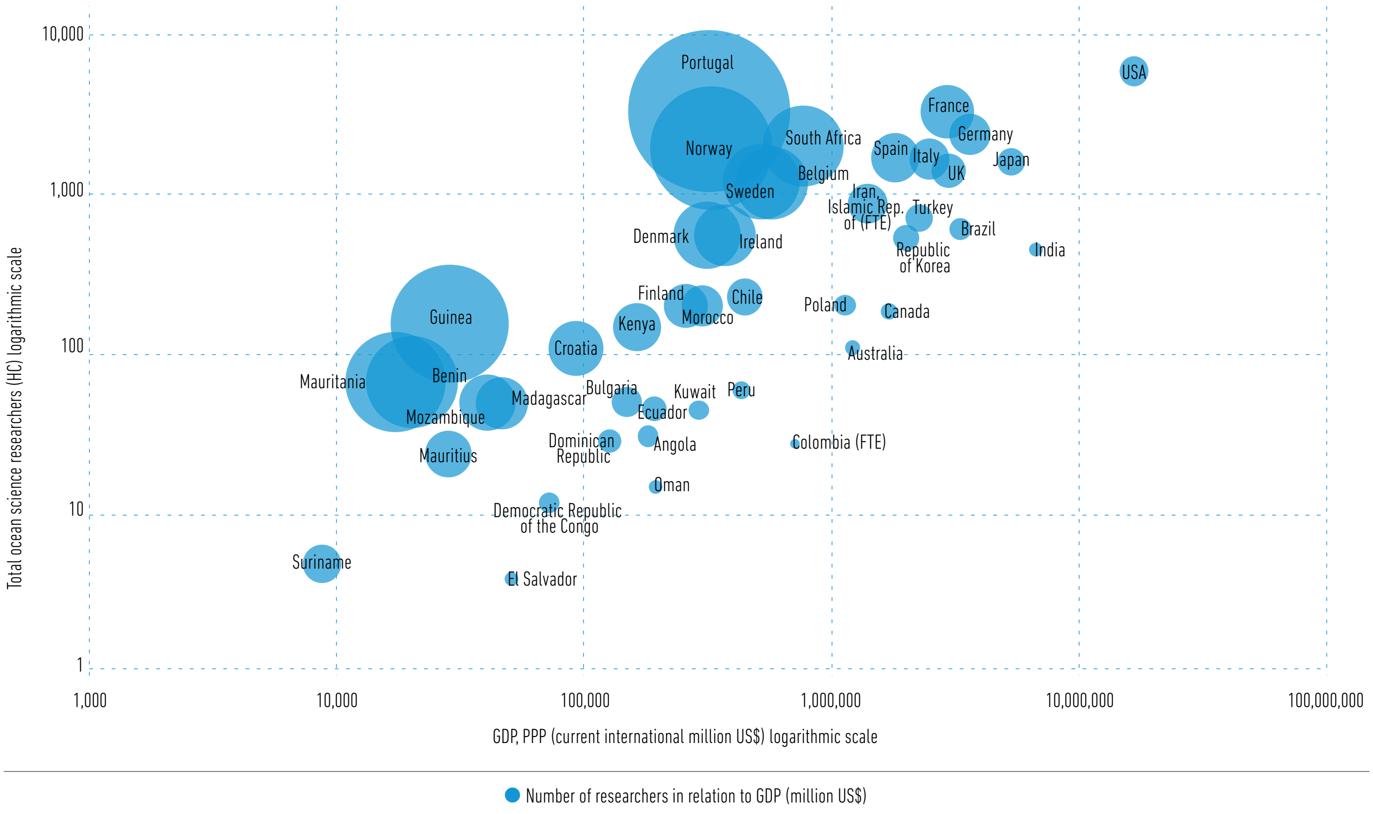


Figure ES.3. Number of national ocean science researchers (HC) in relation to the GDP purchasing power parity (PPP) (current million US$) extracted for each country and year. The size of the bubble is proportional to the ratio of researchers vs GDP for each country.
Sources: Data based on the GOSR2017 and GOSR2020 questionnaires (researchers) and the Global Economic Monitor (GDP, current million US$, seasonal adjustment), available at the World Bank Databank.[4]

[4] See https://databank.worldbank.org/home.aspx (accessed 12 February 2020).

Gender equality in ocean science is far from having been achieved but the challenge to reach it is realistic

Female ocean science personnel range from about 7% (Democratic Republic of the Congo) to 72% (Ireland) of all ocean science personnel, including researchers and technical support staff in the different countries. The global average stands at 37%. The percentage of female ocean science personnel is equal to or higher than 50 in countries such as Angola, Bulgaria, Croatia, El Salvador, Ireland, Poland and Turkey.

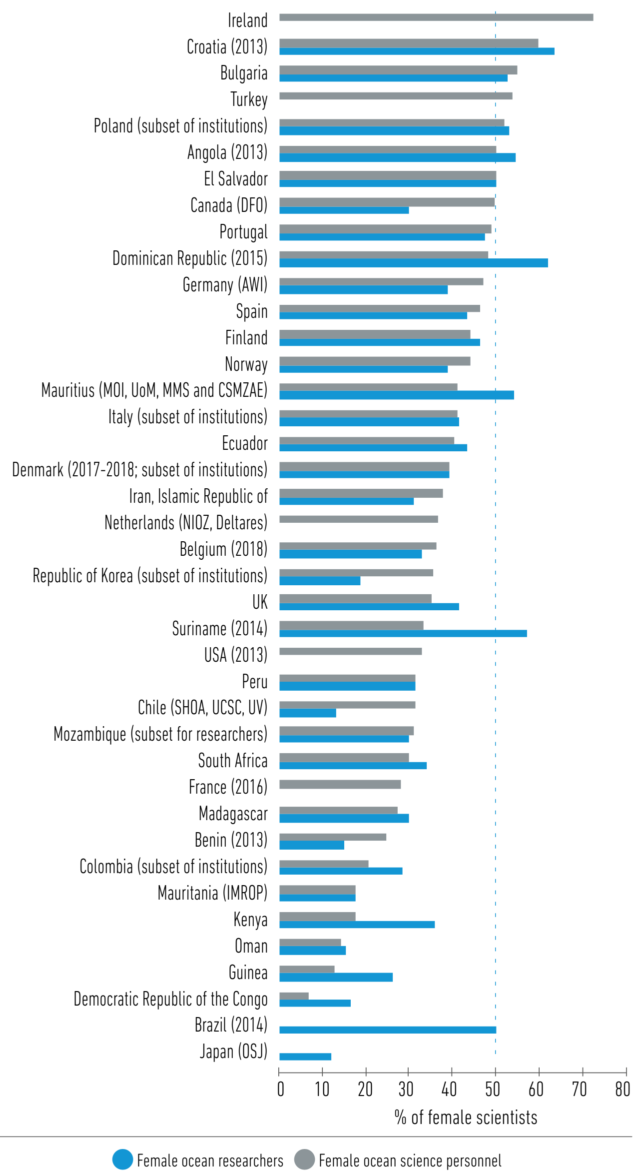


Figure ES.4. Proportion (% of total HC) of female ocean science personnel and female ocean researchers in 2017. In the absence of data for 2017, the latest available year is shown in brackets (see Chapter 4).
Sources: Data based on the GOSR2017 and GOSR2020 questionnaires.

