Global Goals, Ocean Opportunities

United Nations Global Compact

ABOUT THE UN GLOBAL COMPACT ACTION PLATFORM FOR SUSTAINABLE OCEAN BUSINESS

As a special initiative of the UN Secretary-General, the United Nations Global Compact is a call to companies everywhere to align their operations and strategies with ten universally accepted principles in the areas of human rights, labour, environment and anti-corruption, and to take action in support of UN goals such as the Sustainable Development Goals (SDGs or 'Global Goals').

The UN Global Compact Action Platform for Sustainable Ocean Business ('the Platform') is taking a comprehensive view of the role of the ocean in achieving the 17 Global Goals. The aim is to explore attractive, viable solutions and best practices for sustainable use and management of the ocean.

By bringing together the leading industries in aquaculture, energy production, fisheries and shipping with key banks, equity funds and insurance companies, the Platform has a cross-industry, cross-UN and cross-Global Goals approach.

Leading up to the 2020 UN Ocean Conference, the Platform is designed to drive decision-making processes and catalyse partnerships to advance shared ocean priorities across all 17 Global Goals with a specific aim to scale up the commitments and performance of companies on this critical agenda.

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Editor: Bente Pretlove (DNV GL)

Editorial Board: Ignace Beguin Billecocq (UN Global Compact); Robert Blasiak (Stockholm Resilience Centre); Erik Giercksky (UN Global Compact); Wenche Grønbrekk (Cermaq); Leif Håkonsen (DNB); Kim Jefferies (Gard AS); Clement Lavigne (Total); Erika Lindholm (Gard AS); Melanie Moore (Wilhelmsen); Hege Thomassen Magnus (Norwegian Shipowners' Association); and, Kris Van Nijen (Global Sea Mineral Resources).

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June 2019

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“The ocean provides food, energy, water, jobs and economic benefits for people in every country, even those that are landlocked. It is a crucial buffer against climate change, and a massive resource for sustainable development. The health of our oceans and seas is inextricably linked with the health of our planet and all life on Earth.”

Jean-Marc Ferré / UNHCR

– H.E. António Guterres
United Nations Secretary-General
Opening remarks to the Ocean Conference, 5 June 2017

Astrid Stawiarz/Getty Images for UN Global Compact

FOREWORD: AN URGENT CALL TO OCEAN ACTION

Every second breath we take comes from the ocean. Connected to all life on this planet, the ocean is our greatest global common, uniting both people and nations. How we protect and manage the ocean will determine much of our success towards delivering the Sustainable Development Goals by 2030, and businesses that are connected to the ocean have a critical role to play.

The United Nations Global Compact has a specific mandate to work with and inspire companies — of all sizes and from all regions and industries — to act responsibly and find opportunities to advance sustainable development. I am encouraged that so many businesses around the world are taking an interest in our ocean sustainability work. The UN Global Compact Action Platform on Sustainable Ocean Business has brought diverse companies, civil society organizations and Governments together to find new ways for companies to navigate the ocean challenge, using our Ten Principles on human rights, labour, the environment and anti-corruption as their North Star.

But in the lead-up to the second UN Ocean Conference in Portugal in 2020, much more work must be done. We need to reach a tipping point where a critical mass of companies is working together to ensure the ocean is sustainably managed. The interlinkages between the climate crisis and ocean health cannot be ignored, nor can the connection between the ocean and all 17 Global Goals.

The rapid deterioration of ocean health, which deeply affects biodiversity, coastal communities and the health of the planet, must be urgently addressed. As this report shows, this deterioration is, like climate change, caused by human activity. We need the capacity and competence of the business community to solve this challenge. Ensuring a healthy marine environment is not only necessary for many ocean companies to continue to operate in the long-term — innovating and investing in new ocean solutions also provides a significant business opportunity.

Nelson Mandela once famously said, "It always seems impossible until it's done." Achieving the 17 Global Goals by 2030, now just over a decade away, will be no small feat. Some already claim the realization of the 2030 Agenda for Sustainable Development is not just unlikely, but impossible. But as this report lays out, the ocean can be the key to achieving the Global Goals. In the next decade, we can:

Improve ocean health by preventing pollution and litter from entering the ocean.

Map the ocean around the world, pioneering innovative research and discovering new insights.

Make healthy food from the ocean available to all.

Provide affordable, clean energy to people everywhere.

Produce low-emission solutions for global maritime transport, facilitating a cleaner, more efficient provider of trade and growth.

As we approach 2020 and the decade of delivery for the Global Goals, we must leverage ocean sustainability, not only to protect the ocean itself, but to ensure people and planet can prosper and thrive. Through our Action Platform on Sustainable Ocean Business, the UN Global Compact will continue to work with all partners to drive business action for the ocean, helping to fulfil the core promise of the 2030 Agenda: leave no one behind.

Lise Kingo
CEO & Executive Director
United Nations Global Compact

A DECADE DEFINING A CENTURY

Throughout the history of humankind, no generation before us has ever enjoyed more prosperous lives. Likewise, no generation has ever before faced more urgent, important and consequential decisions. The decisions that we do or do not make over the next few years will define lives for generations to come. The decade to 2030 is one that will define a century.

The choices we face are immediate and real. They should serve as an inspiration, as much as a burden, to us all. We do have the knowledge, technology and means necessary to choose a trajectory of sustainable prosperity over a path of degradation and destruction. It is for us to decide and act — now.

It is for our generation to demonstrate the stewardship, leadership and determination required to find the common solutions for 'The Future That We Want', as laid out in the 17 Sustainable Development Goals for 2030.

The ocean, our most important global common, is key to achieving these goals. There are few other environmental or human domains where the risks of failures and rewards of success are more pronounced. The ocean is merciless and generous. It embodies our dilemmas, challenges and opportunities. The ocean is in a dire state, it is weakly governed and poorly managed. We must restore ocean health, biodiversity and productivity. Concurrently, we must tap more of the generous potential of the ocean to provide food, energy, minerals, medicines and transportation to serve a rapidly growing world population.

No single country, industry or entity can succeed in doing this alone. We need more international cooperation, more global solutions and more extensive cooperation between the public and private sectors. We need industry and corporations to come forward and step up as stewards of sustainable ocean practices, the core ambition of the UN Global Compact's Action Platform on Sustainable Ocean Business.

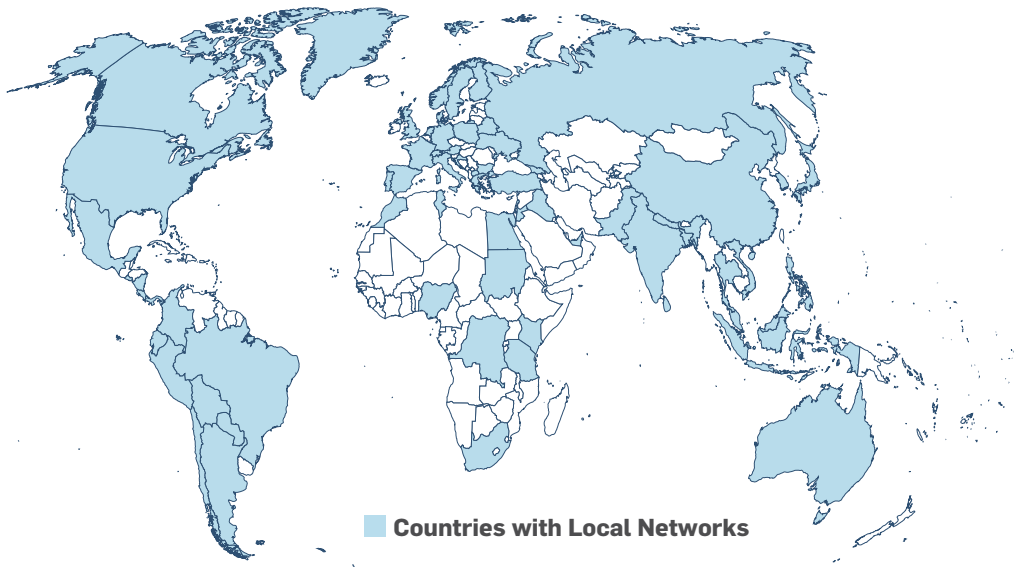
When the Ocean Action Platform was launched in New York on World Ocean Day, 8 June 2018, we were excited and optimistic about the project. A short year later, our hopes and expectations have risen way beyond what we thought possible. The dedication and determination demonstrated by the participating companies and organizations have been as impressive and inspiring as the commitment and competence contributed by the members of the project group. The workshops conducted with the Global Compact's regional and national organizations around the world have added valuable insights and energizing inspiration.

In this report we endeavour to elaborate on how to protect and preserve the ocean while concurrently producing more from it. We must achieve all of this. The decade to 2030 will ensure 'The Ocean That We Need — for The Future That We Want'.

Sturla Henriksen
Special Advisor, Ocean
United Nations Global Compact

Erik Giercksky
Head, Sustainable Ocean Business
United Nations Global Compact

GLOBAL COMPACT LOCAL NETWORKS



Established in June 2018, the UN Global Compact Action Platform for Sustainable Ocean Business focus on growth, innovation and sustainability, exploring multi-stakeholder action for a healthy, productive and well-governed ocean. The Platform aims to mobilize the private sector to take tangible action, make investments and form partnerships to leverage the ocean as a resource to deliver the Global Goals. In addition to the Platform Patrons, Participants and Partners, the Platform has an Advisory Group and engages directly with Global Compact Local Networks.

Patrons

CERMAQ, equinor, covestro, gard, TOTAL

Participants

DNV·GL, CEFIA, DNB, Munich RE, MAERSK, KONGSBERG, TATA NYK, GRIEG, NORGES BANK INVESTMENT MANAGEMENT, New Zealand King Salmon, Lloyd's Register, ABN·AMRO, GSR Global Sea Mineral Resources, GIEK, BAKKAFROST, UK Seabed Resources, Nor-Shipping, Norges Rederiforbund Norwegian Shipowners' Association, StormGeo

Partners

Centre for the Ocean and the Arctic, 東京大学 THE UNIVERSITY OF TOKYO, SRC, GLOBAL CITIZEN, AWI

UN and Governments

UN environment, International Seabed Authority, UNESCO United Nations Educational, Scientific and Cultural Organization, Intergovernmental Oceanographic Commission, FAO, UNDESA, WORLD BANK GROUP, UNDP, UN-HABITAT, IMO

A MULTI-STAKEHOLDER APPROACH TO UNDERSTANDING THE OCEAN

Approximately 300 companies, organizations, academic institutions and non-governmental organizations (NGOs) have been involved, consulted or taken part in workshops leading up to the writing of this report.

The Platform surveyed stakeholders to investigate the potential impact and relevance of each Sustainable Development Goal to ocean industries, considering both direct and indirect impacts. The respondents ranked the Goals and targets they contribute towards and were asked to provide examples of their work.

Goal 14 (Life Below Water) alongside the need for partnerships and peace, justice and strong institutions (Goal 17 and Goal 16) were generally seen as being of overarching importance to deliver a productive ocean. Collectively, all the interacting Global Goals feature as shown in the graphic on this page. Those that are enlarged were highly prioritized by the respondents when taking an ocean perspective and therefore receive more focus within this report. In the workshops, however, it should be noted that several cross-cutting issues and targets related to— for example — gender, equality and education were also considered highly relevant.

There are great differences in how ocean industries assess their contributions towards the achievement of the Global Goals. This is dependent on their products or services, whether they have a local or global scope and where they operate in the world. There is no surprise that describing the state of the ocean and seeking future solutions and opportunities generate a considerable amount of inputs, facts and opinions.

This report is published by the United Nations Global Compact, with key editorial input from DNV GL and an editorial board from a wide range of platform members. The impetus for producing this report came from the UN Global Compact Action Platform for Sustainable Ocean Business. This does not mean that individual companies, organizations or academic partners necessarily agree with or endorse all the contents in this report, or that it reflects their individual sustainability approaches or practices. The development of this report underscores a much-needed openness for discussion and debate on the future of the ocean. All participants have eagerly supported the need for a report such as this to push the conversation forward.

GLOBAL GOALS, OCEAN OPPORTUNITIES

This report is divided into three parts covering the linkages between a healthy, productive and well-governed ocean and the 17 Global Goals. Ocean productivity is dependent on ocean health, and a well-governed ocean is a key enabler to manage the related threats and opportunities.

HEALTHY

LIFE

CLIMATE

BIO DIVERSITY

Climate change is the overarching threat to ocean health, which is also under pressure from the over-exploitation of natural resources, habitat destruction, pollution and marine littering. These challenges can be turned into long-term business opportunities for the **Ocean We Want**.

PRODUCTIVE

OCEAN TRANSPORT

OCEAN MINERALS

OCEAN FOOD

OCEAN MEDICINE

OCEAN ENERGY

OCEAN TOURISM

Meeting the needs of a growing world population and bringing healthy food and resources to billions of people must be done sustainably. Ocean productivity can meet the needs of the **Future We Want.**

WELL-GOVERNED

PARTNERSHIPS

GLOBAL PRINCIPLES

Strong public and private governance mechanisms and responsible finance are preconditions and enablers for a healthy and productive ocean. Our 'Sustainable Ocean Principles' will provide guidance for the **World we Want**.

alxpin / iStock

OCEAN HEALTH

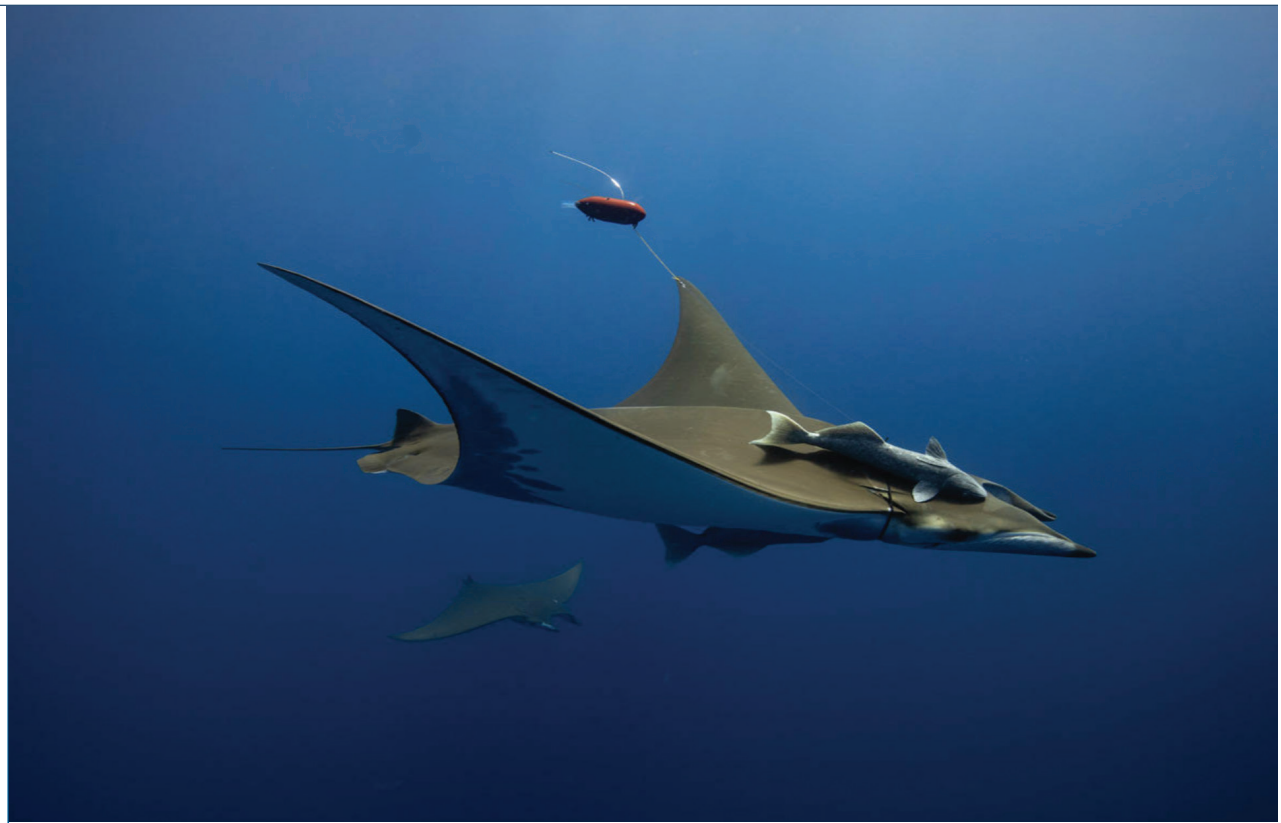
Climate change is the overarching threat to ocean health, which is also under pressure from over-exploitation of natural resources, habitat destruction, pollution and marine litter.

Ocean health is significant to our planet's overall health. Understanding the pressure points of ocean health needs a planetary approach.

Our direct and indirect interactions with the ocean have resulted in far-reaching ecological changes. There is a serious risk that future generations will experience a very different ocean, one characterized by degradation, depletion, pollution and littering. Urgent action at local and global levels is needed to address threats from climate change, habitat destruction, overfishing, pollution, littering and poor governance.

Ocean-based industries can have a substantial impact on some of these areas. Mitigating or eliminating threats, such as climate change, pollution and marine litter will require not only a paradigm shift in terms of mainstreaming sustainability into business operations, but also substantial coordination between Governments and ocean industries and their land-based counterparts.

