



An initiative of
Economist Impact and The Nippon Foundation

A GLOBAL OCEAN FREE FROM THE HARMFUL IMPACTS OF POLLUTION: ROADMAP FOR ACTION

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Intergovernmental
Oceanographic
Commission



2021 United Nations Decade
of Ocean Science
2030 for Sustainable Development

**ECONOMIST
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Executive summary

Ocean pollution is a complex and multifaceted problem. It threatens ecosystems, human health and economies, but a lack of data about its impact means relatively little is being done to prevent and address it.

Marine pollution includes plastic, but the challenges are far broader than plastic pollution alone. It includes nutrients, such as fertilisers and sewage, that run into the ocean, creating vast dead zones. It includes chemicals, such as per- and polyfluoroalkyl substances (PFAS), known as “forever chemicals”, that accumulate in seawater over time, posing a potential risk to human and animal health. It includes pharmaceuticals, such as antibiotics, that increase the risk of antimicrobial resistance. It includes an unknown number of the approximately 300,000 synthetic chemicals in use, and much more.

Most ocean pollution comes from land-based human activity, via stormwater run-off from cities and towns, ineffective waste management, agriculture, manufacturing, mining and the chemicals supply chain—from the production of raw materials through to improper management of discarded consumer goods and waste. Rivers and estuaries carry pollution from the land to the sea. Some pollution is deliberate; much is inadvertent. Offshore industries, such as shipping and energy, also contribute. There is no single source, and so there is no single solution.

This complexity means that, despite the potentially catastrophic impact of pollution on the ocean, our collective knowledge about its extent and its effect on marine ecosystems is extremely limited. The available data primarily focuses on coastal areas of large, wealthy countries. It is not possible to create a global “map” of ocean pollution nor to draw robust conclusions about the combined and cumulative impact of pollutants on ocean health—or about the interdependencies between climate change and nature loss in the ocean.

Pollution, climate change and nature loss together constitute a deeply intertwined “triple planetary crisis”, yet pollution is the forgotten third of the triangle.

Back to Blue, an initiative of Economist Impact and The Nippon Foundation, has engaged with stakeholders from across the United Nations (UN) system, science, industry, policy and finance over a two-year period to understand their perspectives on ocean pollution and how to address it. This roadmap is a synthesis of their views. It sets out an ambitious, strategic framework within which a global group of stakeholder organisations can collaboratively build a comprehensive evidence base about the impact and extent of ocean pollution and, in turn, spark action.

The vision of a **global ocean free from the harmful impacts of pollution by 2050** is deliberately bold. It reflects and complements the ambitions of many organisations working to address ocean pollution, and aligns with the ambition of the UN Decade of Ocean Science for Sustainable Development to “understand and beat marine pollution”. Developing a more holistic understanding of the impact of pollution will be an important complement to the global treaty to address plastic pollution that is currently being negotiated.

Reflecting this shared ambition, “A Global Ocean Free from the Harmful Impacts of Pollution by 2050: Roadmap for Action” envisages a collaborative, co-ordinated and global approach to harmonise existing projects, catalyse new initiatives and increase momentum for action. It recommends:

- establishing a **high-level, global, multi-stakeholder co-ordinating task force**, supported by a secretariat;
- publishing a **Global Ocean Pollution Assessment and Action Plan** every five years;
- establishing **four independent stakeholder groups** focused on science, data, policy, and business and finance; and
- convening a network of independently operated and funded **implementation partners** from across the UN, universities, and the public, private and not-for-profit sectors, to work collaboratively.

The call to action is clear. A vision this sweeping is beyond the remit of any single organisation. A collaborative effort, at a global scale, has the potential to reshape our collective understanding of the impact of pollution on the ocean—and in turn to radically reform our approach to preventing and addressing it. Diverse people and organisations must now come forward to make this roadmap’s vision—a global ocean free from the harmful impacts of pollution by 2050—a reality.

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Foreword



Charles Goddard
Editorial director,
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Mitsuyuki Unno
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In 2022, Back to Blue, an initiative of Economist Impact and The Nippon Foundation, published “The Invisible Wave: Getting to Zero Chemical Pollution in the Ocean”. We knew that ocean pollution was an under-studied topic and felt that an in-depth examination of the extent and impact of marine chemical pollution would be a valuable addition to the growing body of analysis about the mounting pressure on ocean health.