Female researchers account for 39% of global ocean scientists, 10% higher than the global share of female researchers in natural sciences

The percentage of female researchers in ocean science ranges from about 12% (Japan) to more than 63% (Croatia). In Angola, Brazil, Bulgaria, Croatia, Dominican Republic, El Salvador, Mauritius, Poland and Suriname, 50% or more of ocean science researchers are women (Figure ES.4). On average, 38.6% of total ocean science researchers are female – a similar level to that reported in 2017 (38%) and one which remains 10% higher than the global share of female researchers in natural sciences.

Female ocean scientists are increasingly talking to the world

Participation of female scientists in international conferences is another indicator used to assess the involvement of women in ocean science. Female participants account for 29% to 53% of total conference participants, depending on science category and region (Figure ES.5). Compared to the assessment presented in the GOSR in 2017, the number of female participants per category and per region is higher in the GOSR2020 analysis.

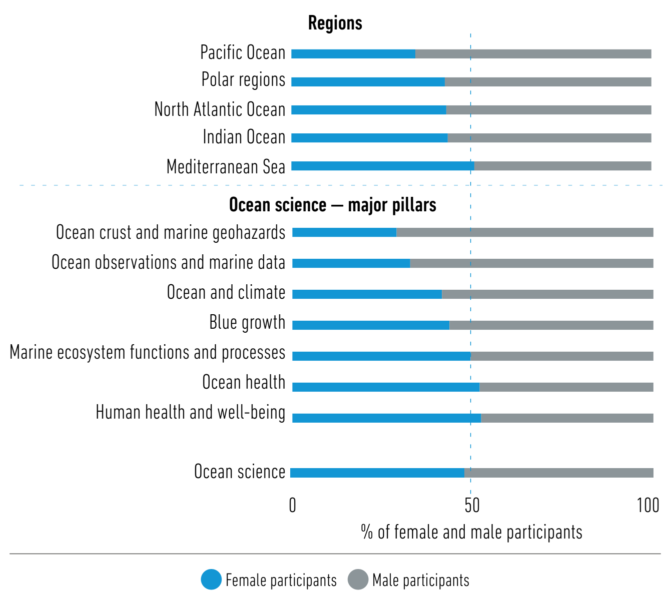


Figure ES.5. Proportion (%) of female and male participants at international scientific conferences/symposia held from 2015 to 2018. Upper section focuses on regional conferences/symposia; lower section on topic-specific conferences/symposia.
Source: Selected lists of participants in international scientific ocean science conferences/symposia held from 2015 to 2018.

Ocean science needs to become younger to open the door for truly innovative transformative solutions

It is important to promote early career scientist networks in the field of ocean science and to facilitate the involvement of young scientists in determining research priorities. To date, only a few countries, developing countries in particular, reported a relatively young community of researchers. Madagascar, for example, reported that more than 50% of their ocean researchers are younger than 34 years. At the same time, Canada, Finland, Italy, Japan and Oman reported that more than 50% of their ocean science researchers are over 45 years old.

Country of origin defines early career scientists' access to international forums

Students from different parts of the world have unequal access to international exchange programmes, e.g. for participation in international conferences. Students from Europe and Northern America account for 69% of the total number of students globally attending ocean science conferences (Figure ES.6).

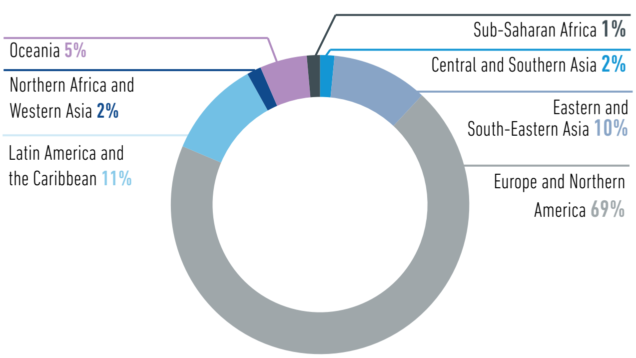


Figure ES.6. Proportion (%) of students per region attending international conferences/symposia, excluding regional conferences from the Pacific Ocean.
Source: Selected lists of participants in international scientific ocean science conferences/symposia held from 2011 to 2018.

Ocean science generates both knowledge and applications

Global ocean science outputs are continuously rising (with regional differences emerging)

There has been an increase in the number of peer-reviewed ocean science publications, both in absolute and relative terms, in most SDG regions over the past 18 years (Figure ES.7). The most obvious change has been a 10% increase in output from the Eastern and South-Eastern Asia region, largely driven by China, and to a lesser extent by Japan and the Republic of Korea. The publication output in Europe and Northern America did not increase to the same extent, resulting in a relative reduction of its contribution to overall science publications by ~17%, from roughly two-thirds to one-half (Figure ES.8).

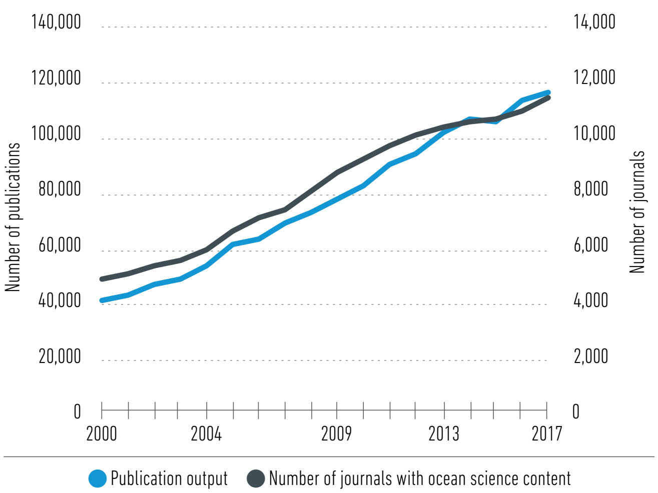


Figure ES.7. Global yearly trend in number of peer-reviewed ocean science publications (blue) and number of journals with content in ocean science (black) between 2000 and 2017.
Source: Authors Chapter 5, based on bibliometric analysis of Scopus (Elsevier) data 2000–2017 by Science-Metrix/Relx Canada.