All industries need to play their part in advancing the Global Goals and work to integrate business models and technologies that take threats to the ocean into consideration. Some international regulatory regimes have already specifically codified the precautionary principle, but even in areas where current governance regimes are weak, a precautionary approach is needed to build up responsible and sustainable activities. The sphere of influence of industries extends far beyond their direct operations and connects to global supply chains, consumer behavior and local communities.



CEiiA / Portugal

HEALTHY OCEAN HEALTHY PLANET HEALTHY PEOPLE

The health of the ocean, the planet and humanity itself are inseparable. The ocean covers more than 70 per cent of the surface of our planet. It contains 99 per cent of the habitat for life, generates over half the oxygen we breathe, and more than one third of the world's population lives along its coasts (OHI, 2019). The ocean shapes Earth's climate and has absorbed more than 90 per cent of the extra heat trapped due to anthropogenic greenhouse gas (Resplandy et al., 2018). It fosters ocean-based industries employing millions, which generate trillions of dollars in value for the global economy every year.

A healthy ocean 'sustainably delivers a range of benefits to people now and in the future' (OHI, 2019). These benefits are diverse and vast in scale, hence actions to keep the ocean healthy must be a priority. Marine fisheries provide 57 million jobs globally and provide the primary source of protein to over 50 per cent of the population in least developed countries. Many coastal ecosystems, including coral reefs, mangrove forests, salt marshes, seagrasses and wetlands act as a natural buffer against extreme

OCEAN HEALTH TODAY

The ocean is home to millions of species, spanning complex habitats.

Marine microbial diversity may involve billions of unknown taxa and represents an enormous natural resource.

Human wellbeing is tied to the ocean. It provides everything from nutrition to medicines and more than half the oxygen we breathe.

A healthy ocean is also linked to a wide range of cultural benefits, and tourism is among the fastest growing sectors within the Blue Economy.

Coral reefs and mangrove forests are among the marine ecosystems that provide protection against extreme weather events, and nurseries for juvenile fish, and need to be protected.

weather events (Barbier, 2017). The ocean is also home to diverse habitats ranging from coral reefs to hydrothermal vents, where life has adapted over thousands of years to extremes of heat, cold, pressure and darkness. These adaptations encoded in the genes of organisms that live there are drawing the interest of a rapidly growing marine biotechnology industry (Blasiak et al., 2018).

Looking beyond these highly tangible benefits provided by the ocean, it is also crucial to note the recreational, aesthetic and spiritual benefits that people derive from the ocean (Barbier, 2017). Thousands of years of close human-nature interactions along coastlines have resulted in diverse and rich traditions among indigenous, local and global communities. The wellbeing of these communities is immediately and visibly linked to the health of the ocean, and illustrates how, on a global scale, humanity itself relies on the ocean.

> **"When the Amazon sneezes, Kenya catches a cold."**
>
> *—Ivan Ochieng, Director, Green Pencils, Kenya, and Board Member, Global Compact Network Korea*

The threats to ocean health today are substantial and growing. Climate change, pollution and marine littering, habitat destruction, overfishing and poor governance are among the direct and indirect causes.

Climate change and changing ocean conditions are causing fish stocks to decline and to shift (Free et al., 2019; Pinsky et al., 2018). Plastic pollution is ubiquitous throughout ocean food systems. It has unpredictable human and ecosystem health impacts, the results of which are being increasingly observed. Agricultural runoff and coastal developments are impacting on and altering the natural balance of marine ecosystems, and may affect sensitive species like coral reefs, or stimulate overproduction of algae. Coral bleaching has devastated reef ecosystems in recent years; for instance, 30 per cent of coral cover in the iconic Great Barrier Reef died within the span of nine months due to a 2016 heat wave (Hughes et al., 2018). In 2019, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Global Assessment found that a million animal and plant species are at risk of extinction, and emphasized that transformative changes are needed in order to restore and protect nature.

The menace of overfishing

A third (30–35 per cent) of fish stocks are fished unsustainably, and an additional 60 per cent are fully fished to the maximum of what can be sustained. Overfishing poses a major health risk to much of the developing world, where substitutes for nutritionally rich fish are scarce (Golden et al., 2016). While some collapsed stocks rebound following a moratorium, others have not, signifying a permanently altered ecosystem and potential loss of economic benefits and livelihoods. Gaps in global governance can result in displacement of poor behaviour (e.g. illegal fishing) into areas with limited monitoring or enforcement capacity (Blasiak, 2015). Many threats facing the ocean are transboundary and require cooperation and coordination among diverse states. International governance and regulatory frameworks vary widely across ocean-based industries and lack coherence across sectors. The need for appropriate governance is becoming even more pressing in the face of modern, more-efficient fishing methods.

Delivering on the Global Goals

Achieving the targets under Goal 14 on Life Below Water has been connected through co-benefits to all the other Global Goals. This illustrates the interlinkages between the goals and the central position of healthy and functional ecosystems — and no ecosystem is as large as the ocean.

Some of the most immediately tangible linkages are associated with nutrition. For many of the world's low-income food deficit countries, the ocean is a crucial source of protein and micronutrients for which local alternatives and replacements are largely absent. In such areas, there is a strong risk that degraded ocean ecosystems will result in negative health outcomes (Goal 2: Zero Hunger, Goal 3: Good Health and Well-Being) (Golden et al., 2016). An estimated 820 million people depend directly on aquaculture and fisheries for their livelihoods, the majority in low- and middle-income countries, and are dependent on continued ocean health and productivity (Goal 1: No Poverty).

More than 600 million people live in coastal areas, and 40 per cent of the global population lives within 100 kilometres of the ocean.[1] This aggregation of communities along coastlines adds to pressure on marine ecosystems through industrial activity, pollution and littering (Goal 12: Responsible Consumption and Production). Many coastlines are also increasingly vulnerable to extreme weather events and storm surges due to removal or degradation of natural protective features like mangroves, barrier islands and coral reefs (Goal 11: Sustainable Cities and Communities). Yet the ocean offers opportunities for renewable energy such as offshore wind, wave and tidal, the full potential of which is being explored (Goal 7: Affordable and Clean Energy).

As the climate changes, it is also reshaping the ocean, causing extended ocean heat waves that have a massive effect on all marine life. Examples include ocean heat waves that result in mass coral-bleaching events and shifts in the distribution of marine fish stocks (Goal 13: Climate Action). Ocean biogeochemistry is also changing, with impacts for the structure of ecosystems, food webs, invasive species and other biotic interactions.

Waters are growing increasingly acidic as they absorb more carbon dioxide. Dead zones around major river deltas are expanding due to ocean warming and runoff from agriculture (Goal 12, Goal 15: Life on Land). In some cases, the result has been vast algal blooms posing a risk to human health and marine life through effects including eutrophic depletion of oxygen, and/or toxicity (Goal 3).

Momentum must be maintained to accelerate progress towards conserving marine and coastal areas (Goal 14) as well as agreeing upon ambitious post-2020 marine and coastal conservation targets which will restore and build resilience of the ocean. The future of the ocean is particularly reliant on good governance and effective regulation (Goal 16: Peace, Justice and Strong Institutions). A growing body of literature is underscoring the connectivity of ocean systems. This means that regional and global approaches and partnerships are needed to ensure the health of transboundary fish stocks, reductions in marine pollution, and vibrant coastal ecosystems (Goal 16, Goal 17: Partnerships for the Goals).

1 UN, 'Factsheet: People and Oceans', Publ. for the Ocean Conference, UN, NY, 5–9 June 2017, www.un.org.

CO-CREATION FOR A HEALTHY OCEAN

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Partnering to collect ocean data

Scientists working to understand the ocean and how it is changing rely on data. They face major challenges including the size of the ocean and cost of chartering vessels or remotely-operated vehicles to collect samples and monitor change over time. Innovative partnerships with ocean-based industries are helping to address this.

For example, more than 2,000 commercial vessels contribute daily through the Voluntary Observing Ships Scheme to collect and transmit oceanographic and meteorological data for scientific use.[2] Monitoring of marine litter and plastics also takes place. The oil and gas industry collect a lot of seabed monitoring data and many of these databases are available for scientific purposes.[3] There are also examples (ABPmer., 2015) from other sectors: seabed cable, commercial fisheries, offshore renewables. Scientists and industry agree, however, that more can be done to make data available and useable without creating risk for those providing it (McMeel et al., 2017).

Our discussion on Ocean Food includes details of a non-profit organization with business links using tracking satellites and state-of-the-art data analytics to offer free locational and other data on vessels engaged in large-scale fishing. In addition, electronic tracking tags on ocean fish can report back on temperature, pressure and other physical parameters of the water they are moving through. As discussed in the New Frontiers chapter, there is also scope for larger and more collaborative efforts in bioprospecting and remote sensing.

2 World Meteorological Organization - Intergovernmental Oceanographic Commission (WMO-IOC) Joint Technical Commission for Oceanography and Marine Meteorology, 'The Voluntary Observing Ships (VOS) Scheme', www.jcommops.org.
3 Oil & Gas UK, 'UKbenthos Database 5.10', oilandgasuk.co.uk.

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PUTTING BUSINESS ON THE CASE
THE PLASTICS CHALLENGE

Plastic in the ocean comes from human activity on land and sea. 'All sectors and people contribute to this pollution — from poorly controlled waste sites, illegal dumping and mishandled waste on land to ropes, nets and other debris from fishing, ships, oil rigs and other sources'.[4] Many companies are pursuing or setting up action plans to prevent, manage and recycle plastic

nycshooter / istock

waste that could otherwise end up in the ocean. However, much more action is needed to counter the rate at which plastic is entering marine environments and food chains. One estimate of total plastic input to the ocean is around eight million tonnes per year, and about 80 per cent is attributed to land-based sources (Jambeck et al., 2015). It predicts that without better waste management infrastructure, the cumulative amount of plastic waste available to enter the ocean from land will rise by an order of magnitude by 2025. Others reckon 90 per cent of plastic entering the ocean from rivers is carried by just 10 of them, usually in areas of high population and with mismanaged plastic waste (Schmidt et al., 2017). It is widely accepted that broad strategy against this must be based on circular economy approaches preventing plastic waste and encouraging its recycling and reuse.

Encouragingly, companies are preparing to escalate their response to these challenges by approaching them as business opportunities. Several including oil and gas operators are part of the Alliance to End Plastic Waste.[5] This non-profit organization has pledged US$ 1.5 billion over five years for projects on waste management infrastructure, education and engagement, innovation and clean-up efforts. A campaign called Renew Ganga to reduce river plastics was launched in India in 2019 to target areas around the Ganges, which delivers an estimated 0.5 million tonnes of plastic waste into the ocean annually.[6] Renew Ganga is driven by a private company founded to be a technology leader in chemical recycling of non-recycled plastic back into new valuable products.

Elsewhere, specialist investment managers and innovation enablers are behind The Incubator Network initiative.[7] This aims to drive entrepreneurial development of new technologies and business models to prevent ocean plastic waste and improve waste management and recycling in South and Southeast Asia. It is a partnership with a non-profit organization[8] promoting ocean clean-up. The first project, supported by the Australian Government, is the Ocean Plastic Prevention Accelerator (OPPA)[9] for Indonesia. Another suggestion is that businesses could support circular economy efforts through 'plastic crediting' for global seafood and other food manufacturers. As envisaged, this could fund reuse initiatives, recycling, biodigesters and development of local sustainable biodegradable alternatives.

Crunching the numbers

Academics are meanwhile developing methods to quantify the feasibility and effectiveness of plastic recovery solutions from the ocean, rivers and waterways.[10] Such knowledge can convert problems into value. It enables guidance on designing recovery solutions, identifying key parameters and their linkages, analysing the economics of recovery, and priorities for scientific research. Further, lifecycle cost analysis of plastics management will require appropriate data such as water use in recycling, and traceability of plastics. Participants in this report suggest this could be enabled by a distributed platform for aggregating data and facilitating the sharing of standards and data between organizations.

4 UN Environment Programme and GRID-Arendal, 'Marine Litter Vital Graphics. UN Environment Programme and GRID-Arendal', 2018, www.unep.org., and www.grida.no.
5 See endplasticwaste.org.
6 Renewlogy, 'Renew Ganga Project', renewlogy.com.
7 Circulate Capital, 'The Incubator Network by Circulate Capital and SecondMuse', circulatecapital.com.
8 Ocean Conservancy, 'The Ocean Starts With You', oceanconservancy.org.
9 SecondMuse, 'Ocean Plastic Prevention Accelerator', oppa.id.
10 Telouw, V., 'Turning a problem into value: The case of plastic reaching the ocean', 7 November 2017, https://resolver.tudelft.nl.

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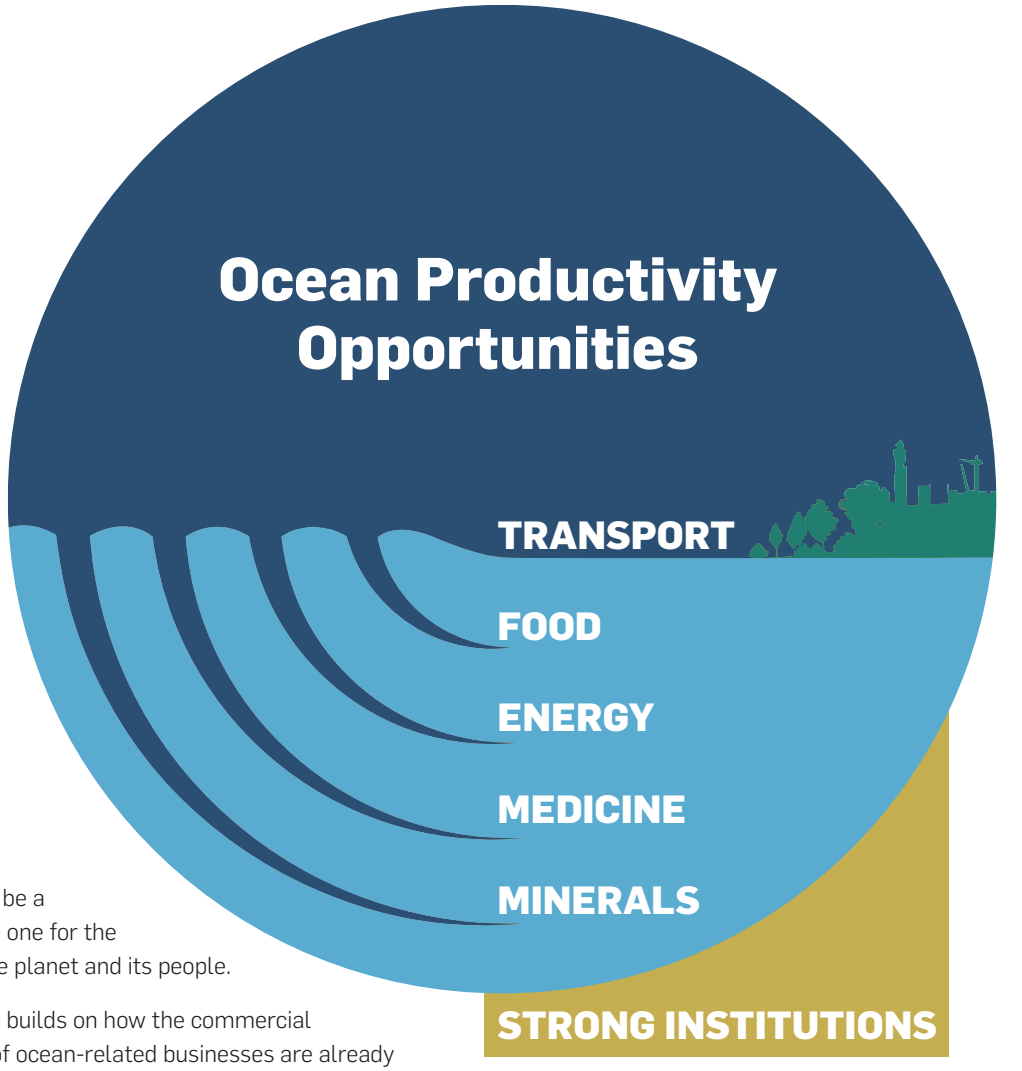
PRODUCTIVE OCEAN INDUSTRIES



A healthy ocean can be a productive one for the good of the planet and its people.

Our report builds on how the commercial activities of ocean-related businesses are already impacting on the Global Goals. We look at how they are starting or planning to align doing good business with shaping a sustainable future, and what it will take to get there.

It encourages belief that private sector innovation and investment within strong public and private governance frameworks can sustainably deliver greater quantities of healthy food; secure and affordable clean energy; more efficient and lower-carbon transport; and, greater tourism and trade to widen the related spread of economic and social benefits while avoiding increasing negative consequences.

New frontiers are also opening up through research and development aimed at sustainably mining abundant seabed minerals vital to technologies needed for decarbonizing human activities. Bioprospecting seeks potentially life-saving new drugs from marine organisms.

The ocean economy covers both established sectors such as transport, food and energy and the emergence of new industries related to the development of medicine and extraction of minerals.