We were not prepared for the surprising lack of data about the extent, or the cumulative impact, of pollution on the ocean. Small-scale, point-in-time studies suggested that pollution could harm ocean health. But, with no large-scale, ongoing monitoring data available, we based the conclusions of “The Invisible Wave” largely on the qualitative assessment of our many expert interviewees.

Their advice was unequivocal: pollution is an unseen, often unnoticed, threat to the health of the global ocean. Yet we knew that compelling evidence would be necessary to turn this qualitative assessment into widespread action. Back to Blue has spent the past two years engaging with a global group of scientific, policy, business and NGO stakeholders, looking for answers to this dilemma.

“A Global Ocean Free from the Harmful Impacts of Pollution: Roadmap for Action”, which marks the culmination of this process, is a synthesis of their views.

The roadmap is unashamedly ambitious. Pollution is a challenge on a scale comparable to that of the other great anthropogenic threats of our time: climate change and biodiversity loss. Bold thinking that sparks bold action is the only way to realise a vision as ambitious as a global ocean free from the harmful impacts of pollution.

We see Back to Blue’s role as a catalytic one. By publishing this roadmap, we hope to spark and inspire the community of nations, scientists, businesses, investors, campaigners, and others who tirelessly work to improve ocean health, to turn their attention—and ambition—to solving the vexed challenge of ocean pollution.

Tackling ocean pollution must be a global, multi-decade effort if it is to be a success. Achieving a global ocean free from the harmful impacts of pollution will require bold regulatory action, large-scale investment and widespread public education. Closing the evidence gap is just the first step.

Many other organisations and individuals envision an ocean free from the harmful impacts of pollution and are working to achieve it. This roadmap does not seek to replicate these efforts but instead proposes a model to unify them. Please join us.



Vladimir Ryabinin
Executive secretary
**Intergovernmental
Oceanographic
Commission
of UNESCO**
March 2015 - February 2024.

The UN Decade of Ocean Science for Sustainable Development, 2021-2030, is a ten-year initiative led by the Intergovernmental Oceanographic Commission of UNESCO (IOC/UNESCO). The decade vision is “the science we need for the ocean we want”. By identifying, generating and applying critical ocean knowledge, the decade aims to offer transformative ocean-science solutions for protecting marine life, combating climate change and sustainably growing the marine economy.

The decade has set ten challenges for collective impact. Meeting challenge one, to “understand and beat marine pollution”, is critically important if we are to move from the ocean we have to “the ocean we want”.

The world is keenly aware of the plastic waste present everywhere, including even the deepest parts of the ocean. However, the ocean is also menaced by pollution that is invisible to the naked eye, such as untreated sewage, pesticides, fertilisers, toxic chemicals, medications, heavy metals and other harmful substances. This type of pollution poses a major threat not only to marine life but also to human health and livelihoods.

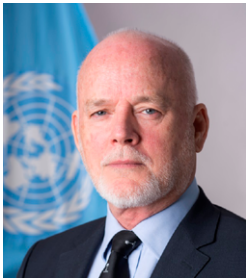
In June 2022, IOC/UNESCO published the pilot State of the Ocean Report to monitor progress towards achieving the decade’s objectives. The findings were concerning: “Despite the global significance of ocean pollution, observations remain limited, geographically and thematically, being mainly concentrated at the ocean surface and in coastal areas.”

“A Global Ocean Free from the Harmful Impacts of Pollution: Roadmap for Action” has the potential to reverse the tide and to set in motion an ambitious programme of activities towards addressing the decade challenge one.

IOC/UNESCO endorses this draft roadmap, supports it and commends Back to Blue, Economist Impact and the Nippon Foundation for catalysing this critical development. The strength of this roadmap is that it does not seek to replicate the vital work already happening but instead sets out a vision for co-ordinated and collective action. I urge all those working towards combating marine pollution to step forward to support and participate in this process.

Working hand in hand, scientists, businesses, governments and all stakeholders can create and roll out solutions that eliminate pollution at the source, reduce its impacts and deliver a clean ocean for us all.

Why this roadmap matters



In 2015, United Nations member states universally adopted the 2030 Agenda for Sustainable Development, including SDG 14.1, which calls for the prevention of marine pollution of all kinds. Work is now underway to arrive at a plastic pollution treaty, but marine pollution involves more than plastics and microplastics, with chemical pollution being equally problematic for marine ecosystems and, ultimately, human health.