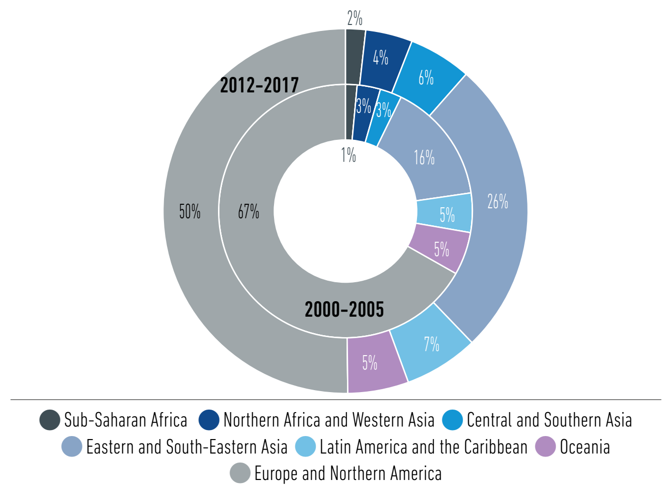


Figure ES.8. Changes in the proportion of global publication output by SDG regions from two different periods: 2000–2005 and 2012–2017.
Source: Authors Chapter 5, based on bibliometric analysis of Scopus (Elsevier) data 2000–2017 by Science-Metrix/Relx Canada.

Competitive ocean science is driven by international partnerships

In the period 2012–2017, 61% of the papers published by ocean scientists globally had at least one co-author from a foreign country, compared with approximately 56% from 2006 to 2011 and 52% from 2000 to 2005 (Figure ES.9). Increased collaboration among scientists from different countries is a sustained trend and should be seen as a very valuable and positive development.

Figure ES.9. Changes in international co-publication rate of the 100 most publishing countries during the periods 2000–2005 and 2012–2017.
Source: Authors Chapter 5, based on the bibliometric analysis of Scopus (Elsevier) data 2000–2017 by Science-Metrix/Relx Canada.

International collaboration results in a higher quality of work

A positive correlation between the average relative impact factor of the publication and the international co-publication rate is reconfirmed (Figure ES.10).

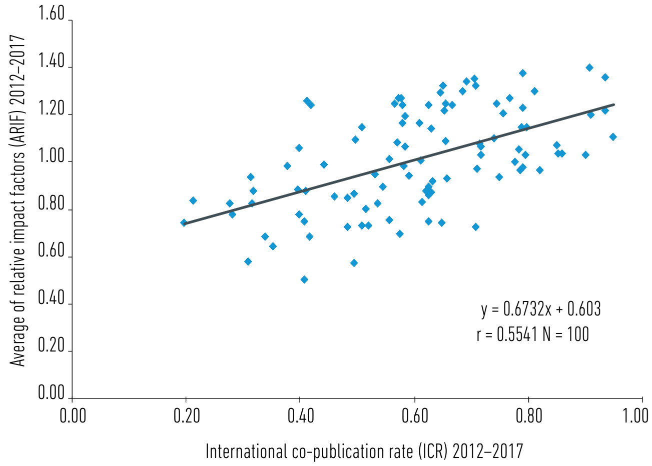


Figure ES.10. Comparison of ICR and average of relative impact factors (ARIF) of the ocean science community and ocean practitioners.
Source: Authors Chapter 5, based on the bibliometric analysis of Scopus (Elsevier) data 2012–2017 by Science-Metrix/Relx Canada.

Ocean science findings are converted into applications for society

'Technologies' or 'Applications for mitigation' or 'Adaptation to climate change' are the most frequent ocean science-related technologies in the Cooperative Patent Classification (CPC) (Figure ES.11). This reflects the increasing recognition of the ocean's role in regulating the climate and the negative impact of anthropogenic change on ocean health. Ocean science discoveries feed into nearly all sectors of the economy.

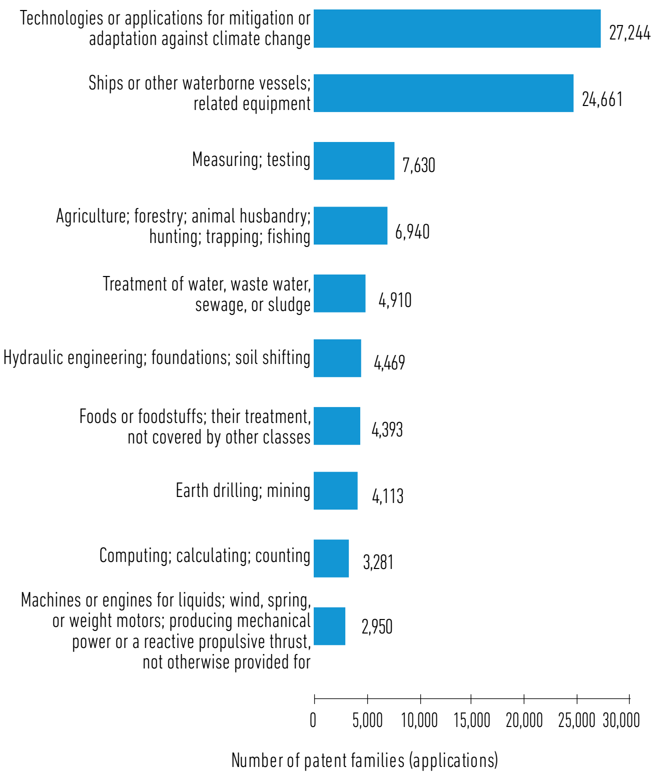


Figure ES.11. Top 10 most frequent CPC technical field classes in the total number of ocean science patent families (applications) using fractional counts.
Source: Based on the technometric analysis of 2000–2018 data provided by the United States Patent and Trademark Office, the European Patent Office, the Korean Intellectual Property Office, the Japan Patent Office and the China National Intellectual Property Administration by Science-Metrix/Relx Canada.

Ocean science in support of sustainable development and management of ocean resources

National priorities and needs guide the focus of ocean science

Nations continue to specialize in particular areas of research reflecting their priorities; these patterns remain consistent over time among the eight considered main ocean science categories (Figure ES.12).