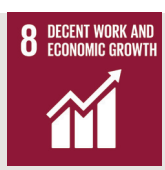
AvigatorPhotographer / istock

THE IMPORTANCE OF TRANSPORT

Since the era of sailing ships, shipping has turned the ocean into a bridge connecting continents and nations and oceanic shipping routes are the global economy's arteries. Shipping is a large, growth business spreading economic and social benefits as the focus of a maritime cluster: shipyards, designers, manufacturers and service providers.[11]

Seaborne transport is projected to increase in all trade segments except crude oil and oil products. Ships, maritime technology and shipping services are also instrumental in supporting growth in offshore renewable energy production and the harvesting of seafood. Enabling sustainable global trade, through which all nations can produce and bring to market what they are best at, is vital to the world economy and future growth. With global trade today linked more than ever with local economies, shipping will be a key factor in reaching the Global Goals.

SUPPORTING DECENT WORK AND ECONOMIC GROWTH



Shipping is regulated globally by the International Maritime Organization (IMO). The role of port-state control is to secure the enforcement of international conventions regulating environment, safety and the work environment. Ships are registered in over 150 nations and manned by a million-plus seafarers.

More than 50,000 merchant ships carry over 80 per cent of trade by volume with almost 11.7 billion tons of goods loaded in 2017.[12]

A 39 per cent rise in seaborne trade tonnes is forecasted between 2016 and 2030, and a two per cent annual rise for the period from 2030 to 2050.

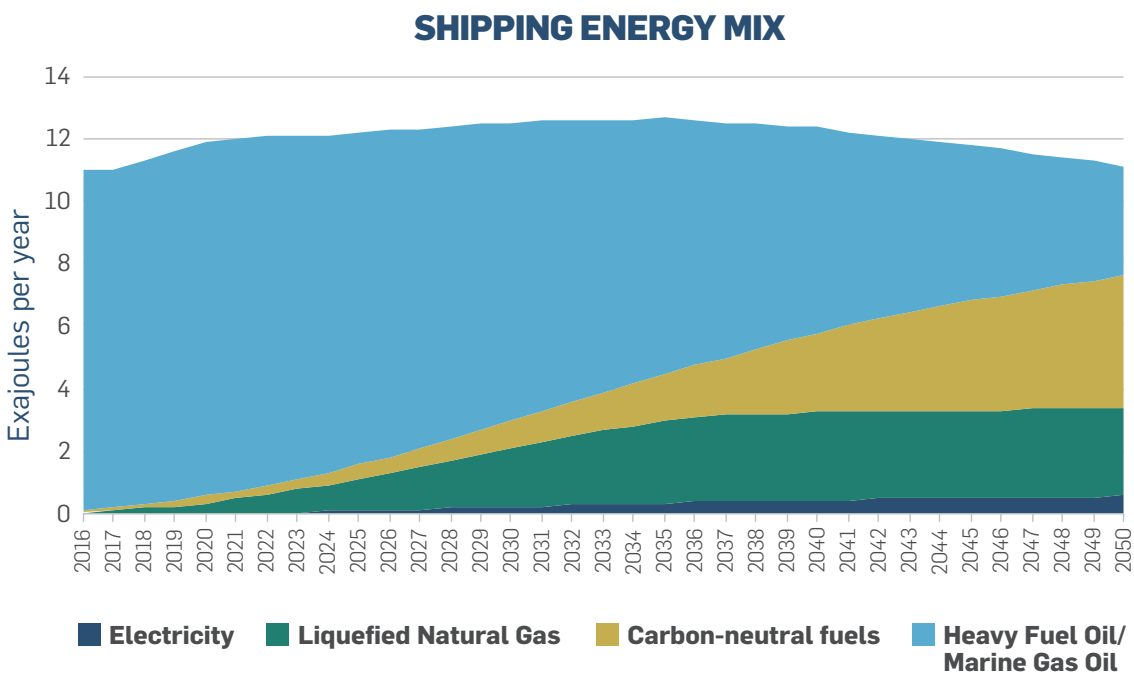
Workers and infrastructure in developing countries handle almost two thirds of goods loaded and unloaded.

Developing countries are arising as suppliers of maritime transport services including, among others, shipbuilding and registration as well as terminal handling operations.[14]

11 DNV GL and Norwegian Shipowners' Association, 'Sustainable Development Goals: Exploring Maritime Opportunities', 6 June 2017, viewable at rederi.no.
12 UN Conference on Trade and Development (UNCTAD), 'UNCTAD Handbook of Statistics 2018 — Maritime transport', unctadstat.unctad.org.

Delivering on the Global Goals

While transporting more than 80 per cent of the world's goods (Goal 2), shipping recognizes its responsibility to minimize its impacts on sea and land. International conventions regulate discharges of pollutants and waste from ships[13], and help to lower the risk of vessels moving invasive aquatic species over long distances.[14] (Goal 14). The IMO has strategy to at least halve annual greenhouse gas (GHG) emissions (Goal 13) from international shipping by 2050 compared with 2008.[15] IMO requirements[16] and public-private partnerships[17] are driving improvements in energy efficiency and assessing how to decarbonize shipping supply chains (Goal 12). The work and cooperation between the IMO and the industry should be an inspiration for other ocean industries, with transparent and open dialogues on the governance of the sector.



If IMO GHG targets are met, 39 per cent of shipping energy will be from carbon-neutral fuels, surpassing liquid fossil fuels, by 2050. (Source: DNV GL, ETO 2018)

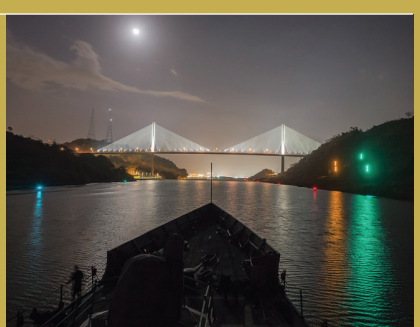
13 International Convention for the Prevention of Pollution from Ships (MARPOL).
14 International Convention for the Control and Management of Ships' Ballast Water and Sediments.
15 Annex 11 of Resolution MEPC.304(72), adopted 13 April 2018 by Marine Environment Protection Committee (MEPC) of the IMO.
16 e.g. Energy Efficiency Design Index for new ships; the Ship Energy Efficiency Management Plan for all ships; and, the Energy Efficiency Operational Indicator data collection system for fuel oil consumption of ships.
17 e.g. Global maritime energy efficiency partnerships (GloMEEP), a Global Environment Facility-UN Development Programme (UNDP)-IMO project supporting uptake and implementation of energy-efficiency measures for shipping.

ranplett / istock

OCEAN TRANSPORT IS THINKING GLOBALLY AND ACTING LOCALLY

ROOTING OUT CORRUPTION FOR FAIRER TRADE

The Maritime Anti-Corruption Network (MACN) is a global business network working towards the vision of a corruption-free maritime industry enabling fair trade to the benefit of society at large. The organization and its members are working to eliminate all forms of maritime corruption by: raising awareness of the challenges faced; implementing MACN Anti-Corruption Principles; co-developing and sharing best practices; collaborating with Governments, NGOs and civil society to identify and mitigate the root causes of corruption; and, creating a culture of integrity within the maritime community.[20]



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PREVENTING BIOINVASIONS IN LOCAL COMMUNITIES

The IMO-executed GloFouling Partnerships project will address bioinvasions by organisms which can build up on ships' hulls and other marine structures.[21] In new marine environments they can affect biodiversity, ecosystem health, and damage fisheries, aquaculture and ocean energy. This is a collaboration between GEF, UNDP and IMO with 12 countries spearheading the work.[22] The alliance will forge deeper partnership between maritime businesses, the public sector and NGOs towards shared goals.

istock

LOWER-CARBON VESSELS TO AID CLIMATE ACTION

Lower-carbon vessels with electric, hydrogen fuel-cell and hybrid propulsion systems are few but increasing. Local emissions from mostly smaller vessels such as ferries are being reduced in some places by using vessels with batteries for electric or diesel/electric hybrid propulsion.[23] Alternative fuels for shipping are starting to contribute to action on climate change. Liquefied Natural Gas (LNG), Liquid Petroleum Gas, methanol and hydrogen look promising.[24]

DNVGL

20 Viewable at maritime-acn.org.
21 IMO, 'GloFouling project kicks off to protect marine biodiversity', press briefing, 23 March 2019, viewable at www.imo.org.
20 Brazil, Ecuador, Fiji, Indonesia, Jordan, Madagascar, Mauritius, Mexico, Peru, Philippines, Sri Lanka, and Tonga.
21 Maritime Battery Forum, 'Ship register reaches 300 mark', February 2019, maritimebatteryforum.com.
22 DNV GL, 'Alternative fuels in shipping — assessment paper', April 2018, dnvgl.com.

SHAPING THE FUTURE

Shipping and the maritime offshore sector have high ambitions to contribute more and quicker to achieving Global Goals as an industry and in cross-sectoral initiatives. Forward-looking IMO international regulations set framework conditions to drive change and higher standards of operation. Within this framework, shipping is able to re-set course to exploit new technological opportunities that can assist it to support the Global Goals.

To future-proof ships for decarbonization, interest is rising in the idea of 'carbon-robust' ships that can be customized over their lifecycles to adjust for new regulations and technologies/fuels.[23] Other opportunities lie in vessel speed to reduce fuel use, and incentives like low-emission requirements in public procurement.

For short-sea shipping, autonomous and auto-remote ships can enable better safety at sea, more cost-efficient ship transport, and improved environmental performance. They are already on the agenda, but it is unclear to what extent future vessels will be completely remotely operated or will have partial manning.

Advanced data analytics, machine learning, and the Industrial Internet of Things are enabling more efficient use of resources. They allow greater sharing of knowledge and best practice in a more transparent industry. Better and smarter sensors, lighter and more powerful batteries, and wireless technologies assist and widen research into meteo-oceanic data, marine biodiversity and pollution.

Optimizing route planning makes better use of shipping fleets and avoids unnecessary time in port, reducing local emissions. Whilst at port, shore-based power can further reduce local emissions. Slow-steaming can reduce emissions and energy use but would need acceptance of slower sea transport and reduction of cargo transported in a year.

Digitally enabled centralized operations raising the sustainability of seaborne transport can enable greater ocean use, supporting economic growth and trade. By establishing strong climate-change credentials, shipping can make a strong case for an enhanced role in cross-sectoral efforts on climate. Ships can carry a higher volume of goods than trucks, enabling a lower environmental footprint per item or volumetric measure of cargo. In many circumstances, shifting cargo and passenger transport from land to sea can cut emissions.

As an employer, shipping continues to adopt health and safety rules and/or guidelines from IMO, the Maritime Labour Convention (MLC) of the International Labour Organization (ILO) of the UN, and the International Convention for the Safety of Life at Sea (SOLAS), but can do better. The fatal accident rate on ships is about 6 per 100 million working hours, some 10 times higher than the Organisation for Economic Co-operation and Development average for all industries.[24]

> **"Our future depends on healthy oceans. As the use of the world's oceans intensifies due to the increased activities of ocean-based industries, and as more stakeholders get involved, there is a need for closer collaboration and communication to ensure the sustainable development of activities in our oceans."**
>
> *—Kitack Lim, Secretary-General, IMO*

There is now a clear expectation from buyers, cargo owners, financiers, markets and consumers that all parts of the value chain should be doing their part. As a major purchaser within a wider industry, shipping can influence suppliers to ensure safe and decent working conditions along the supply chain.

23 DNV GL, 'Energy Transition Outlook 2018: Maritime Forecast to 2050', September 2018, view at eto.dnvgl.com.
24 Fairplay by IHS Markit, '2010–2011 World Casualty Statistics', viewed at ihsmarkit.com.

PUTTING BUSINESS ON THE CASE

SET SAIL FOR ZERO

Shipping enables world trade, connecting individuals and goods so people can produce what they are best at and consume what they desire in one global market place. To fulfil this role responsibly and with social license to do so, its future must be zero emissions and pollution, particularly with the expected emergence of new shipping routes in pristine and sensitive environments due to loss of sea ice.

The pace of the transition towards these goals will differ between industry segments such as tankers and ferries. However, the sector is investing in three main technical developments to enable its 'voyage to zero'. One is vessel design and engineering, with scope here for greater cross-sectoral technology transfer. Another is access to alternative fuels, which depends on global energy supply dynamics. The third technical enabler is digital connectivity. It can, for example, assist route optimization for goals including emissions reduction alongside business benefits such as reduced costs. Such connectivity also facilitates global cross-sectoral collaboration including shared logistics efficiencies that can also reduce emissions across supply chains.

Brodrene Aa.

Enablers

Technology and operational choices in shipping rely on market conditions including the requirements of cargo owners, regulatory frameworks, and access to finance and innovative technologies. Preferences or demands from consumers and cargo owners for products and services that are cleaner across lifecycles and value chains including shipment can drive vessel owners to order ships that are appropriately designed and equipped. A continuing trend towards increased and more global regulation of maritime emissions and pollution also drives the pace and evolution of technologies that can provide solutions at the right price. The finance community can play a role by continuing to make greener activities more attractive, or requiring them.

Call to action

As in most technology research, development and full use, there is commercial tension between early and on-time implementation of new technologies. In this mosaic of interacting forces on shipping's decarbonization and anti-pollution efforts, we need to see effective enforcement of framework conditions to bring all players to at least the same standard, but without encouraging an attitude that achieving the bare minimum is sufficient. This would provide greater certainty and clarity on technical qualification requirements, certification, verification and classification, thus giving added impetus to technology solutions still being developed.

redtea / istock

OCEAN CRUISE TOURISM ON THE RISE

Ocean-related tourism is a US$ 134 billion per year growth industry according to the Cruise Lines International Association (CLIA).[25] Managed responsibly, cruising can contribute to the Global Goals through generating economic growth and quality work for all including women and young people. Nearly 27 million cruise passengers in 2018 supported an industry paying US$ 46 billion in wages and salaries, CLIA estimates. Many locations target cruises for tourism growth. Host communities encourage and invest in quays, terminals, facilities, training and destination promotion. Unregulated, poorly planned and weakly monitored cruise tourism can lead to less biodiversity, damaged cultural heritage, and overcrowding pressure ashore. Growth in sustainable cruise tourism requires environmentally friendly practices, support for protection of cultural and natural heritage, and tangible economic and social benefits to local people (WTO/APTEC, 2016).

OCEAN CRUISE TOURISM TODAY

Supporting an estimated 1.1 million full-time equivalent jobs[27] lets the cruise industry influence its supply chains to produce responsibly.

The industry says it recycles 60 per cent more waste per head than the average person does on land.[28]

Some cruise operators are working with local governance organizations to predict, control and track impacts on host communities.

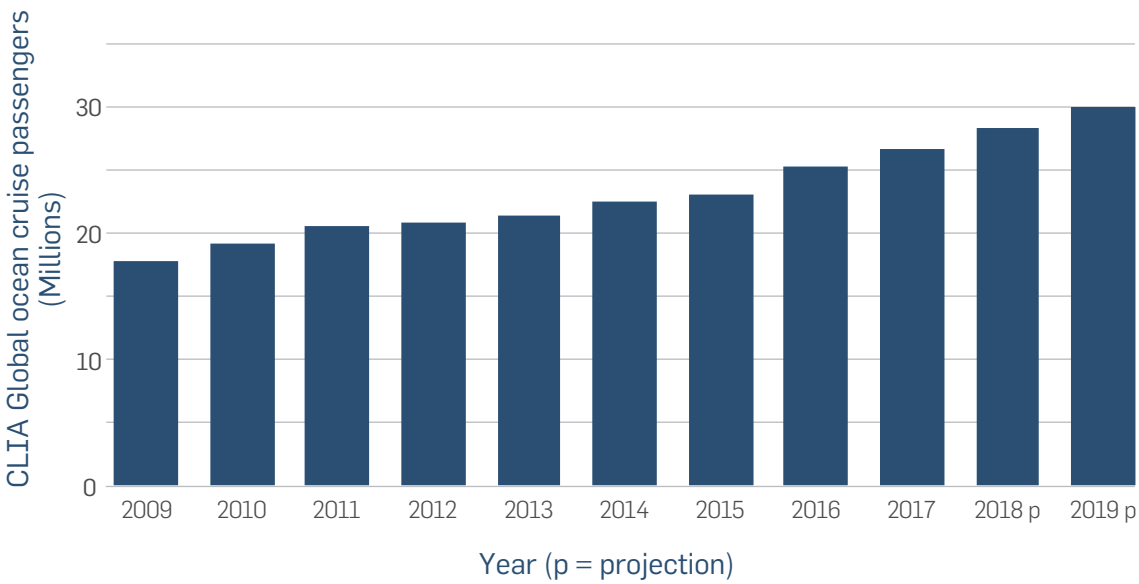
CLIA members, representing more than 95 per cent of global cruise capacity, have committed to reduce the rate of carbon emissions by the industry fleet by 40 per cent by 2030 compared with 2008.

25 CLIA, '2019 Cruise trends and industry outlook', 2019, view at cruising.org.
26 CLIA, news release, December 2018, view at cruising.org.

Delivering on the Global Goals

Ocean tourism impacts Goal 12 on sustainable consumption and production; Goal 14 on life below water; Goal 8 on inclusive and sustainable economic growth; and, Goal 11 on sustainable cities and communities. This growing industry (see graph below) can influence suppliers to align with Global Goals, particularly when procurement controls protect employee and customer health on ships. Some lines aim for zero or reduced use of plastics on vessels, while trying to reduce food loss. Cruise lines are among marine industry leaders in waste management (Carr, 2017): their controls can be stricter than international conventions or local laws. Advanced wastewater treatment and purification technologies on some vessels are set to be installed in many new-build cruise ships over the next decade (Carr, 2017). Some lines are now working with policymakers to maximize benefits and minimize negative impacts of bringing many visitors to confined areas ashore. International cruise companies share sustainability know-how with each other and externally, and collect data for researchers.

GROWTH IN PASSENGER CAPACITY OF CLIA MEMBER LINES



CLIA expects 30 million passengers will cruise with its member lines in 2019 compared with 17.8 million a decade ago. CLIA says these lines represent more than 95 per cent of global cruise capacity.
(Source: CLIA, 2019, Cruise trends and industry outlook)

Pixabay

OCEAN TOURISM IS THINKING GLOBALLY AND ACTING LOCALLY

RESPONSIBLE CONSUMPTION AND PRODUCTION

Some lines have banned or are phasing out single-use plastics from vessels.[27] At least one has also banned them from land-based hotels, restaurants and other establishments operated by a subsidiary, and challenges all its suppliers to reduce the use of plastic.[28] Most major cruise lines source food fresh before their voyages begin, and also take on fresh produce at ports along the way. Cruise lines contribute to general awareness of sustainability challenges by explaining their efforts and policies to passengers and widely communicating sustainable operations for marketing advantage.

JamesBrey / istock

SAFEGUARDING LIFE BELOW WATER

The Association of Arctic Expedition Cruise Operators (AECO) aims to enable members to operate sustainably in one of the most sensitive environments. AECO says its mandatory guidelines are often stricter than the legal requirements. It supports an international ban on Heavy Fuel Oil (HFO) for all ship traffic in the Arctic, and has signed The Arctic Commitment, a private-public initiative calling for such a ban.[29] Global governance could be moving in the same direction. The IMO recently started developing measures to reduce the risks of use and carriage of HFO as fuel by ships in Arctic waters.[30]

LeonU / istock

CONSULTING WITH AND INVESTING IN LOCAL COMMUNITIES

The cruise ship industry is consulting with local governments in some of the most popular and sensitive locations to schedule visits and other features of trips to limit overcrowding and other potentially negative social and environmental impacts.[31] For example, in the Galapagos Islands, cruise operators are among stakeholders contributing collective private funding for nature conservation.[32] Elsewhere, cruise lines are co-investing with local development agencies and funds, aiming to enhance the benefits of cruise tourism to small local communities.[33]

steve-goacher / istock

27 Hallinan, B., 'All of the Travel Companies and Places Phasing Out Single-Use Plastics', Condé Nast Traveler, 2 January 2019, viewed at cntraveler.com.
28 Hurtigruten, 'Hurtigruten wages war on plastic: Bands single-use plastic by this summer', accessed at global.hurtigruten.com.
29 HFO-Free Arctic campaign led by the Clean Arctic Alliance, viewed at hfofreearctic.org.
30 IMO, 'Consistent implementation of 2020 sulphur limit – draft guidelines finalized', 22 February 2019, viewed at imo.org.
31 Coulter, A., 'Cruise Industry Focuses on Issues of Overtourism to Keep Popular Ports on Itineraries', cruisecritic, 7 March 2019, viewed at cruisecritic.co.uk.
32 Galapagos Conservancy, viewed at www.galapagos.org.
33 Live&Learn, 'Carnival Cruises and P&O Cruises partnership to improve WASH in Schools'. 3 October 2018, viewed at https://livelearn.org.

SHAPING THE FUTURE

Ocean cruise tourism recognizes that it must raise its environmental and emissions performance at sea, and its impacts ashore. Pointers to the future include cruise ship operators starting or planning to increase use of local food suppliers and workers; minimize use of single-use plastics[34,35,36]; and, to boost recycling and waste management. The waste includes ballast water; bilge water; greywater from showers, sinks, kitchens and laundries; sewage; and, solid waste including food and garbage. Research for the CLIA (Carr, 2017) concluded that its member cruise lines are industry leaders for various aspects of waste: zero discharge of untreated sewage; adoption of advanced water treatment; and, generally meeting or exceeding wastewater discharge requirements. The study estimated that at least 47 per cent of newly built cruise ship capacity for CLIA members between 2017 and 2027 will be using advanced wastewater treatments.

Climate change is increasing the frequency and severity of extreme weather events at sea. Consequently, cruise ship operators have a vested interest in climate action. From limited data, researchers[37] estimate that cruise ships account for 0.2 per cent of all CO_2 emissions from fossil-fuel combustion and cement production. Other research (Carr, 2017) suggests that CLIA lines lead the marine industry in some aspects of emissions: compliance with emission controls; ship connections for using power from the shore; exhaust gas cleaning systems; and, adoption of cleaner fuels and advanced engine technology.

Propelling ships by LNG is among ways to reduce costs and promote clean energy, according to UNCTAD. Others disagree that LNG could or should be used to reduce GHGs from shipping, even as a temporary solution in the energy transition. Currently, two cruise ships can use LNG in port, though using electricity generated ashore if it has a lower carbon footprint is set to become an increasingly available option. The first cruise ship that can be fully powered by LNG entered service in 2019[38], and 25 being built will use it for primary propulsion. Operators are also looking at hydrogen fuel cells as a propulsion option. Other strategies can or could involve reducing hull friction; using sea water instead of air conditioning for cooling; onboard wind generators and photovoltaic 'sails'[39]; and, boosting energy efficiency by steaming as slowly as possible.

It is essential that cruise routes are planned in partnership with policymakers and planners so that baseline studies, impact assessment, monitoring and risk management can be established. As noted earlier, some operators are now working with local government to manage impacts on local facilities and cultural and natural heritage. The cruise industry partners with global organizations on related issues.[40] As a global industry with large transnational operators, it can be an important part of future collaborative efforts involving global governance and other stakeholders to support the Global Goals. Some suggestions for what these efforts could include are floated opposite for wider consideration and development.

34 UN Clean Seas project, 'Paradise lost? Travel and tourism industry takes aim at plastic pollution but more action needed' view at www.cleanseas.org.
35 AECO clean seas project, view at www.aeco.no.
36 CLIA, 'Sustaining the places we sail', CLIA presentation, 2019, view at cruising.org.
37 Griffith Institute for Tourism Insights, Griffith University, Australia, 'Cruise Ship Emissions (2016)', Global Sustainable Tourism Dashboard, view at tourismdashboard.org.
38 Carnival Corporation, 'AIDAnova successfully starts its premiere season on the Canary Islands & Madeira', news release. January 2019, view at carnivalcorp.com.
39 Ecoship, view at ecoship-pb.com.
40 These partnerships include, among others, The Nature Conservancy, Unesco, Unicef, US Wildlife Tracking Alliance, and WWF.

PUTTING BUSINESS ON THE CASE
SUSTAINABLE CRUISES FOR STRONGER COMMUNITIES

Joci03 / istock

Responsibly managed ocean cruises can bring economic and other benefits to more places. They should be encouraged as they become affordable to a growing number of people and in more countries. Conversely, good planning and consultation is required to prevent poorly managed cruise ship operations damaging local communities and natural and cultural heritage.

Enablers

Growing disposable income in markets such as China is driving greater demand for ocean cruises. Competition from locations for cruise ship visits is pulling the market through. New routes can spread economic benefits. Aware of their responsibility to operate in environmentally and socially responsible ways, the more enlightened cruise lines are sharpening their focus on emissions, pollution, waste, packaging and underwater noise. They are implementing best practice and using new and improved technologies to assist them. They are also starting to collaborate more with governance organizations to predict, mitigate or eliminate, and monitor impacts on local natural and historic heritage and facilities.

Call to action

Governance organizations and the industry should build on lessons from multi-stakeholder planning and development collaborations such as the Maritime Silk Road in Southeast Asia/China (UNWTO, 2019) to develop a roadmap and formal statement of principles for sustainable cruise tourism. Perhaps the UN World Tourism Organization (UNWTO) could examine with the industry if and how Articles for sustainable development of cruise tourism should be included in the UN WTO Global Code of Ethics for Tourism.

We call for a study to see if and how greater and better sustainable development certification could spur industry efforts by making its social and environmental performance transparent to customers and investors. Consideration could also be given to creating a formal crediting mechanism through which holiday companies would provide funding to communities they visit. Ideas for the use of such funds include infrastructure for recycling, organic food production to supply visiting cruise ships, education, sustainable fishing practices, environmental protection and remediation, and small-scale renewable energy projects.

franckreporter / istock

AN OCEAN HARVEST FOR THE WORLD

In the global effort to lift two billion people out of poverty and improve nutrition, and with population to increase by another two billion by 2050, food systems worldwide will need to adapt. Beyond simply producing more food, we will need a more sustainable and efficient food system to ensure food security. Nutritious, sustainable ocean food has a central role to play in that future food system. While reducing general food waste and improving land-based protein production are important measures, an important realization is that our planet is 71 per cent ocean. Sustainable and nutritious food from the ocean can cover the needs of a growing world population and enhance livelihoods for future generations. This chapter focuses on the most significant form of ocean food today, namely fish. However, future ocean food may also involve increasing cultivation of different food sources, including sea vegetables and shellfish.

OCEAN FOOD TODAY

Fish provides healthy fats, protein and micronutrients whose absence from diets can cause 'hidden hunger', leading to chronic illness and malnutrition.

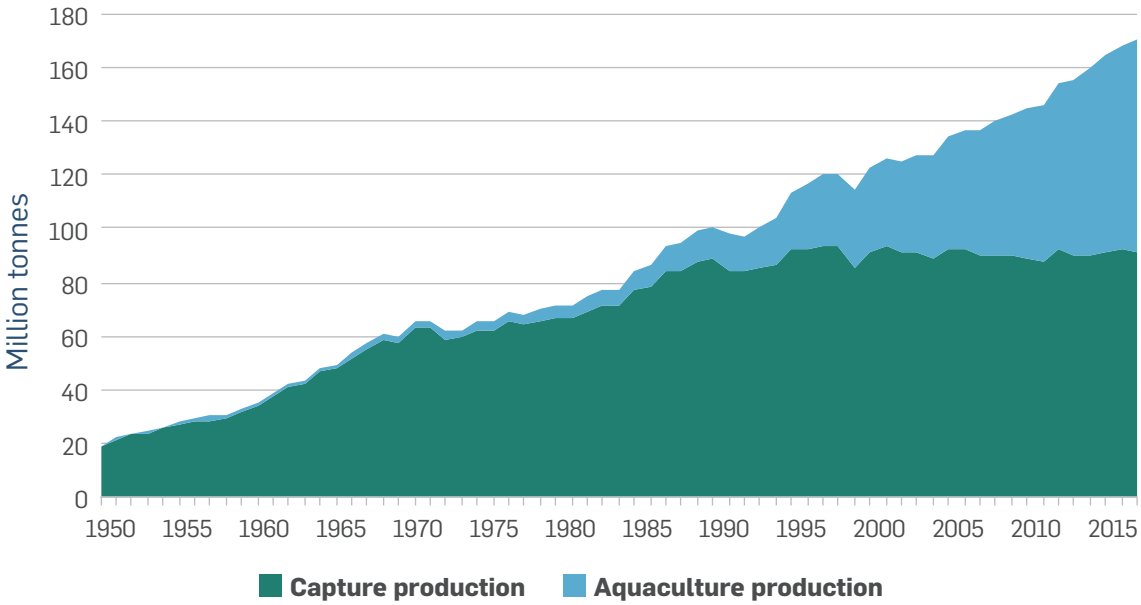
National dietary guidelines worldwide recommend two fish meals a week, though actual consumption is much lower in most countries (FReSH[43]).

The Food and Agriculture Organization (FAO) estimates that close to 90 per cent of wild fish stocks are fished at or above sustainable levels.[44] A growing demand for climate-friendly food from the ocean can be met by responsible aquaculture to take the pressure off wild stocks and help them recover.

Marine aquaculture contributes 50 per cent of the seafood we consume today and is one of the fastest growing sectors of the global food system.

41 FReSH (Food Reform for Sustain ability and Health) is a World Business Council for Sustainable Development project, see wbcsd.org.
42 FAO, 'The State of the World Fisheries and Aquaculture (SOFIA)', 2018, see www.fao.org/state-of-fisheries-aquaculture.

AQUACULTURE IS OUTPACING CAPTURE FISHERIES PRODUCTION



(Source: FAO, 2018, The State of the World Fisheries and Aquaculture)

Delivering on the Global Goals

Food from the ocean and inland waters can supply the world with nutritious food with a relatively low carbon footprint compared with other animal-source food production sectors (Goal 2, Goal 13). Using more sustainable production practices in the ocean can improve nutritious yields, and reduce the pressure on forests, freshwater, land use and soil quality (Goal 15). Artisanal fishing and small-scale aquaculture remain fundamental for the livelihoods of many coastal communities and the millions of people working directly or indirectly in the sector (Goal 8). While ocean food contributes to meeting the world's food needs, there are some key barriers to sustainable growth. Companies with corporate responsibility know that a healthy ocean is the foundation of a productive ocean and that shared value creation is critical for sustainable development. To strengthen environmental and social performance, the industry can pursue certifications and engage in value-chain partnerships to raise the standard of the sector as a whole. There are various sectoral organizations and certification schemes.

Nina Rangøy

OCEAN FOOD IS THINKING GLOBALLY AND ACTING LOCALLY

INTEGRATED FARMING OF THE OCEAN

The use of sea plant species, such as kelp, in fish and shellfish aquaculture may contribute to mitigating climate change impacts, specifically ocean acidification and carbon sequestration. Species such as macroalgae may also contribute to more balanced ecosystems and better use of byproducts and organic waste from fish farming. Integrated farming delivers several services to coastal populations, including food supply and job creation. For policymakers, there is great potential to stimulate markets for nutritious and sustainable food by achieving better integration of aquaculture into national food security and nutrition strategies.[43]

wrangel / istock

NOVEL INGREDIENTS IN FISH FEED

As demand for farmed fish continues to grow, companies have started developing novel sources of nutrients and protein for fish feed. New sources of omega-3 and omega-6 fatty acids from algae are currently being developed and scaled up. For protein, possible alternative sources include insect meal, yeast fed with wood by-products, and bacteria. Further innovation will be needed to ensure sustainable growth of the fish farming industry and to prevent overfishing of forage fish species.

Cermaq

DIGITAL TOOLS TO REDUCE IUU FISHING AND MODERN SLAVERY

New digital solutions are promising tools in the fight against Illegal, unreported and unregulated (IUU) fishing and modern slavery on fisheries vessels. A Seafood Business for Ocean Stewardship (SeaBOS)[44] pilot using on-deck species-detecting cameras and facial-image recognition software aims to identify illegal catch and undocumented fishermen on board vessels. To help quantify and reduce IUU fishing, the independent non-profit organization Global Fishing Watch is providing free data from near-real-time tracking of global commercial fishing activity.[45]

teekid/ istock

43 This is a major theme in the UN Decade of Action on Nutrition (2016–2025) led by the FAO and the World Health Organization (WHO).
44 Weblink: SeaBOS, https://solutionsforseafood.org.
45 Global Fishing Watch, 'New Data And Analysis Cell To Help Combat Illegal Fishing', news release, 14 February 2019, globalfishingwatch.org.

SHAPING THE FUTURE

Several ambitious industry initiatives committed to Global Goals have identified key barriers and enablers for sustainable growth.[46] Such growth also requires political will and alignment of priorities. For example, there is potential to further stimulate markets for nutritious and sustainable food by achieving better integration of fish into national food security and nutrition strategies. Currently, such policies tend to be dominated by agriculture.[47] Given responsible, supportive policies, there are big opportunities for ocean food companies to apply novel technology and sustainable practices to industry challenges.

Sustainable fish-feed ingredients are critical to decouple aquaculture growth from dependency on small pelagic fisheries and land-sourced ingredients (e.g. soy and wheat) that could be used directly for human consumption. Novel ingredients being developed and tested include, among others, algal oil and insect meal. Developing vaccines against common diseases in aquaculture will reduce environmental impacts from using medicines including antibiotics and will benefit animal welfare. Commercial vaccines and preventive production systems are being developed and tested, but more R&D is needed. Such measures can significantly reduce the use of chemical treatments of fish against parasites (e.g. sea lice). Some biosecurity solutions today include cleaner fish, physical lice barriers, freshwater treatment and genetic selection based on resistance to disease. Scaling up farming of less-cultivated marine fish species can learn from more technologically advanced aquaculture.

> **"We must plant the sea and herd its animals using the sea as farmers instead of hunters. That is what civilization is all about — farming replacing hunting."**
>
> *–Jacques-Yves Cousteau, Oceanographer*

Novel and improved technologies will help to tackle IUU fishing. Catch shares and community based management systems also help to conserve fish stocks, and can be refined and used more widely. Sale and distribution of fish can be better organized to prevent IUU fish entering markets. Indeed, all ocean food sectors can increase responsible procurement. Their purchasing power can boost markets for sustainably sourced products and services. More transparency and oversight of supply chains from harvest to consumer is key for food security and sustainable growth. Technology like blockchain may enable full traceability and more sustainable supply-chain management.[48]

Many major markets for seafood fly it in, contributing to GHG emissions. In some markets, demand for fresh products adds to demand for rapid transport, challenges to cold chains and food security, and increases food waste. More local production, and improved cold chains and frozen products, could reduce impacts of transport and reduce food waste. Ghost gear from fishing traps wildlife and adds to plastic pollution, but collecting and recycling it is achievable through better monitoring and market-driven solutions.