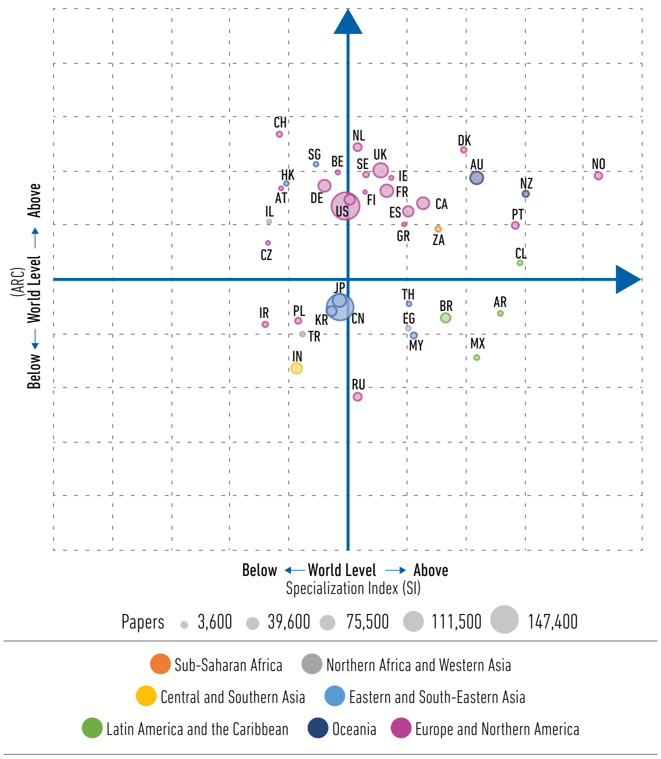


Figure ES.12. Positional analysis for the 40 countries included in the comparison group for ocean science output for the period 2012–2017. This analysis combines three separate indicators: the number of peer-reviewed ocean science publications, the specialization index (SI) and the average relative citation score (ARC). The size of the bubble is proportional to the number of publications for that country over the study period. Abbreviations: Argentina (AR), Australia (AU), Austria (AT), Belgium (BE), Brazil (BR), Canada (CA), Chile (CL), China (CN), China Hong Kong SAR (HK), Czechia (CZ), Denmark (DK), Egypt (EG), Finland (FI), France (FR), Germany (DE), Greece (GR), India (IN), Iran (Islamic Republic of) (IR), Ireland (IE), Israel (IL), Italy (IT), Japan (JP), Malaysia (MY), Mexico (MX), Netherlands (NL), New Zealand (NZ), Norway (NO), Poland (PL), Portugal (PT), Republic of Korea (KR), Russian Federation (RU), Singapore (SG), South Africa (ZA), Spain (ES), Sweden (SE), Switzerland (CH), Thailand (TH), Turkey (TR), United Kingdom of Great Britain and Northern Ireland (GB), United States of America (US).
Source: Based on the bibliometric analysis of Scopus (Elsevier) data 2012–2017 by Science-Metrix/Relx Canada.

Sustainable development is not possible without ocean science

The ocean represents the largest biome on the globe. It provides essential resources supporting human nutrition, health and recreation, and is part of the cultural identity of many coastal communities. Hence, by working towards the achievement of SDG 14, nations also profoundly contribute to attaining all other SDGs.

Many countries lack a specific strategy to measure progress towards the achievement of SDG 14

Of the 37 countries that responded to the related GOSR2020 question, over 70% have strategies and a roadmap to achieve the goals of the 2030 Agenda. However, only 21% reported that they have a specific strategy focusing on the ocean and SDG 14 (Figure ES.13).

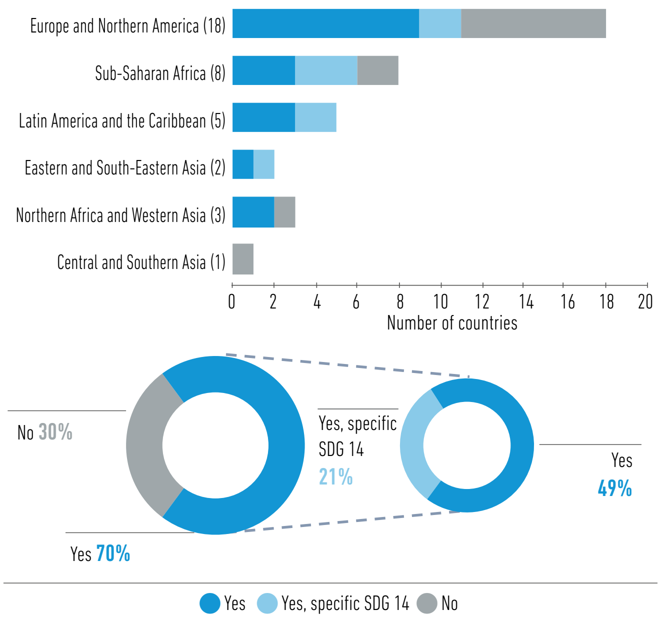


Figure ES.13. Distribution of countries that reported to have a national strategy to achieve the 2030 Agenda ('Yes') and/or SDG 14 within the different regional groups and globally, or not.
Source: Data based on the GOSR2020 questionnaire.

Preparedness for reporting towards the achievement of the different SDG 14 targets varies both among regions and targets

Of the respondents, 25 countries confirmed that they have reporting mechanisms in place for the individual SDG 14 targets and indicators (Figure ES.14).

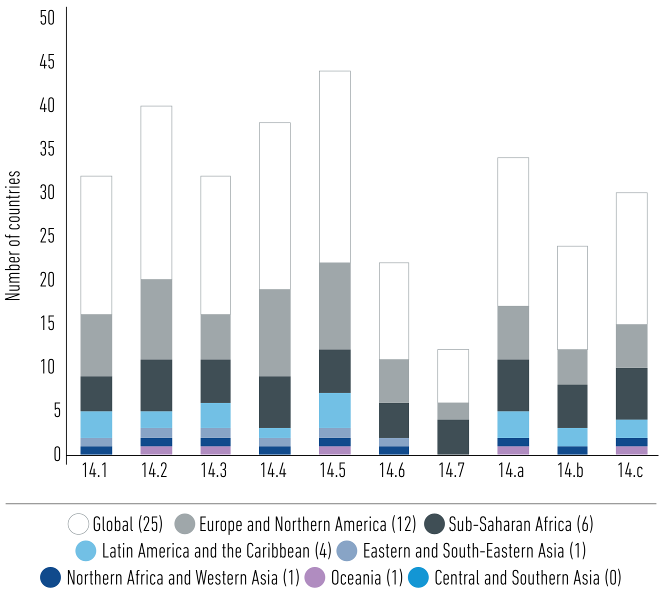


Figure ES.14. Number of countries with reporting mechanisms addressing the different SDG 14 targets in the different SDG regions.
Source: Data based on the GOSR2020 questionnaire.

Ocean data and information management

Capacity and infrastructure supporting the management of ocean data and information do not exist in every country but ocean data and information services already support diverse users

Globally, only 57 countries have a designated national oceanographic data centre. The top four services the centres offer to clients are: (i) metadata and data archival; (ii) access to documented methods, standards and guidelines; (iii) data visualization; and (iv) web services (Figure ES.15). The clients and end users of data, products or services represent many sectors of society, reflecting the broad relevance of oceanographic data and information to the economy, research, public administration and, in particular, to businesses. The dominant users of data, products or services are the national and international science communities, students and the private sector, as well as the general public and policymakers.

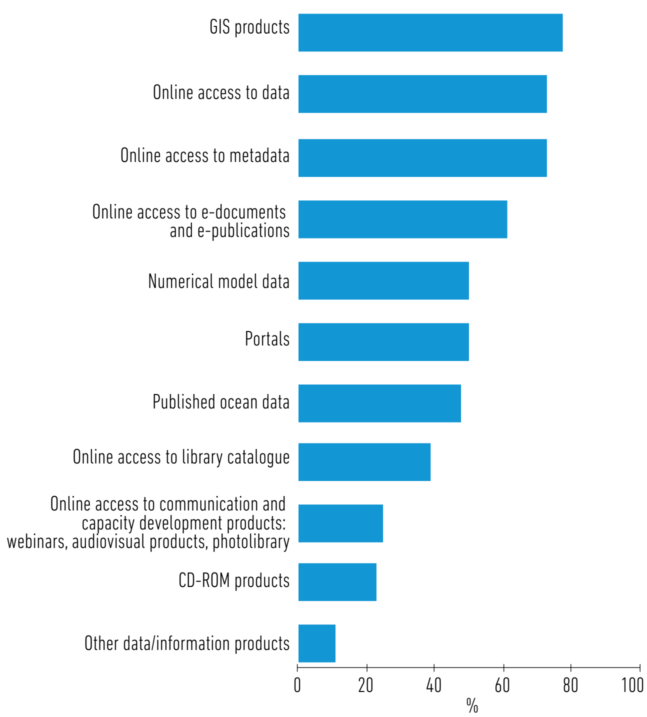


Figure ES.15. Proportion (%) of data/information products and services provided by countries' data centre(s) to their clients (multiple answers possible, 44 submissions).
Source: Data based on the GOSR2020 questionnaire.