On the whole, the seafood industry falls short on gender equality and equal opportunity. Women accounted for an estimated 14 per cent of direct employment in the fisheries and aquaculture primary sectors in 2016[49], though statistics are limited. Eliminating forced labour on fisheries vessels is hindered by corruption and poor transparency. In many places, regulations and anti-corruption measures are insufficient or unenforced. There are also challenges related to regulation and monitoring on the High Seas. Technology for monitoring can help, but political will is needed to improve governance and enforcement.

46 These include the SeaBOS companies' 10 commitments and the three priorities defined by the Global Salmon Initiative for salmon producers. New benchmarks such as the Seafood Stewardship Index (SSI) will be rating seafood companies on performance while encouraging transparency.
47 This is a major theme in the UN Decade of Action on Nutrition (2016–2025) led by the FAO and WHO.
48 DNV GL, 'Blockchain can revitalize trust in seafood industry by boosting transparency', news release, 6 March 2019, see dnvgl.com.
49 FAO, 'The State of the World Fisheries and Aquaculture (SOFIA)', 2018, see www.fao.org/state-of-fisheries-aquaculture.

PUTTING BUSINESS ON THE CASE
FEED THE WORLD FROM THE OCEAN

pierivb / istock

The central vision for achieving progress on the Global Goals is to provide sustainable fish and seafood to all by 2030. More industry transparency and oversight of the value chain, from harvest to consumer, is central for food security and sustainable growth. Connecting the loose ends of the fragmented fish and seafood supply chain, and increasing data collection and analysis, are also key for developing solutions to improving nutrition and the health of populations. Challenges include how to: eliminate IUU fishing; improve working conditions on fisheries vessels; and, how to improve cold chains and logistics for better food safety, less food waste and lower emissions from transport. In aquaculture, fish feed represents half of the procurement costs and a significant part of the industry's indirect environmental and social impacts from both marine or terrestrial sources. Traceability and increased data availability will improve governance and operations, and ultimately help build trust among consumers.

Enablers

Solving the challenge of traceability may require alignment of global policy frameworks to emphasize:

- Transparency and good governance;
- Transparency from companies and suppliers as a requirement to operate; and
- The use of new technology, including digital tools, to enable traceability.

Educating consumers on the importance of sustainable seafood will be important, as will ensuring that only documented, responsible harvest makes it to the store. Through digital solutions and the use of new technology such as blockchain, fully traceable seafood supply chains can be a reality by the end of the decade.

A call to action

To enable the vision of sustainable seafood for all by 2030, transparency and full traceability are key to the creation of a responsible value chain. Good management throughout the whole value chain will make sustainable, traceable fish and seafood a food source to consume with a good conscience.

NicoElNino / istock

OCEAN ADDS TO THE ENERGY MIX

People need affordable, reliable and sustainable energy. Today, nearly three billion people rely on animal waste, charcoal, coal or wood for cooking and heating.[50] Energy enables the sustainable economic development needed for achieving most Global Goals, but it must be provided in line with the Paris Agreement. Decarbonizing energy when power consumption is expected to double by mid-century requires more renewables, greater energy efficiency, and carbon capture and storage. Electric power from ocean wind, currents, tides and waves will play a role. Today, offshore wind supplies 0.2 per cent of global electricity, but is forecasted to have the potential to at least match the energy supplied by offshore oil in 2050.[51] Offshore wind needs energy storage, connections to stable, resilient power grids, and good governance including supportive spatial ocean planning, if it is to achieve its full potential.

ENERGY FROM THE OCEAN

7 AFFORDABLE AND CLEAN ENERGY

Two current independent forecasts for offshore wind capacity see it growing sevenfold[54] to tenfold[56] by 2030.

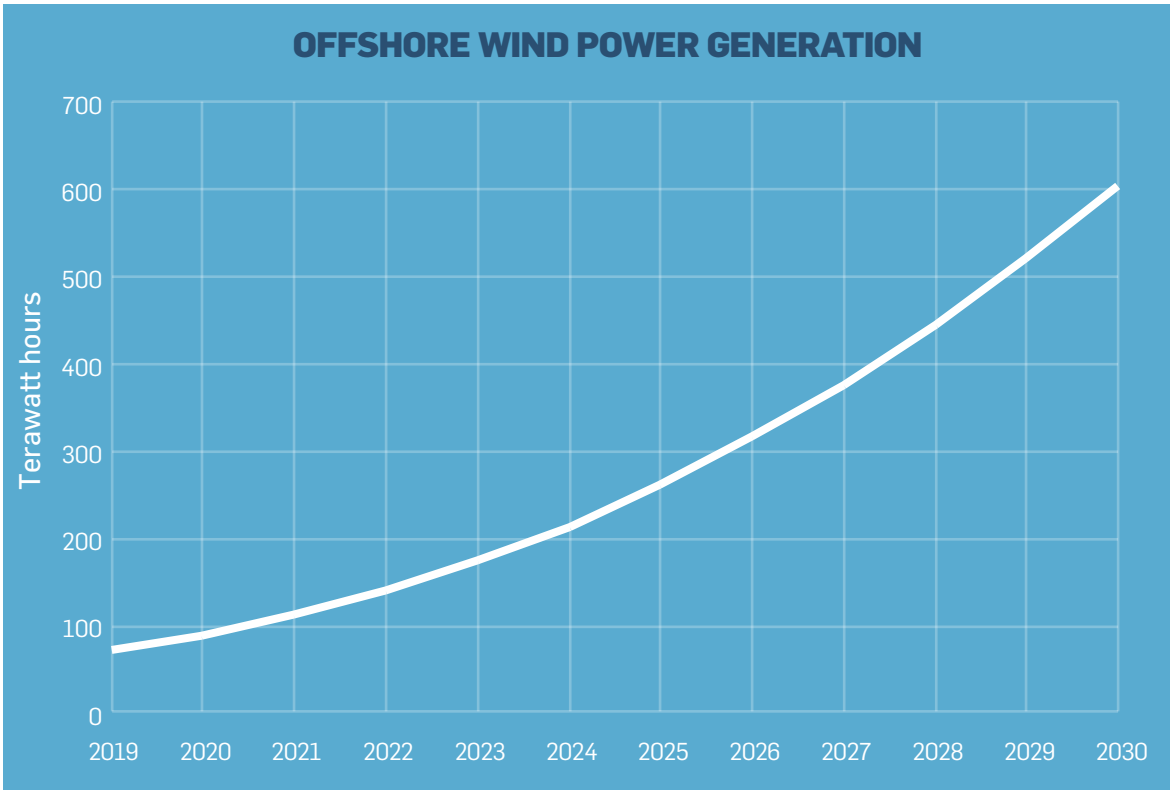
Cost reduction through innovation and industrialization of manufacturing means offshore wind will soon compete without subsidies in major markets.[55]

Tidal, wave, floating solar and other marine energies will escalate, but in the longer term.[57]

Gas is forecasted to provide resilience and security of energy supply in the transition to a decarbonized world energy system.[55]

New floating technologies for liquefied natural gas (LNG) are enabling viable exploitation of gas resources in seas off less developed nations (Fulwood, 2019).

50 UN, 'Ensure access to affordable, reliable, sustainable and modern energy', www.un.org/sustainabledevelopment/energy.
51 DNV GL, 'Energy Transition Outlook 2018', September 2018, eto.dnvgl.com.
52 Bloomberg New Energy Finance, 'Offshore Wind Market Outlook', December 2018.
55 Wind Europe, 'World's first offshore wind farm without subsidies to be built in the Netherlands', news release, 20 March 2018, windeurope.org.
56 DNV GL, 'Energy Transition Outlook 2018: Power Supply and Use — Forecast to 2050', September 2018, eto.dnvgl.com.
55 Source: Ocean Energy Europe, oceanenergy-europe.eu.



Offshore wind is set for sustained growth in the longer term. (Source: DNV GL)[56]

Delivering on the Global Goals

Offshore oil and gas has been providing energy for several decades to respond to the ever increasing world demand (Goal 8). To continue to do so, it is exploring and producing in deeper and more challenging oceanic areas, raising concerns and generating public resistance in some parts of the world. New offshore renewables are adopting best practice early on and complying with rules for protecting life below water (Goal 14). The oil and gas industry is targeting more-efficient energy use in oil and gas production and is assessing how to decarbonize its supply chains (Goal 12).[56]

It continuously seeks improved environmental management and performance, and carries out baseline studies, ocean current mapping, impact assessments and biodiversity censuses. The industry supports efforts to reduce or eliminate impacts of underwater noise on marine life[57] and to minimize methane emissions from its activities.[58] It researches, advocates and uses carbon capture, utilization and storage (Goal 13).[59] New LNG technologies can potentially bring cleaner fuel for ships, onshore power generation, and decent work (Goal 8) to less developed regions with offshore gas.[60]

56 International Finance Corporation/IPIECA/UNDP, 'Mapping the oil and gas industry to the Sustainable Development Goals: An Atlas', July 2017, www.ipieca.org.
57 Sound and Marine Life Joint Industry Project, www.soundandmarinelife.org.
58 The World Bank, 'IPIECA supports flaring initiative', 22 January 2019, www.worldbank.org.
59 Global CCS Institute, 'The Global Status of CCS 2018', available at www.globalccsinstitute.com.
60 The Energy Institute, London, UK, 'Sub-Saharan Africa pushes forward with LNG', Energy World, April 2019.

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OCEAN ENERGY IS THINKING GLOBALLY AND ACTING LOCALLY

SPATIAL PLANNING AND CROSS-SECTORIAL COLLABORATION

Spatial planning brings together multiple users of the ocean — including energy, industry, Government, conservation and recreation — to make informed and coordinated decisions about how to use marine resources sustainably. The process can result in a statutory or non-statutory plan providing a consensus framework that identifies how to minimize potential conflicts regarding use of marine resources and space. This may lead to offshore wind farms having cross-sectoral applications in supplying power for marine aquaculture and offshore oil and gas operations.[61]

CharlieChesvick / istock

CARBON CAPTURE AND STORAGE

Capturing carbon dioxide (CO_2) from onshore industries for permanent storage 2,000 metres below the seabed is the subject of multi-partner studies involving energy companies Equinor, Shell and Total.[62] It has been estimated that current oil and gas fields globally could store 900 billion tons of CO_2.[63] It would take about 1.7 million wind turbines running for a year to save that much CO_2 being emitted by combusting fossil-fuels.[64] Alternative nature based solutions are also being considered for capturing CO_2. On land, this may involve protecting forests or marshland. In the ocean, studies are looking at the potential of using algae or seaweed as long-term carbon sinks.

Art Wager / istock

FLOATING SOLAR PHOTOVOLTAIC PANELS

Prototypes of floating solar photovoltaic (PV) panels for marine installation are being tested in near-shore conditions (Bjørneklett, 2018) and commercial development is planned.[65] Combining PV technology and the experience of marine and offshore industries could create potential to scale up solar power in the ocean, particularly where there are constraints on devoting land to solar (The World Bank, 2018). Floating-solar concepts offshore could provide opportunities for integration with other maritime industries in the storage, application and transmission of the intermittent renewable power produced.

pandemin / istock

61 Foxwell, D., 'Wind farming and aquaculture: a win-win solution?', Offshore Wind Journal, 25 March 2019, viewed at www.owjonline.com
62 Reuters, 'Norway awards Equinor license to build CO_2 storage under seabed, 11 January 2018, www.reuters.com.
63 Intergovernmental Panel on Climate Change (IPCC) Special Report on Carbon dioxide Capture and Storage, 'Chapter 5: Underground Geological Storage', www.ipcc.ch.
64 See calculator at https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.
65 Kenning, T., 'Sunseap to build 5 MW offshore floating solar project near Singapore', PVTECH, 9 November 2018, www.pv-tech.org.

SHAPING THE FUTURE

Oceanic winds, tides, currents and waves are already powering clean electricity generation. Offshore wind is a rapidly maturing technology: major wind farms have operated in coastal waters for years. Through innovation and industrialization of manufacturing, it will increasingly be able to compete in the market place without subsidies. Additionally, offshore wind can contribute to local economic development, similar to what the oil and gas industry has done in some places by encouraging the development of a localized network of service companies for the new industry.

Nations other than in traditional hotspots such as Northern Europe are showing intent to develop offshore wind and are keen to benefit from learnings elsewhere. India recently set a target to have 5 gigawatts (GW) operating by 2022, and up to 30 GW by 2030.[66] It is cooperating with Denmark to transfer knowledge for managing development of this capacity.[67] The Republic of Korea is considering floating offshore wind to shift its energy mix from nuclear and coal to renewable energy.

There is a move further away from coasts where spatial planning for competing ocean use can be more complex. Ocean winds can be stronger and more reliable in these areas, though issues of grid connection become greater. Bigger wind farms with fixed turbines are being built further from shore[68] where site conditions and levels of risk to navigation allow.

Bringing ashore the electricity from offshore wind farms faces challenges. Output is intermittent, so power storage may be needed for balancing supply to grids. Innovative and ambitious concepts are being studied. They include 'power-link' hubs on existing or constructed offshore islands to store and transmit offshore wind energy as electricity or converted into gas or hydrogen.[69]

Collaborative public-private projects are springing up to explore how to leverage synergies between ocean-related and other energy options and what it will take to maximize the speed and scale of the transition. Examples include the North Sea Energy shared innovation programme in the Netherlands.[70] It is creating a coalition of companies and research organizations to study and exploit synergies between offshore renewable and fossil energy activities. The goals are to minimize negative trade-offs and competition for resources such as infrastructure, services, human capital, products and knowledge. All the 'ocean energy' technologies such as tidal and wave are currently costly but are seen as potential longer-term additions to the portfolio of commercially viable clean energy options available for various locations and environments. Europe's ocean energy industry has stated its ambition to deploy enough production capacity by 2050 to meet 10 per cent of electricity demand in the region.[71]

66 Indian Ministry of New and Renewable Energy, 'To give confidence to wind industry, Government declares national targets for off-shore wind power', news release, 19 June 2018, www.pib.nic.in.
67 'Prime Minister of India, 'Cabinet approves Cooperation Agreement between India and Denmark in the field of Renewable Energy with focus on Offshore Wind Energy, news release, 15 April 2019, www.pmindia.gov.in.
68 e.g. the 1.2 GW Sofia Offshore Wind Farm 165 km offshore UK will provide some 5.4 TWh/yr of power to meet the needs of more than one million households.
69 See North Sea Wind Power Hub, northseawindpowerhub.eu.
70 See 'North Sea Energy: Offshore system integration' at north-sea-energy.eu.
71 Ocean Energy Europe, 'The size of the prize: 10% of Europe's electricity', www.oceanenergy-europe.eu.

PUTTING BUSINESS ON THE CASE
OFFSHORE WIND TO OUTCOMPETE FOSSIL FUELS BY 2030?

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Achieving an ambition to make offshore wind power a more commercially attractive technology and investment than any fossil-based alternative for power generation by 2030 would impact positively on Goal 7 and Goal 13. This is particularly relevant in regions where there are reasonable offshore wind resources and sufficient energy storage or resources to balance the power grid and ensure grid stability. By 2030, this could mean that construction of fossil-based power production units is no longer commercially attractive in these regions. They would have become uncompetitive because of fully-transparent energy production costs including the price of CO_2 emissions and the decommissioning of upstream oil and gas production facilities.

Enablers

Technology enablers maturing or developing include advanced offshore wind turbines; fixed and floating substructures, mooring systems and dynamic power cables; and, meshed high-voltage direct current offshore transmission networks. Capital and operational costs are reducing quickly and will continue to do so, the more and the quicker capacity is installed. Technologies for energy storage offshore are immature but are starting to attract Government and private sector interest and investment along the chain from concept to pilot projects. This trend can be accelerated and expanded through aggressive public-private investment in developing new technology through targeted incentives with a clear focus to drive down costs as fast as possible. Applications and subsidies for offshore use of offshore wind power — in aquaculture, oil and gas, and on islands for example — can help to pull through the market for offshore wind. Enhanced spatial planning frameworks are needed to minimize environmental impacts and to prevent or resolve conflicts over how offshore areas are used for the competing claims of offshore wind and other industries and stakeholders. These include leisure activities and smaller businesses that rely on access to the ocean or its resources.

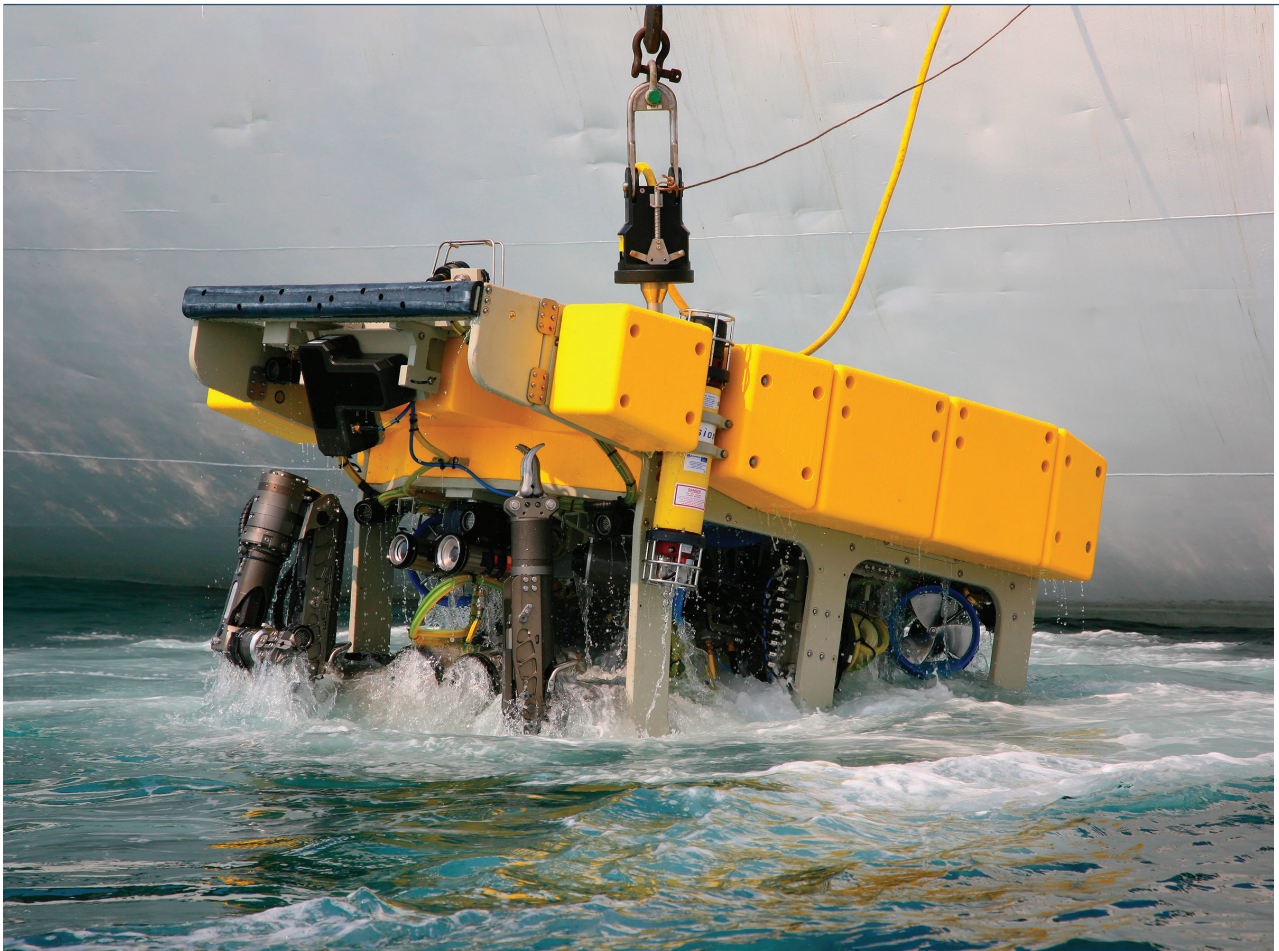
Call to action

Major changes to the ways we produce energy from the ocean will be possible only if the generation technologies — wind, waves or currents — are seen as acceptable because they contribute directly to achieving the Global Goals. Beyond technology, the solutions also involve finance and, most importantly, support from ocean stakeholders, and in particular local communities and industries.

While offshore wind is becoming mature in some areas, it is early enough in its development to benefit most from technology, commercial and governance lessons learned in the evolution of older ocean- and land-based energy production and consuming industries.

Building a robust and supportable narrative around the unfolding energy transition, the role of gas over coming decades, and the shared future use of ocean space is key to achieving acceptance of future uses of oceanic resources.

hakule / istock



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NEW FRONTIERS: A QUEST FOR MINERALS AND NOVEL DRUGS

It is generally estimated that mankind has explored only five per cent of the ocean. Despite this, we know enough to predict that seabed minerals can meet our need for metals for centuries. We can also see that half the species found in the deep sea by oceanographers are new to man and hold great possibilities for medical research and innovation. However, sourcing either minerals or drugs this way is not uncontroversial, easy to do or necessarily profitable today.

Rising demand for minerals

Demand for responsibly sourced minerals will continue to grow due to population growth, urbanization and the energy transition to a low-carbon future (Elshkaki, 2018). This is happening as the ore quality of many land-based deposits declines, requiring more water and energy for extraction, thus imposing higher environmental and social impacts (Church, 2018; Norgate, 2009). To meet demand, attention is turning to more efficient mining, including recycling and the mining of waste, as well as opportunities related to deep-seabed mineral deposits. Some research suggests that without enough raw materials to urbanize and manufacture clean technologies, the world cannot take urgently needed action to address the Global Goals (Ali, 2017).

New medicines required

The world's population is also ageing, creating the need for more and better treatments for related medical conditions on top of rising general threats such as increasing microbial resistance to antibiotics. Medical science has made huge progress in prolonging life and treating disorders, but more can be done. It requires greater understanding of how life processes function or malfunction, and the way that substances like drugs work. Medical science often relies on models of life processes in simple organisms to study this. Living organisms can also provide us with substances including drugs and nutrients to help cure or alleviate disorders. Most natural drugs currently derive from terrestrial organisms, particularly plants, but less explored regions such as the deep seabed could also reveal many biologically active substances.

Additionally, as we learn more about the complexity of deep-sea life, its local uniqueness and significance for multiple ecosystems, we also gain new insight into the value of biodiversity.

Delivering on the Global Goals

Deep-seabed deposits containing high concentrations of cobalt, copper, manganese, nickel and other minerals, are receiving increasing attention in the quest for minerals needed for a low-carbon future (Goal 7, Goal 13). Commercial activity is in its infancy and the regulatory framework for activities is still under development both for the deep seabed and on continental shelves.

Lack of complete knowledge of the deep-sea environment necessitates a careful approach. Many have concerns related to commercial deep-sea mining until the potential effects have been studied and researched sufficiently and all possible risks are understood. Several studies and projects aim to shed light on benefits, drawbacks and knowledge gaps associated with such mining.

In this complex picture, strong governance is required and the International Seabed Authority (ISA)[72] is developing regulations for commercial deep-seabed mining that will require a completed environmental impact assessment and environmental management and monitoring plan as part of the exploitation contract application. These regulations aim to incorporate specific provisions to ensure the effective protection of the marine environment and conservation of marine biodiversity.

Susanova / GSR

As for the other focus of this chapter, the ocean hosts hundreds of thousands of organism types, and possibly billions of micro-organisms. The resulting vast range of genetic material and biologically active compounds is referred to as marine genetic resources (MGR).

Aided by new technologies, the search for these has intensified. The aim is to speed up the accumulation of knowledge for developing new valuable drugs, natural compounds and/or nutritional supplements, as described later in the chapter. Collectively, as ocean opportunities, these efforts may support many Global Goals; particularly Goal 3 on good health and well-being. New businesses exploring sustainable applications based on marine biotechnology can also contribute to Goal 8, providing decent and equal opportunity work and economic growth.

72 ISA comprises 167 States and the EU. It is an inter-governmental body established by UNCLOS to organize, regulate, and control all mineral-related activities in marine areas beyond natural jurisdiction (ABNJs).

FOUNDATIONS FOR SUSTAINABILITY

According to the 1982 UN Convention on the Law of the Sea (UNCLOS), marine resources are either in or beyond zones of national jurisdiction. Deep-sea mineral deposits and MGR can be found in both. In a national jurisdiction they belong to the state which, subject to certain restrictions, is responsible for their management.

ISA is implementing an ambitious plan to establish Regional Environmental Management Plans (REMPs)[75] in all areas in which deep-seabed mineral exploration is taking place. As well as setting frameworks for environmental management, these REMPs include the establishment of Areas of Particular Environmental Interest (APEIs) that are to remain protected from environmental effects of mining.

Mining contractors will be required to establish Preservation Reference Zones (PRZs) that are ecologically representative of mine areas. PRZ and APEIs will help to maintain biodiversity and ecosystem health and function.

It should be noted that there are several opposing views concerning the effectiveness of the proposed governance measures for deep-seabed mining. Some argue that protection under REMPs may be uncertain if set-aside areas are not tailored to the ecosystem structure and functions for the specific area in question.[75]

In the case of the first REMP, for the Clarion-Clipperton Fracture Zone (CCZ), ISA allocated APEIs in 2012.[76] As more information becomes available through exploration, additional mechanisms may be recommended during the CCZ REMP review process currently underway in collaboration with the marine scientific research community.[77] Similarly, the PRZs need to be ecologically representative, something which must be carefully assessed during the environmental impact assessment process required by ISA prior to an exploitation contract being granted.

Key current and pending activities in governance related to deep-sea mining and using living marine organisms include:

In 2020, ISA is expected to adopt seabed mining regulations for the international seabed area. These regulations include requirements for environmental impact assessment prior to the grant of any exploitation contract.

The UN is also progressing an expected treaty under UNCLOS on Marine Biodiversity Beyond National Jurisdiction (BBNJ).[76] The BBNJ treaty will focus on the conservational and sustainable use of living marine resources, including MGR.

Financial benefit sharing for deep-sea mineral resources is assured under UNCLOS and is implemented by ISA. Benefit-sharing is also under consideration for MGR as part of the BBNJ treaty.

73 The ISA-established REMP for the CCZ in the North Pacific establishes nine APEIs across more than 1.4 million square kilometres to remain protected from environmental effects of mining. Additional REMPs for other seabed deposits are being developed, and will be supplemented by PRZs established by all contractors.
74 See www.un.org/bbnj.
75 The Pew Charitable Trusts, 'How to Protect the Deep Sea', December 2018, www.pewtrusts.org.
76 ISA, 'ISBA/18/C/22 Decision of the Council relating to an environmental management plan for the Clarion-Clipperton Zone', 26 July 2012, www.isa.org.jm.
77 For example, see Deep CCZ Biodiversity Synthesis Workshop announcement, 25 April 2019, www.isa.org.jm.

FOUNDATIONS FOR GROWTH

The deep seabed beyond national jurisdiction covers slightly over half the planet's surface. Yet it is one of the remotest places on Earth, at least 200 nautical miles from land and many kilometres below the ocean surface.

What we know reveals much that is worthy of further investigation, from an abundance of mineral resources to deep-sea ecosystems and MGR. However, the huge investment needed to access the deep seabed means it remains largely unexplored, except for those areas where there is a commercial interest to do so.

Traditionally, major scientific breakthroughs and game-changing technological innovation have gone together with commercial development (Coombs, 2002).

Commercial interest in deep-seabed mineral deposits has been rising in recent years. Deep-seabed mineral exploration can provide synergistic access to the deep sea for science, and the industry has been proactive in involving the marine scientific research community in its environmental baseline studies and technology development.

This helps to ensure transparency and that management decisions are based on the best possible science and facts. Additionally, these industry-academic partnerships increase the global knowledge of deep-sea environments much quicker than if the industry was not developing. Because of these collaborations, for example, 32 scientific publications from work within ISA contract areas were achieved in a single year between July 2017 and July 2018 (Glover, 2018). This publication rate will increase as the industry moves closer to commercial production and as more is learned through baseline studies, mining system component testing, and other activities.

Partnerships are vital to meeting conservation goals

Industry-academic partnerships are also critical to inform science-based marine spatial planning to ensure the industry progresses while meeting regional and global conservation goals and objectives. When commercial production starts, marine scientific researchers can play an important role in validating impact assessments and conducting ongoing monitoring and baseline studies for further exploration work.

At the same time, the industry will be working to provide metals for a low-carbon future. For example, the polymetallic nodule field in the CCZ contains more cobalt, manganese and nickel than all land-based reserves combined (Hein, 2013). Many battery types will power the future, but forecasters predict that the NMC (Nickel-Manganese-Cobalt) lithium-ion battery will grow significantly.

> **"Deep sea mineral exploration is one of the most tightly regulated activities in the ocean [...] I can think of no other activity in the ocean where we have had the chance to put the rules into place before the activity has occurred, and we should take every advantage of this opportunity."**[80]
>
> *– Michael Lodge, Secretary-General, ISA*

It is estimated that 10.6 per cent of the surface of the CCZ — equivalent to just 0.17 per cent of the ocean surface worldwide — contains enough metal to replace the global internal combustion engine car fleet with electrical vehicles. As such,

78 Lodge, M.W., 'Regulating Deep Sea Mining', Guest blog, World Ocean Initiative — The Economist Group, 2 April 2019, www.woi.economist.com.

it could replace 22 years' worth of mining for nickel, 33 years of copper and 13 years of cobalt mining globally at the predicted 2050 consumption rates for energy technology.[79]

We also need to recognize that metal recycling can still be substantially enhanced, and that seabed integrity is a prerequisite for marine life. Thus, thinking big to recognize, quantify and realize sustainably the massive potential benefits of mineral and living ocean resources for the planet, its people and climate-change mitigation requires symbiosis between industry and academia.

Such collaboration can lay the foundation for our low-carbon future while building on the significant amount of data and information collected over the last 40 years through deep-seabed mineral exploration activities. It requires conservationists and industry to recognize the ocean's tremendous value and to work together to contribute to the Global Goals so vital to the health of Earth and its population.

Unlocking the human health potential of marine life

Enhanced and accelerated bioprospecting for MGR research is among the synergies that deep-seabed mineral exploration can offer to science. Researchers have sought potentially therapeutic metabolites from marine microorganisms and species such as sponges for decades. Few drugs derived from these sources are yet authorized for use in humans. However, the list of approved marine-derived drugs is increasing just as the world needs more and better therapies.

Patent applications for marine-derived genes have been increasing faster than the rate at which new species are being discovered (Arrieta et al., 2010). Behind this fact is the hope and expectation that the ocean will in time live up to its potential to provide knowledge for a valuable and growing source of new treatments.

Most marine-derived drugs to date have anti-cancer applications, for example. In addition, the development of new antibiotics based on marine organisms is a particularly attractive and pressing area of work. One stark example of the need for novel anti-microbials is the rapid spread of antibiotic resistance in the potentially life-threatening bacterium known as MRSA (Tortorella, 2018; Ercolano, 2019). Antibiotic-resistant strains of the mycobacterium that causes tuberculosis are also a rising cause for concern, hugely expensive to treat, and potentially life-threatening.[80]

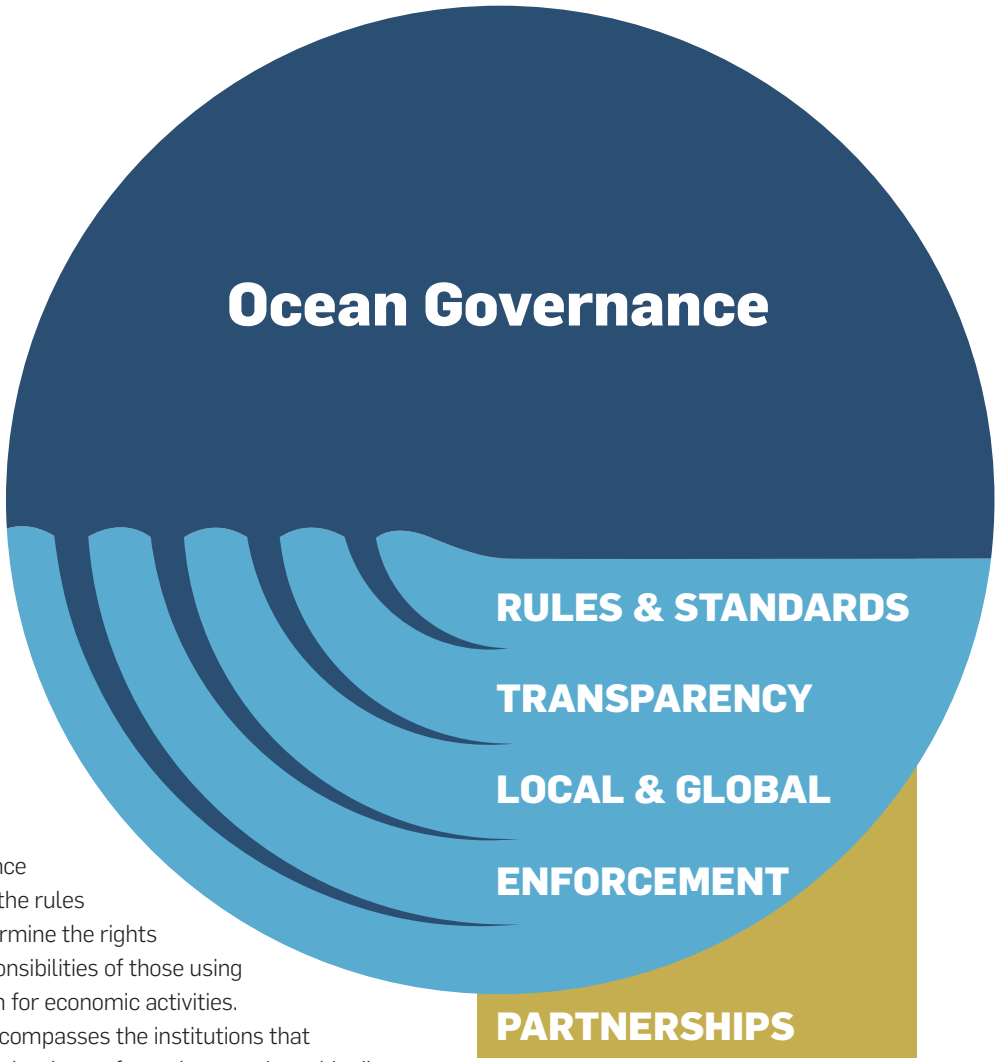
It is not just about drugs. The genes of marine organisms also direct the synthesis in nature of enzymes that can also catalyse industrial processes (Parages, 2016). Such applications include making fine chemicals. Another use being actively researched, developed and applied is for cleaning up marine and other environments; for example, through bacterial degradation of oil in marine water (Bargiela at al., 2015).