Ocean data tend to be recognized as a common good; however, open access to ocean data is still far from being the norm

Data sharing and open access ensure that a variety of societal groups have access to data, data products and services. More than 80% of the countries apply institutional, national or international data-sharing policies. 74% of data centres have established relationships to exchange part of their data and information with other international data systems. This percentage varies greatly among the regions. In Europe and Northern America, for example, more than 90% of data centres have this kind of exchange, while in Latin America and the Caribbean fewer than 50% do (Figure ES.16). While countries reported that 58% of ocean data centres comply with the FAIR principles (Findability, Accessibility, Interoperability and Reusability), 60% of data centres still restrict access to 'certain' data types and 58% of them do so for a certain period of time. Only 16% of data centres apply no restrictions at all to data access (Figure ES.17).

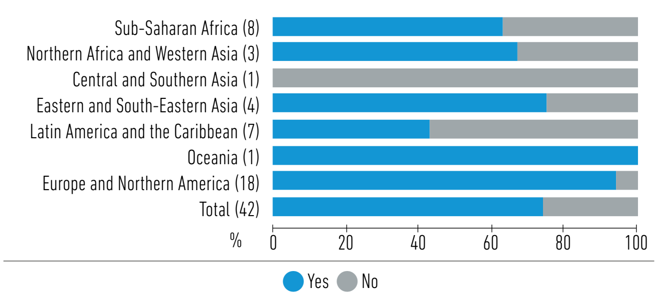


Figure ES.16. Percentage of countries' data centre(s) contributing data and information to international systems such as ICS World Data System, GDACs, WMO Global Telecommunication System (GTS) and others (42 submissions).
Source: GOSR2020 questionnaire.

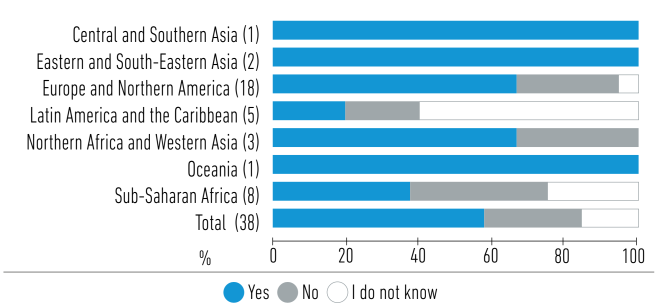


Figure ES.17. Compliance of national data centre(s) with the FAIR data management criteria (percentages based on 38 submissions).
Source: GOSR2020 questionnaire.

Transfer of marine technology and investments in ocean science

Access to technical infrastructure required for ocean science remains unequally distributed

Information about specific technical equipment used for ocean science was provided by 42 countries. Full access to a wide range of technical infrastructure is reported by five countries from the Northern Hemisphere: USA, Germany, Norway, Japan and Canada. Countries in the southern hemisphere only have limited access to ocean science technologies and infrastructure.

Access to the open ocean is not a given

A total number of 1,081 vessels serve ocean science, comprised of 924 research vessels almost exclusively used for ocean science and 157 ships of opportunity. More than a third of this global research fleet is maintained by the USA. Based on information obtained for 920 research vessels, local and coastal research is the primary purpose of 24% of these research vessels in 35 countries, 8% of the vessels operate at regional, 5% at international and 11% at global scale (Figure ES.18). Vessels plying globally are retained by 23 countries.

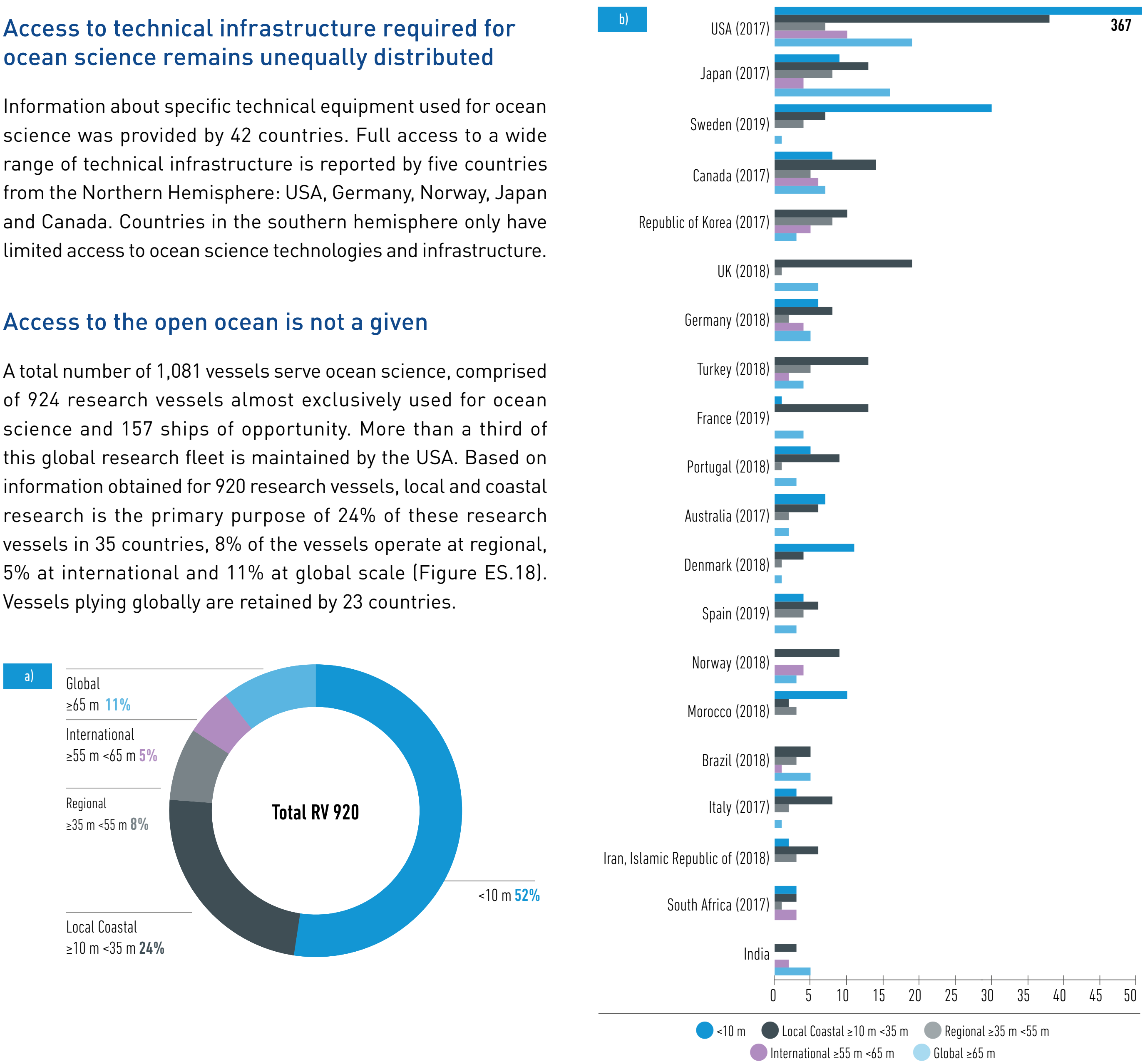


Figure ES.18. Number of nationally maintained RVs (a), classified by ship size. Detailed information is provided for the top 20 countries only (b). *Sources*: Data based on the GOSR2017 and GOSR2020 questionnaires.

There are large differences in countries' investment in ocean research

Overall, the portion of gross domestic expenditure on research and development (GERD) devoted to ocean science is noticeably smaller than for other major fields of research and innovation. On average, only 1.7% of national research budgets are allocated for ocean science, with percentages ranging from around 0.03% to 11.8% (Figure ES.19). This is a small proportion compared to the modestly estimated US$1.5 trillion contribution of the ocean to the global economy in 2010. Some countries are 'punching above their weight' in the field of ocean science, as they allocate a large proportion of their GERD to ocean science, despite having very low overall GERD.

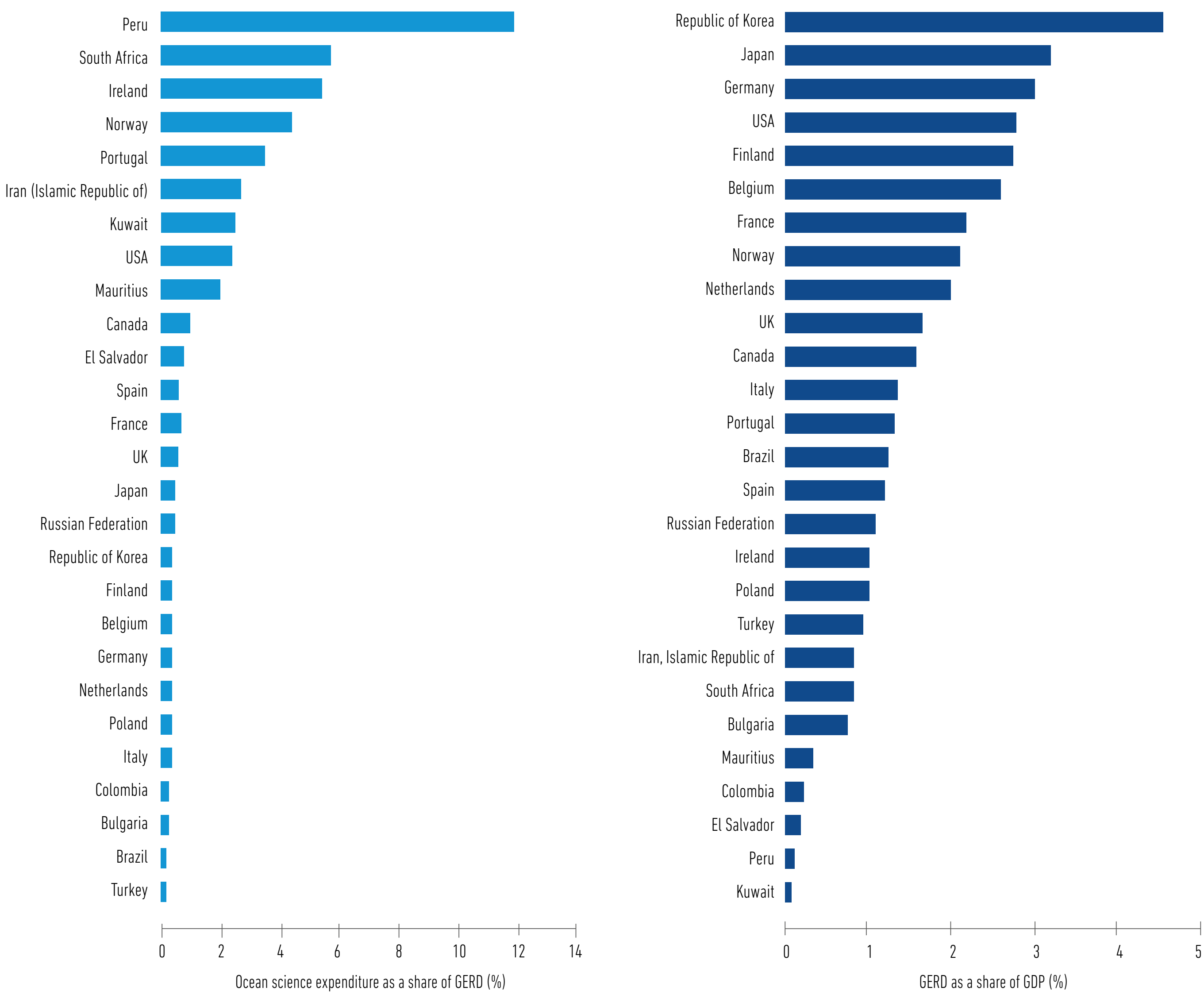


Figure ES.19. Estimates of ocean science funding as a share of GERD and GERD as a share of GDP in 2017.
Sources: Data adapted from GOSR2020 questionnaire and UNESCO Institute for Statistics database. Note that ocean science funding is not identified as such in GERD data and can be found in natural sciences and other categories.[5]

[5] The latest available data for Peru, Portugal and the USA are from 2016. The earliest available data for Iran (Islamic Republic of) and Portugal are from 2014. The latest available GERD data for South Africa are from 2016.

Maintenance and improvement of technical and human capacity in ocean science is at risk

Ocean science budgets vary significantly among countries and over time. Based on the datasets received, 14 countries increased their average budgets between estimates for years 2013 and 2017 (the Russian Federation had the highest annual growth rate, peaking at 10.4%, followed by the UK and Bulgaria), while 9 have reduced their budgets, in some cases quite markedly (particularly Japan, Ecuador, Turkey, Brazil and Italy) (Figure ES.20).