Few marine-derived enzymes have been commercialized, but an ambitious project called Industrial Applications of Marine Enzymes (INMARE) has been working to change that.[81] Its goals include streamlining and speeding up the process of getting marine enzymes and bioactive compounds through development and into commercial use as catalysts. INMARE has also identified novel lead products and worked on prototypes and delivery of new biocatalytic processes. The project has involved dozens of stakeholders from industry and academia, and MGR from unique environments in the Atlantic. An international cluster[82] of companies, and also universities from Brazil, Canada and the US are to play key roles in communicating the results. More than 70 scientific papers and book chapters have resulted from INMARE, and its final report is awaited.

79 The World Bank, 'Climate-Smart Mining: Minerals for Climate Action: Infographic', 26 February 2019, www.worldbank.org.
80 Centers for Disease Control and Prevention, 'Drug-Resistant TB', viewed at cdc.gov/tb/topic/drtb.
81 See inmare-h2020.eu.
82 CLIB2021 (Cluster Industrial Biotechnology): An open-innovation cluster of large, medium and small companies, academia and others active in biotechnology and the bioeconomy, https://bioconsortium.eu.

jaminwell / istock

WELL-GOVERNED OCEAN



Governance includes the rules that determine the rights and responsibilities of those using the ocean for economic activities. It also encompasses the institutions that create such rules, enforce them, and provide dispute resolution processes and forums. Governance is both a public and private sector activity. Public governance is regulation through national and international law and institutions while the private sector establishes industry standards and principles, due diligence processes, and procurement rules.

Consistent implementation and enforcement of international ocean regulations, complemented by private governance mechanisms, are key to how the ocean industries can deliver on the Global Goals.

Of all the topics discussed in workshops, meetings and interviews for this report, the need for strong and transparent governance was clearly identified as the most important enabler for industries to deliver on the Global Goals.

HOW PUBLIC AND PRIVATE GOVERNANCE INTERACT

Public governance

Public global ocean governance rests on the UN Convention on the Law of the Sea (UNCLOS). Many regard it as the backbone of different legal and non-legal institutions.[83] Ocean governance includes international and national governance, in which Governments and public bodies are the primary actors. One example is the ongoing (2019–2020) intergovernmental negotiations under UNCLOS over the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction.

Private governance

Ocean governance also encompasses private governance initiatives led by companies and NGOs. Private governance mechanisms complement and enable public governance by providing standards, best practices and certification schemes. These include, among others, ship and offshore classification, and different certification schemes for materials, equipment, processes and operations. These can be mandatory or voluntary. They may cover different phases from design to end-of-life, different parts of value chains, and can focus on technical, social and environmental requirements. Investment and financing criteria, are other de facto forms of governance.

Public and private governance may intersect. For example, several of the International Maritime Organization conventions contain a component of mandatory insurance that is provided by the private sector. The International Convention on Civil Liability for Oil Pollution Damage (CLC) provides for strict liability of shipowners for spills of persistent oil carried as cargo and the requirement for compulsory liability insurance to pay for clean-up and compensation to the limit of liability under the convention. Similarly, the International Convention on Civil Liability for Bunker Oil Pollution requires mandatory insurance for damage caused by spills of bunker fuel.

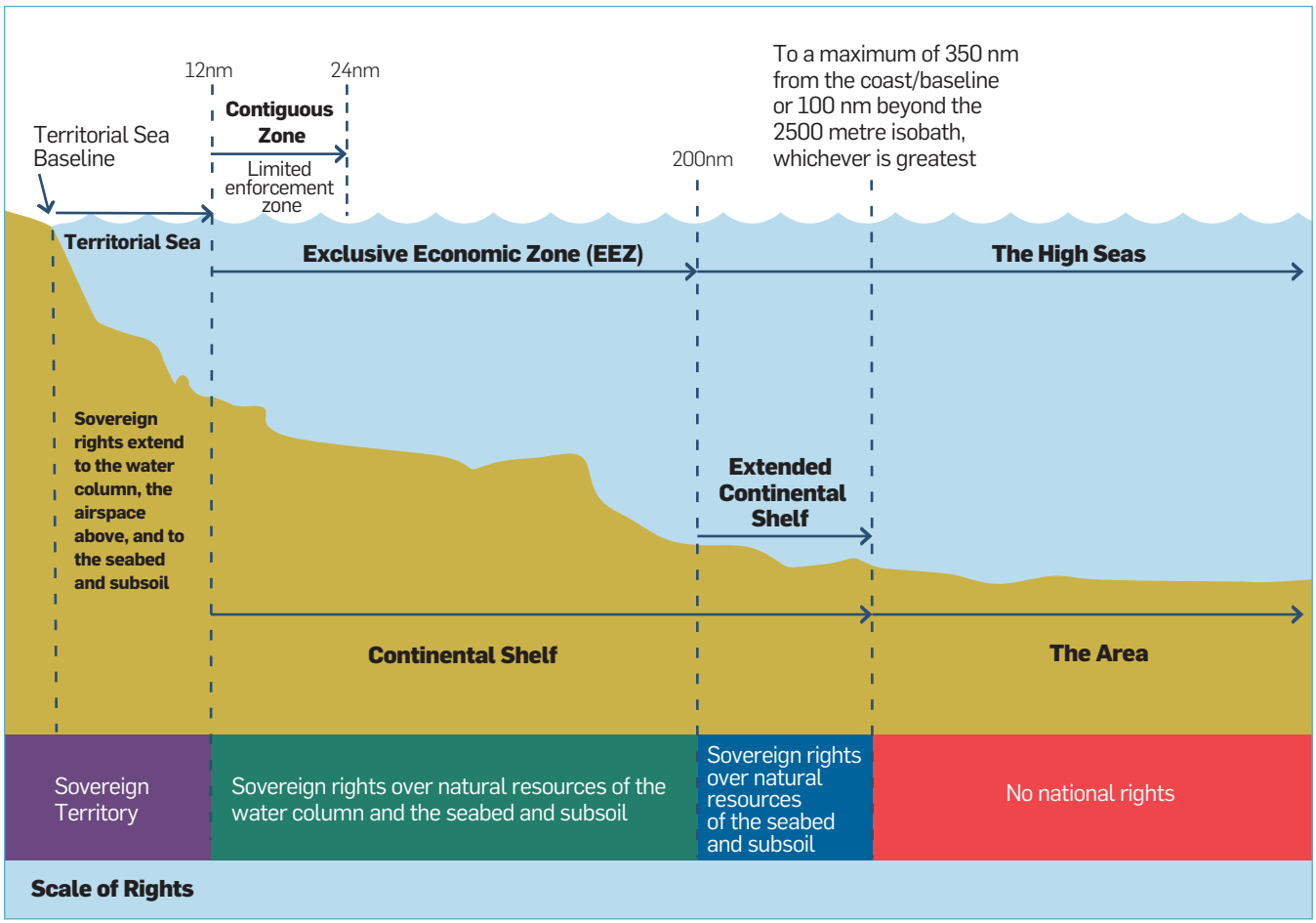
The relationship between governance and the Global Goals

Sustainable development of the ocean requires regulation through strong and transparent institutions as well as robust public/private cooperation. The Global Goals aim to encourage entities to improve practices and act more responsibly. Goal 16 on peace, justice and strong institutions is of note here. Among the 17 Global Goals, it is often referred to as 'the enabling goal', as it enables the others. For example, without good governance and solid institutions any regulatory frameworks or laws protecting the ocean cannot be adequately enforced.

In this chapter, we explore the role of insurance, finance, and classification/certification providers within existing governance regimes as well as the further actions such enabling industries take to promote a healthy and productive ocean. A detailed and comprehensive overview of ocean governance and regulations is provided in Mapping Ocean Governance and Regulations, the first report of the UN Global Compact Action Platform for Sustainable Ocean Business.[84]

Ocean governance is extensive and complex. Coastal states have jurisdiction within 'Exclusive Economic Zones' usually extending 200 nautical miles (nm) from their coasts. Laws, regulations and their effectiveness vary by country. Generally, there is weaker governance and poorer management for marine Areas Beyond National Jurisdiction (ABNJ), 'the High Seas'. Development, implementation and enforcement of High Seas regulations reside in many global, regional and national bodies. In the UN, more than 20 are vested with some normative and regulatory competence related to the High Seas. Only deep-sea mining in ABNJs is regulated by one body, ISA.

83 See legal.un.org/avl/ha/uncls/uncls.html.
84 See www.unglobalcompact.org/docs/publications/Mapping-Ocean-Governance-and-Regulation.pdf.



Maritime Zones and the International Law of the Sea[87]

No single nation state manages an ABNJ. No sole international body is vested with a strong mandate and effective means to ensure holistic, sustainable approaches to managing the High Seas. Their global regulation is an extensive framework of rules based on economic, environmental, industrial and social considerations. UNCLOS sets the legal framework for all activities. Other instruments are sector-specific with detailed technical specifications.

The UN Global Compact, the UN's private-sector collaboration, implements universal sustainability principles and acts to support UN goals. Corporate sustainability starts with a company's value system and a principles-based approach to business. It means operating in ways that at least meet fundamental responsibilities for human rights, labour, environment and anti-corruption. Responsible businesses consistently apply the same values and principles wherever they are, knowing that good practice in one area does not offset doing harm elsewhere. By incorporating the Ten Principles of the UN Global Compact into strategy, policy and procedure, and having a culture of integrity, companies are upholding their basic responsibilities to people and planet while setting the stage for long-term success.

85 Maritime Zones from the UN Convention on the Law of the Sea (1982)

RESPONSIBLE INSURANCE, CLASSIFICATION AND CERTIFICATION BODIES CONTRIBUTE TO GOVERNANCE

Insurance companies, classification ('Class') societies and certification schemes act as de facto private sector governance. They play key roles in ensuring responsible operation in line with regulations or towards common voluntary standards focused on technical, environmental, social and economic requirements. Companies failing to meet these requirements may lose their insurance or license to operate. Examples include financial guarantees for oil pollution clean-up and compensation under the IMO's CLC Convention and Bunker Convention (Goal 14). The guarantees, 'Blue Cards', are provided by Protection and Indemnity Clubs (P&I Clubs) insuring shipowner liabilities for just over 90 per cent of ocean-going tonnage (see text box). Through risk prevention, reduction and sharing, insurers help to protect society and underpin economic growth.

Classification societies set technical standards for building and operating ships and offshore structures such as oil platforms. They certify that vessel building complies with relevant IMO and other standards, and regularly survey ongoing construction work to ensure continuing compliance. Insurers require vessels to maintain Class standards as a condition of the insurance. Failure to maintain Class certification can result in loss of insurance cover, a powerful financial incentive to maintain standards necessary for safe operation.

Several certification schemes apply to standards prescribing the quality or performance of a given practice, procedure or product. For example, standards steer internal company work processes, design and performance of products and services, and labour conditions. They are more than just technical documents. They steer behaviour, embed norms and provide 'recipes for reality'.[86] They are one of the most important governance systems regulating the functioning of companies.

PROTECTION AND INDEMNITY CLUBS

More than 80 per cent of global trade is carried by sea, and 11.7 billion tons of cargo was carried by ships in 2017, according to UNCTAD. The world fleet comprises about 94,600 ships totaling more than 1.3 trillion gross tons, of which 1.2 trillion is insured with one of 13 International Group (IG) P&I Clubs. Each is owned by its shipowner members in a form of non-profit mutual insurance: A pooling agreement means IG P&I Clubs share risks beyond a US$ 10 million retention. Add in a collective reinsurance contract, and this arrangement provides up to US$ 3.1 billion cover per ship per incident for shipowner liability risks such as wreck removal, personal injury, and damage to cargo and other third-party property. The P&I insurance limit for pollution liability is US$ 1 billion per ship per incident.

86 St. Clair & Aalbu, 'Business action for climate-resilient pathways: the role of standards', DNV GL, 2017.

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Delivering on the Global Goals

By preventing accidents, managing risks, creating transparency and ensuring trust through quality standards, insurance, classification and certification bodies are important in fostering sustainable development.

Marine insurers contribute to Goal 14 for Life Below Water by setting clear expectations on limiting the risk of accidents that could harm environments. The significance of this is shown in the funding of clean-up and paying compensation following incidents that result in casualties. This includes wreck removal and the containment and remediation of pollution from oil and other hazardous substances. They contribute to decent work and economic growth [Goal 8] by compensating workers for personal injury and supporting bereaved families.

Protecting employee rights

The global private insurance regulations also include guaranteeing payment of wages and repatriation expenses for seafarers abandoned due to an employer's insolvency. This guarantee is required under the ILO Maritime Labour Convention. All marine insurers work to provide loss prevention advice to avoid on-the-job injury. Hence, the private sector has a strong self interest in improving working conditions and the environmental footprint of industries.

Insurers enable sustainable marine development. However, 'enable' can have a negative connotation if risk shifting allows an insured party to act irresponsibly. Insurers should be transparent in supporting responsible behaviour and in clearly indicating activities that will result in loss of insurance cover. They should also support a wider and more globally consistent enforcement of regulations and international conventions, thereby providing a global protection of the marine environment.

Insurers can fight ocean pollution

The MARPOL convention Annex V in force since 1988 prohibits commercial vessels from dumping plastic and requires ports to provide adequate reception facilities for waste from ships. More than 150 countries are signatories. Insurers should work within their spheres of influence to promote monitoring of maritime industries to ensure compliance as well as ensuring adequate waste reception facilities in ports.

The classification societies have developed a series of notations for vessels to prove voluntary compliance with additional pollution prevention measures and upcoming environmental regulations. These notations show compliance with all mandatory MARPOL requirements, but also contain additional requirements such as stricter oil-tank protection, approved ballast water treatment systems, compliance with the Hong Kong Convention for Ship Recycling (Goal 12) and improved technical and management procedures to reduce discharges to sea and emissions to air (Goal 13).

RESPONSIBLE FINANCE

Financial institutions are lenders and investors; providers of financial products, services and infrastructure; and, advisors, enablers and more. In these roles, banks have a responsibility and the power to benefit society through responsible and sustainable business conduct.

The UNDP estimates, meeting the Global Goals will require US$ 5–7 trillion annually.[87] Financial institutions will be essential for providing infrastructure, loans, project risk assessment, advice on financing projects, combatting financial crime, and using monetary leverage to promote projects that contribute to meeting the Global Goals. Responsible finance is about developing financial institutions able to use their position, knowledge and capital to support the Global Goals. In these ways many financial institutions are moving from a 'do no harm' mandate to leveraging finance to do good. By choosing not to finance companies that have weak governance and contribute to societal and environmental harm, such institutions make it harder for such companies to operate.

The complexity of deciding where capital should be distributed is growing, but innovation for dealing with it opens new opportunities. Big data, new technologies and industry information could be made available for companies to use in assessing their environmental and social impacts.

More focus on reporting and sharing data from ocean-related industries would raise transparency and reduce riskwhen distributing capital. This is similar to recommendations of the Task Force on Climate-related Financial Disclosures set up in 2015 by the international Financial Stability Board.[88] For ocean-related industries, such data would not be limited to financial information but should also cover data along the value chain to understand underlying risk.

The changes to traditional risk models required in moving more towards alignment with the Global Goals provide a new direction and framework to choose from. Taking a long-term perspective, this seems like the right thing to do and might also be expected to have positive effects on business.

Finance has huge resources and competence in backing new technology, entrepreneurs and companies that can create a better and more sustainable future.

Collaboration is the key to success and would itself create opportunities. Banks are used to working together on syndicated deals. A common set of principles across all financial institutions, would make it easier to have shared expectations and practices. Responsible corporate behaviour should be financially rewarding. Stock market investors' growing focus on sustainability has traditionally been about avoiding the worst operators. It is increasingly about identifying the best ones. Tomorrow's winners will be the companies that, over time, create value for their stakeholders in a sustainable manner.

FINANCIAL RISK — THE CHANGING RISK PICTURE

The Finance Industry has come a long way since the launch in 2003 of the Equator Principles, developed by financial institutions to assess environmental and social risks in project-financing transactions. Today, the UNEP Principles for Responsible Banking connects Global Goals with the Paris Agreement. These Principles are backed by 55 banks. Meeting the Global Goals is a long-term aim requiring long-term policy solutions that go beyond current practice. The Principles for Responsible Banking are a framework to identify and assess where a bank's portfolio and service offerings 'generate, or could potentially generate, the most significant positive and negative environmental, social and economic impacts'. The initiative 'Principles for Responsible Investment' (PRI)[91] provides research and education, and facilitates collaboration, to help investors align their responsible investment practices with the broader sustainable objectives of society as currently best defined by the Global Goals.