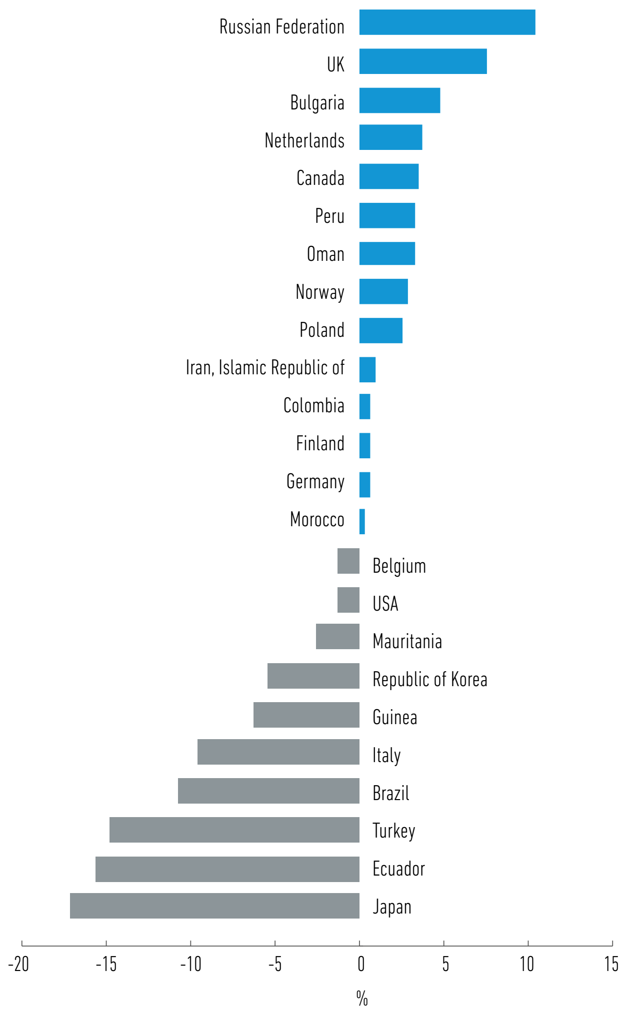


Figure ES.20. Change in % in ocean science expenditure over time based on average annual change of ocean science expenditure in local currency, at constant prices (2010=100), from 2013 to 2017. *Sources*: Data adapted from the GOSR2020 questionnaire and the International Monetary Fund's International Financial Statistics Database.[6]

[6] The latest available data for Peru, Portugal and the USA are from 2016. The earliest available data for Iran (Islamic Republic of) and Portugal are from 2014.

Funding for ocean science no longer lies exclusively with governments

The sources of funding for ocean science have diversified over the years and today they include national administrations, international programmes, the private sector, foundations and philanthropic organizations. Although the majority of funding for ocean science will certainly remain institutional, private foundations and donors could play a larger role in the funding of small- and large-scale ocean science projects during the next decade. Like other scientific domains, ocean science is also starting to benefit from innovative funding mechanisms. These include transdisciplinary research funds, crowdfunding, lotteries and levies.

International cooperation in ocean science is encouraged by multiple strategies

Partnerships across countries and different sectors are recognized as a key strategy for more effective resource use and increased participation in ocean science, reinforcing its application in policy. Multiple measures are being put in place to encourage the strengthening of international cooperation and exchange, such as financial and in-kind support to facilitate international board memberships, exchange programmes, advisory positions in national and regional bodies, as well as guest researcher positions in the academic sector.

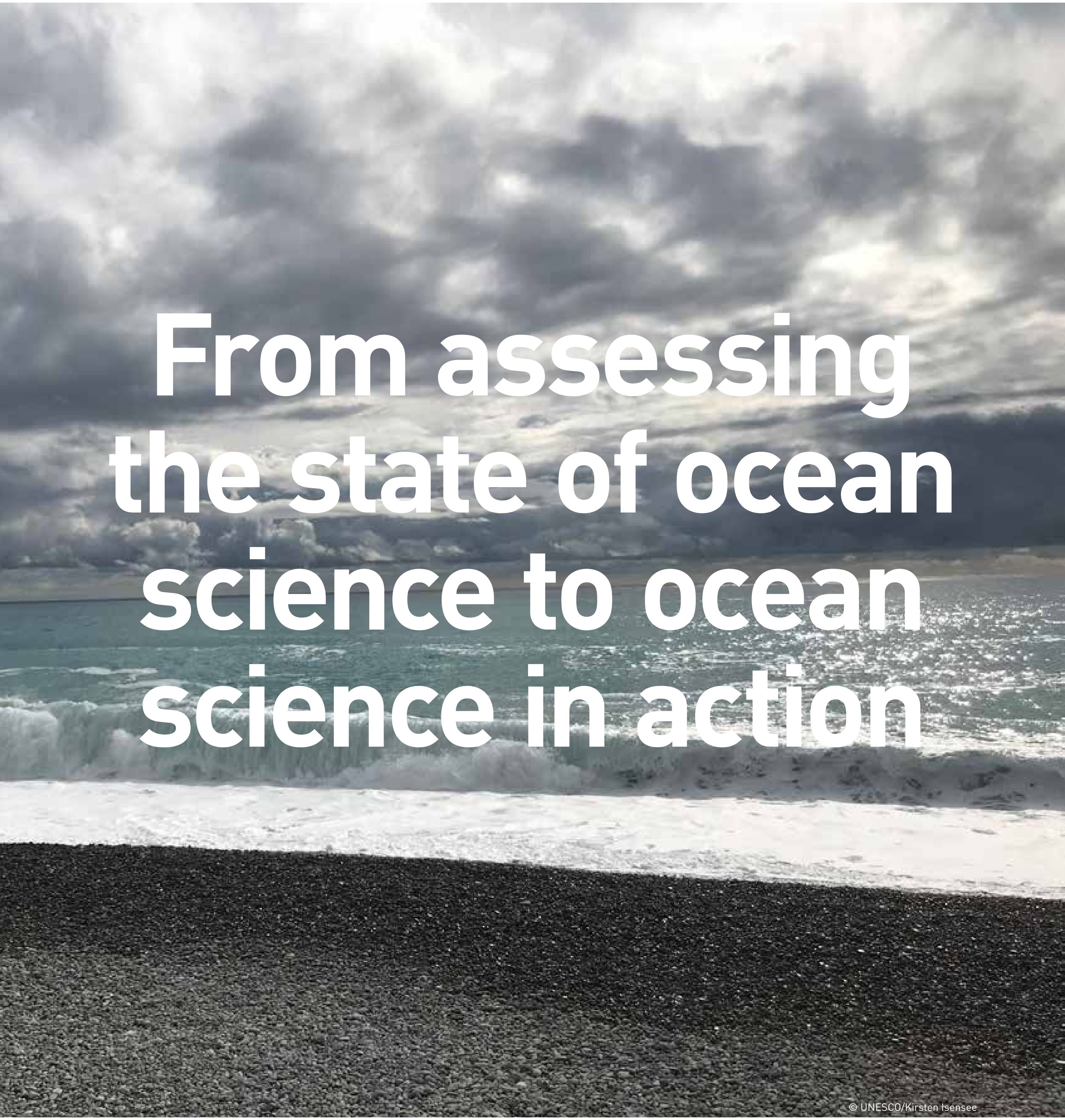
Potential impact of COVID-19 on ocean science

Ocean observations are negatively impacted by the COVID-19 pandemic

The immediate impact of COVID-19 on ocean observations during the first half of 2020 has been dramatic. Almost all research vessels have been called to their home ports. Almost all work to maintain vital mooring arrays that monitor major ocean currents and air-sea exchange has been cancelled. A number of arrays are therefore at risk of failure in the coming months. In June 2020, this situation affected between 30–50% of the 300+ moorings. Some of them had already ceased to send data as batteries ran out. However, up to June 2020, the Global Ocean Observing System showed some resilience, due to its inherent inertia, use of autonomous observing platforms, a well-maintained base and the swift mitigation actions of many observing system operators. However, the system will not stay this way indefinitely and if current trends continue, recent assessments have led to serious concerns with regard to the outlook for the second half of 2020 and the first half of 2021.

The impact of the COVID-19 pandemic on ocean science at large is still unknown

Evaluating the impacts of COVID-19 on ocean research requires a different approach than the way in which impacts on ocean observations have been assessed and described to date. The data contained in the GOSR2020 are pre-COVID-19. The next edition of the report will aim to measure the full impact of the pandemic on ocean science infrastructure, human and technical capacities, core funding, investment by the private sector, scientific output, conferences, observations, trends in R&D, employment and the gender dimension of ocean science.


From assessing the state of ocean science to ocean science in action
© UNESCO/Kirsten Isensee

The 2030 Agenda for Sustainable Development, the targets of SDG 14 and the desired outcomes of the UN Decade of Ocean Science for Sustainable Development (2021–2030)[7] require collaborative efforts by all stakeholders in ocean science. To turn the vision of the Ocean Decade – 'The science we need for the ocean we want' – into reality, the GOSR2020 calls for the following actions by governments, organizations, scientists, philanthropy, the private sector and civil society:

1. Enhance the current level of funding for ocean science

Overall, funding for ocean science is insufficient to fill existing knowledge gaps and deliver the information required for decisions, tools and solutions leading to a sustainable ocean (SDG 14). During the Ocean Decade, funding mechanisms at all levels, from government to institutions, philanthropy and corporations, are urged to accord explicit priority to ocean science and to seek better alignment between strategic funding initiatives.

2. Establish continuous collection of internationally comparable data on investments in ocean science

Monitoring of ocean science investments will be instrumental to identify their multiple socio-economic returns at the national, regional and global scale. Appropriate and regularly updated indicators, as defined in the GOSR, will also contribute to tracking ocean science capacity development internationally.

3. Facilitate co-design of ocean science by involving ocean science information users and producers

Co-design of science is necessary to identify challenges and opportunities for action in support of ocean sustainability. It should involve not only representatives of governmental institutions, national and international policy frameworks, but also private foundation donors, and users and producers of ocean science products. The Ocean Decade can serve as the platform for ocean science co-design.

[7] Implementation Plan for the United Nations Decade of Ocean Science for Sustainable Development Version 2 available at: https://oceanexpert.org/document/27347.

4. Promote multistakeholder partnerships in ocean science and operationalize transfer of marine technology

Partnerships, South-South and North-South in particular, and broad cross-sectoral cooperation should be promoted as vehicles to improve marine research capacities, and to optimize research infrastructure and human potential. TMT and innovation play a fundamental role in supporting developing countries to sustainably exploit the ocean and associated resources. Leaders in ocean science are urged to help operationalize the provisions of the UN Convention on the Law of the Sea with regard to capacity development and TMT.

5. Move towards ocean science capacity development with the equal participation of all countries, genders and ages, embracing local and indigenous knowledge

Ocean science capacity development should be governed by the principle of 'leaving no one behind', to be understood as providing equal opportunities for all countries, genders and age groups, and embracing local and indigenous knowledge. It should rely on ocean science best practices and follow community-approved guidelines, taking into account specificities at the national and regional level and corresponding jurisdictions.

6. Develop strategies and implementation plans to support the career needs of women and young scientists

Collaborative strategies that fully account for the gender and intergenerational dimensions of ocean science need to be developed and implemented to address the specific career needs of women and young scientists. In turn, the views of these critical stakeholders will be paramount for co-designing ocean science that is capable of supporting sustainable development and serving society.

7. Find solutions to remove barriers for open access to ocean data

Access to data is one of the starting elements of the ocean science value chain, which culminates in creating the capacity to inform decisions, ensuring long-term sustainability of the ocean. Therefore, two of the key transformations to be pursued during the upcoming Ocean Decade should be identifying and mainstreaming incentives for open data access. There is a need to change the view of ocean data by recognizing it as common good.

8. Foster education and training in professions related to ocean sciences

The world will need more professionals in the various fields of ocean management, for example in ocean data and information management, an area of expertise where there is currently no formal education. Increased support for education and training in all domains of ocean affairs therefore needs to be provided.

9. Assess the impact of the COVID-19 pandemic on human and technical capacity in ocean science

Possible temporary and longer-lasting impacts of the COVID-19 pandemic on the international ocean research and observations should be assessed. The data contained in the GOSR2020 reflects the pre-COVID-19 era, while the next edition of the report will examine the impact of the pandemic on ocean science, including core funding, investments by the private sector, scientific production, conferences, observations, trends in R&D, employment and the gender dimension of ocean science. An intermediary study will therefore be undertaken starting in 2021, based on the GOSR2020 approach, to reflect the specificity of the COVID-19 pandemic, relying on tailor-made variables and indicators. Cooperation and input to that study will be requested.

The next edition of the GOSR is expected to be published in 2025, halfway through the Ocean Decade. The continuously improved data collection and updated information submitted to the GOSR portal will make future analyses more robust. It will enable the accurate measurement of how ocean science capacity contributes towards the goals of the 2030 Agenda, help to gauge the effectiveness and efficiency of ocean science and to find innovative and transformative ways of directing growing investment towards fulfilling the emerging needs of society.

Global Ocean Science Report 2020

Charting Capacity for Ocean Sustainability

The world ocean is a life-supporting system for humanity, yet it remains largely unknown. Based on data collected from around the world, the Global Ocean Science Report 2020 (GOSR2020) offers a global record of how, where and by whom ocean science is conducted. By analysing the workforce, infrastructures, equipment, funding, investments, publications, data flow and exchange policies, as well as national strategies, the GOSR monitors our capacity to understand the ocean and seize new opportunities. In its second edition, the GOSR2020 addresses four additional topics: contribution of ocean science to sustainable development; blue patent applications; extended gender analysis; and capacity development in ocean science.

The GOSR2020 is a resource for policymakers, academics and other stakeholders seeking to assess progress towards the sustainable development goals of the UN 2030 Agenda, in particular SDG target 14.a on scientific knowledge, research capacity and transfer of marine technology. The GOSR provides the information for the indicator for target 14.a as the proportion of total research budget allocated to research in the field of ocean science. GOSR2020 not only provides consistent reference information at the start of UN Decade of Ocean Science for Sustainable Development 2021–2030, it evolves as a living product. The global community is given the online facility to submit and update data on the GOSR portal and consult data to regularly assess progress on the efficiency and impact of policies to develop ocean science capacity.

For more information:
https://gosr.ioc-unesco.org

**One Planet,
One Ocean**

ioc.unesco.org

United Nations
Educational, Scientific and
Cultural Organization

UNESCO
Publishing