87 Impact Investment to close the Global Goals funding gap
88 See FSB website at fsb.org.
89 See unpri.org.

Portra / istock

Delivering on the Global Goals

Goal 16 on Peace, Justice and Strong Institutions is a key target for the finance sector, which is in the forefront of applying and helping to devise laws and practices to prevent, detect and report financial crime and corruption.

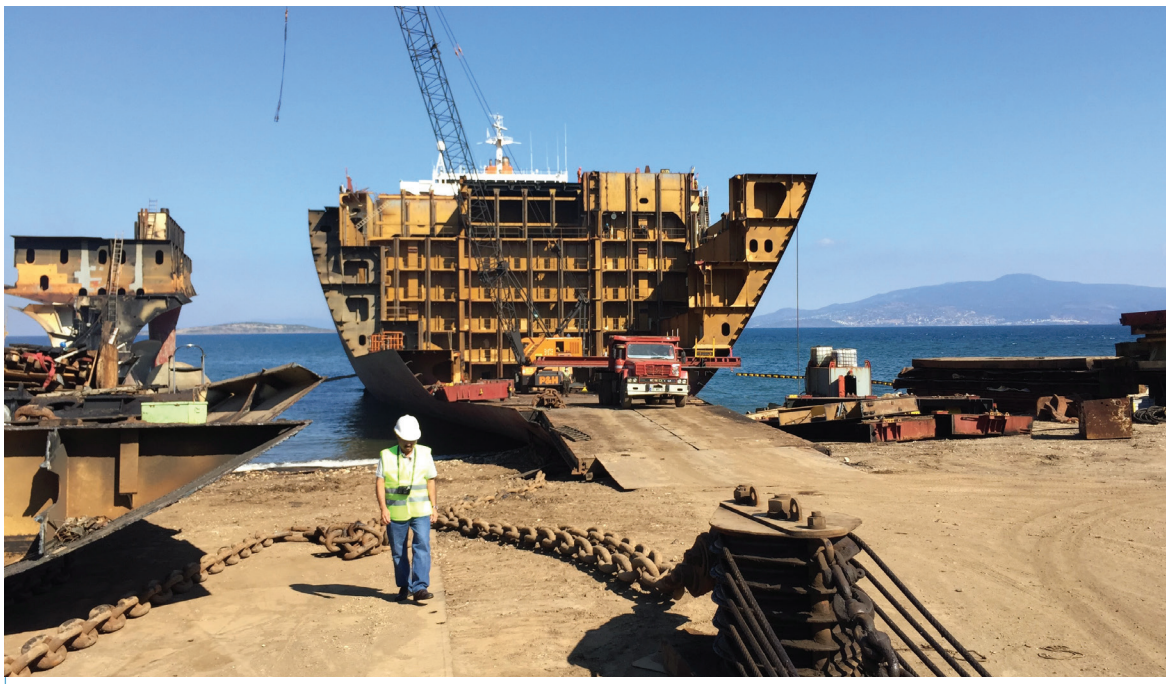
Finance has influence within its own sector and with customers to support Goal 8 on Decent Work and economic growth. Banks and finance play an important role in building financial literacy, supporting startups and entrepreneurs. They can ensure that working conditions, equality and diversity are maintained in the sector's own supply chain and expect the same from customers and other stakeholders.

Supporting innovation for the ocean

Few industries are challenged as much and as rapidly by disruptive new business models as the finance sector. New expectations from customers, new technologies enabling online transactions and their tracking, and stricter regulations, are driving change in the industry. This also makes it an important contributor to Goal 9 on Industry, Innovation and Infrastructure. In partnership with regulators, the industry could support and finance innovation seeking to improve the health and productivity of the ocean.

"In most of our meetings with Small Island Developing States and Developing Nations, the lack of enforcement and capacity building are the most pressing issues. So, even if regulations are in place, lack of enforcement is a barrier for many to create a level playing field."

– Erik Giercksky
Head, Sustainable Ocean Business
UN Global Compact



International cooperation and governance at work

Ship Recycling Transparency Initiative

Using the online platform shiprecyclingtransparency.org, shipowners share information on their approaches to ship recycling based on pre-defined disclosure criteria developed jointly by key industry stakeholders. Cargo owners and investors access this information from different companies to assist with decision making about the companies with which they chose to do business. The SRTI is a market-based approach to improving ship recycling practices in the current absence of global standards.

ITOPF[90]

This not-for-profit source of objective technical expertise is available to all parties affected by accidental pollution from ships. Established in 1968 and funded by shipowners via their P&I insurers, ITOPF is a respected authority on preparedness and response to oil spills. It provides 24/7 support to shipowners and their P&I Clubs and has attended over 800 incidents in 100 countries. Cooperation between ITOPF and P&I Clubs improves claims handling and it also helps to ensure that clean-up of oil spills and restoration of natural resources match best industry and scientific practice.

Bonds and green loans

Financing targeted specifically at environmentally friendly operations is a growing market. It can allow companies to tap into new sources of finance. This shift in lending criteria takes time. Banks need to change their risk models and to gain regulatory approval. In the years ahead, however, such financing should become cheaper than standard financing because of the lower risk involved.

90 Formerly the International Tanker Owners Pollution Federation, itopf.org.

PUTTING BUSINESS ON THE CASE
A PRINCIPLES-BASED APPROACH FOR THE OCEAN WE WANT

With the deadline for the Global Goals only a decade away, many companies feel a strong sense of urgency to act. Clear expectations from business leaders, employees, shareholders, customers and clients are often reflected in impatience towards slow multilateral processes. Coming together and setting standards and expectations within the private sector have never been more important. Strong alliances driven by the ambition to deliver on the Global Goals inclusively and transparently can accelerate the world's transition to becoming a more sustainable place. Harnessing the power of market forces for this may bring the financial leverage needed for this major effort.

Ocean Principles on the way

One of the main targets of the UN Global Compact Action Platform for Sustainable Ocean Business since its launch in 2018 has been to detail how the Ten Principles of the Compact specifically address ocean-related business. This reflects an increasing ambition within the private sector to set shared expectations on industry's impacts and responsibilities related to a clean, healthy and productive ocean. The Compact plans to launch a set of ocean Principles and practical guidances at the UN General Assembly in September 2019.

This set of Principles is being developed jointly by the Action Platform participants, including representatives of ocean-related industries, academic institutions, Governments, NGOs and UN bodies. The Principles are subject to wide consultation, with input coming from relevant stakeholders across the global regions. With sector-based guidances, this initiative addresses how businesses should approach the key environmental, social and governance issues related to the ocean, including marine waters and resources. They are intended for use by companies whose business may impact on the ocean, and by those that are part of an ocean-productivity value chain.

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Action from the top

The Principles are directed at company boards and executive management and are designed as a tool for pursuing above-minimum standards towards excellence in sustainability. They will be a reference point for interaction between companies on sustainable uses of the ocean. The Principles do not prescribe a new reporting framework but set expectations for voluntary qualified reporting using existing instruments.

REFERENCES

ABPmer, 2015. A Review of Access to Industry Environmental Data. A report produced by ABP Marine Environmental Research Ltd for Productive Seas Evidence Group, November 2015. www2.gov.scot/Resource/0049/00490558.pdf.

Ali, S.H., Giurco, D., Arndt, N., Nickless, E., Brown, G., Demetriades, A., Durrheim, R., Enriquez, M.A., Kinnaird, J., Littleboy, A., Meinert, L.D., Oberhänsli, R., Salem, J., Schodde, R., Schneider, G., Vidal, O., Yakovleva, N., 2017. Mineral supply for sustainable development requires resource governance. Nature 543, 367–372.

Arrieta, J.M., Arnaud-Haond, S. and Duarte, C.M., 2010. What lies underneath: conserving the oceans' genetic resources. Proc. of the National Academy of Sciences, 107(43), pp.18318–18324.

Bargiela, R., Gertler, C., Magagnini, M., Mapelli, F., Chen, J., Daffonchio, D., Golyshin, P.N. and Ferrer, M., 2015. Degradation network reconstruction in uric acid and ammonium amendments in oil-degrading marine microcosms guided by metagenomic data. Frontiers in microbiology, 6, p.1270.

Barbier, E.B., 2017. Marine ecosystem services. Current Biology, 27(11), pp.R507-R510.

Bjørneklett, B., 2018.Offshore floating solar – a technical perspective. PV PowerTech. Vol 16. September 2018. pp60–64.

Blasiak, R., 2015. Balloon effects reshaping global fisheries. Marine Policy, 57, pp.18–20.

Blasiak, R., Jouffray, J.B., Wabnitz, C.C., Sundström, E. and Österblom, H., 2018. Corporate control and global governance of marine genetic resources. Science advances, 4(6), p.eear5237.

Carr, E., Corbett, J.J., 2017. Evaluation of Cruise Industry Global Environmental Practices and Performance. Study prepared for CLIA. Energy and Environmental Research Associates, LLC.

Church, C., Crawford, A., 2018. Green Conflict Minerals: The fuels of conflict in the transition to a low-carbon economy. International Institute for Sustainable Development, Canada.

Coombs, R., Georghiou, L., 2002. A New 'Industrial Ecology'. Science 296, 471–471.

Deloitte/DNV GL, 2019. Blockchain in the seafood industry: Increasing transparency and efficiency in global seafood supply chains.

Elshkaki, A., Graedel, T.E., Ciacci, L., Reck, B.K., 2018. Resource demand scenarios for the major metals. Environ. Sci. Technol. 52, 2491–2497.

Ercolano, G., De Cicco, P., and Ianaro, A., 2019. New Drugs from the Sea: Pro-Apoptotic Activity of Sponges and Algae Derived Compounds, Marine Drugs, 17(1), 31; doi:10.3390/md17010031.

Free, C.M., Thorson, J.T., Pinsky, M.L., Oken, K.L., Wiedenmann, J. and Jensen, O.P., 2019. Impacts of historical warming on marine fisheries production. Science, 363(6430), pp.979–983.

Fulwood, M. Opportunities for gas in Sub-Saharan Africa. The Oxford Institute for Energy Studies. Oxford Energy Insight:44. January 2019.

Glover, A., 2018. New scientific data from exploration contract areas relevant to the management of deep-sea mining. Natural History Museum, London. Presentation 2018. https://s3-eu-west-1.amazonaws.com/pfigshare-u-files/12424481/201807DOSIGlover rppt.ppt.

Golden, C.D., Allison, E.H., Cheung, W.W., Dey, M.M., Halpern, B.S., McCauley, D.J., Smith, M., Vaitla, B., Zeller, D. and Myers, S.S., 2016. Nutrition: Fall in fish catch threatens human health.Nature News, 534(7607), p.317.

Hein, J.R., Mizell, K., Koschinsky, A., Conrad, T.A., 2013. Deep-ocean mineral deposits as a source of critical metals for high- and green-technology applications: Comparison with land-based resources. Ore Geology Reviews 51, 1–14.

Hughes, T.P., Kerry, J.T., Baird, A.H., Connolly, S.R., Dietzel, A., Eakin, C.M., Heron, S.F., Hoey, A.S., Hoogenboom, M.O., Liu, G. and McWilliam, M.J., 2018. Global warming transforms coral reef assemblages. Nature, 556(7702), p.492.

Jambeck, J.R., Andrady, A., Geyer, R., Narayan, R., Perryman, M., Siegler, T., Wilcox, C., Lavender Law, K., (2015). Plastic waste inputs from land into the ocean, Science, 347, p. 768–771.

McMeel, O., Pirlet, H., Calewaert, JB., 2017. Use and sharing of marine observations and data by industry: Good practice guide. Viewable at www.columbusproject.eu.

Norgate, T.E., 2009. Deteriorating Ore Resources, in: Graedel, T.E., van der Voet, E. (Eds.), Linkages of Sustainability. The MIT Press, pp. 130–148. COLUMBUS Monitoring and Observation Node.

OHI (Ocean Health Index), 2019. Ocean Health Index. http://www.oceanhealthindex.org/about/faq

Pinsky, M.L., Reygondeau, G., Caddell, R., Palacios-Abrantes, J., Spijkers, J. and Cheung, W.W., 2018. Preparing ocean governance for species on the move. Science, 360(6394), pp.1189–1191.

Parages, M., Gutiérrez-Barranquero, J., Reen, F., Dobson, A. and O'Gara, F., 2016. Integrated (Meta) genomic and synthetic biology approaches to develop new biocatalysts. Marine drugs, 14(3), p.62.

Resplandy, L., Keeling, R.F., Eddebbar, Y., Brooks, M.K., Wang, R., Bopp, L., Long, M.C., Dunne, J.P., Koeve, W. and Oschlies, A., 2018. Quantification of ocean heat uptake from changes in atmospheric O2 and CO2 composition. Nature, 563 (7729), p.105.

Schmidt, C., Krauth, T., Wagner, S., 2017. Export of Plastic Debris by Rivers into the Sea. Environ. Sci. Technol. DOI: 10.1021/acs.est.7b02368.

Tortorella, E., Tedesco, P., Palma Esposito, F., et al., 2018. Antibiotics from Deep-Sea Microorganisms: Current Discoveries and Perspectives. Marine Drugs. 16 (10): 355. Published 29 Sep 2018. doi:10.3390/md16100355

The World Bank, ESMAP and SERIS, 2018. Where Sun Meets Water: Floating Solar Market Report—Executive Summary. Washington, DC: The World Bank.

UNWTO, 2019, 21st Century Maritime Silk Road: Tourism Opportunities and Impacts.

WTO (World Tourism Organization) and APTEC (Asia-Pacific Tourism Exchange Center), 2016. 'Sustainable Cruise Tourism Development Strategies – Tackling the Challenges in Itinerary Design in South-East Asia', UNWTO, Madrid.

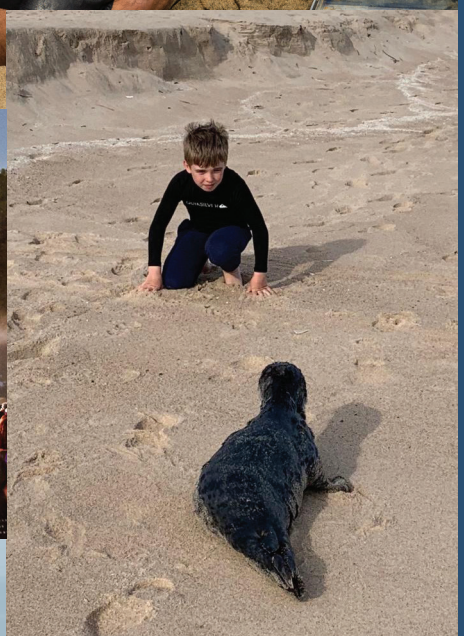
Global engagement for the ocean

All over the world people are celebrating, researching and taking action for ocean health and opportunities. The ocean bridges generations as well as continents. It is for our generation to demonstrate the stewardship, leadership and determination required to find the common solutions for 'The Ocean That We Want'.

Global_Pics / istock

Biologists from 'Projeto Tamar' during routine research in the archipelago of Fernando De Noronha.

The annual Global Citizen Concert in Central Park, New York, is dedicated to fighting plastic from entering the ocean.



Global Compact's youngest ocean health champion, Otto.

Dear Erik,

The UN is amazing. It helps people all around the world... It does a great job of keeping the world safe. The oceans are just as important to keep safe. Too much pollution goes into the oceans every year... Plastic is bad for all fish.

People should stop using so much plastic. All new plastic needs to be biodegradable or they pay a plastic tax. UN inspectors should check plastic companies and give them fines for bad actions.

Thank you for reading my letter, I hope you agree and can help.

From,
Otto Joyce

Koldunov / istock

Beach clean up Kuta, Bali Indonesia

THE TEN PRINCIPLES OF THE UNITED NATIONS GLOBAL COMPACT

HUMAN RIGHTS

1 Businesses should support and respect the protection of internationally proclaimed human rights; and

2 make sure that they are not complicit in human rights abuses.

LABOUR

3 Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining;

4 the elimination of all forms of forced and compulsory labour;

5 the effective abolition of child labour; and

6 the elimination of discrimination in respect of employment and occupation.

ENVIRONMENT

7 Businesses should support a precautionary approach to environmental challenges;

8 undertake initiatives to promote greater environmental responsibility; and

9 encourage the development and diffusion of environmentally friendly technologies.

ANTI-CORRUPTION

10 Businesses should work against corruption in all its forms, including extortion and bribery.

The Ten Principles of the United Nations Global Compact are derived from: the Universal Declaration of Human Rights, the International Labour Organization's Declaration on Fundamental Principles and Rights at Work, the Rio Declaration on Environment and Development, and the United Nations Convention Against Corruption.

ABOUT THE UNITED NATIONS GLOBAL COMPACT

As a special initiative of the UN Secretary-General, the United Nations Global Compact is a call to companies everywhere to align their operations and strategies with ten universal principles in the areas of human rights, labour, environment and anti-corruption. Launched in 2000, the mandate of the UN Global Compact is to guide and support the global business community in advancing UN goals and values through responsible corporate practices. With more than 9,500 companies and 3,000 non-business signatories based in over 160 countries, and more than 70 Local Networks, it is the largest corporate sustainability initiative in the world.

For more information, follow **@globalcompact** on social media and visit our website at **www.unglobalcompact.org**.

United Nations Global Compact

685 Third Avenue New York, NY 10017, USA