In 2022, the publication of “The Invisible Wave” was a heads-up for the world on the scale of humankind’s marine chemical pollution. Now, through their Back to Blue initiative, Economist Impact and The Nippon Foundation are taking us to the next level of remedial action with their proposal for “A Global Ocean Free from the Harmful Impacts of Pollution: Roadmap for Action”. The roadmap presents a strategic route to meeting what is a key challenge of the UN Decade of Ocean Science for Sustainable Development, proposing radical reform of our approach to the prevention of marine chemical pollution. I commend Back to Blue for the roadmap proposal and call on those concerned with preventing marine chemical pollution to give it their fullest attention.

Peter Thomson
Secretary-general’s special envoy for the ocean
United Nations



Human impacts on the health of the ocean are underappreciated. Addressing them is both a challenge and crucial to tackling climate warming. Yet a lack of data is hindering scientists' understanding of the complex interdependencies between climate change and ocean health. There is now a new recognition that the global community must fully understand the role of the ocean in climate solutions and as it moves to safeguard ocean health from adverse climate impacts.

I commend Economist Impact and The Nippon Foundation for raising the profile of this critical issue through the work of the Back to Blue initiative and the publication of "A Global Ocean Free from the Harmful Impacts of Pollution: Roadmap for Action". It is now up to the global community of ocean stakeholders, through all of the preparatory meetings leading to the UN Ocean Conference in 2025 and beyond, to collectively address it. This will require commitment and funding from a wide range of organisations. The time to act on this is now.

Kilaparti Ramakrishna

Senior adviser to the president on ocean and climate policy

Woods Hole Oceanographic Institution



There is mounting evidence that chemical pollution is transforming marine ecosystems. This pollution, in turn, affects human health as well. Chemicals are essential for modern society, but we can do a much better job at managing how chemical pollutants interact with the environment. Back to Blue has had considerable success raising awareness about the issue of chemical pollution in the ocean and highlighting the critical gaps in our knowledge about pollution's impact. The quest for better data about ocean pollution must not interfere with or delay the ultimate goal: to address the negative impacts of pollution in the ocean. Yet "A Global Ocean Free from the Harmful Impacts of Pollution: Roadmap for Action" sets out a constructive path to build an evidence base which can underpin solutions. I commend Back to Blue for the publication of this important work, and implore all ocean stakeholders to join the collective effort to understand and address ocean pollution.

Elsie Sunderland

Gordon McKay professor of environmental chemistry

Harvard University

Background

The ocean is fundamental to many of the environmental, social and economic processes that humans rely on. It is a carbon sink, a mode of transport, a food source and much more. Yet in 2024, almost halfway through the UN Decade of Ocean Science for Sustainable Development, it is still nearly impossible to glean a clear picture of the extent of ocean pollution and its effects on ecosystems, human health and economies.

In 2022, Back to Blue, an initiative of Economist Impact and The Nippon Foundation, published “The Invisible Wave: Getting to Zero Chemical Pollution in the Ocean”,¹ which examines in detail the extent and impact of marine chemical pollution. “The Invisible Wave” concluded that pollution is an urgent and underappreciated crisis that, if left unaddressed, will lead to considerable—and possibly irreversible—damage to the marine environment. Yet patchy data makes it a challenge to quantify pollution’s impact and assess the efficacy of solutions to address it. The inaugural State of the Ocean Report from the Intergovernmental Oceanographic Commission of UNESCO (IOC/UNESCO), published a few months after “The Invisible Wave”, reached a similar conclusion, recommending that “a more resourced and systematic approach to observations and synthesis of ocean pollution is urgently required.”²

“A Global Ocean Free from the Harmful Impacts of Pollution: Roadmap for Action” (“the roadmap”), comes from a two-year stakeholder consultation process³ and sets out a pathway to understand—and subsequently beat—marine pollution.

Why understanding ocean pollution matters

The United Nations Environment Programme (UNEP) lists pollution alongside climate change and nature loss as part of a “triple planetary crisis” that is “putting extreme pressures on the planet”.⁴ Tackling pollution is essential in its own right, and the interdependent nature of these crises means that understanding how pollution affects the marine environment may also help us understand the ocean’s ability to absorb carbon dioxide and the extent and causes of marine biodiversity loss. Learning more about marine pollution may, therefore, be an important step towards achieving the goals of both the Paris Agreement to limit climate change and the Kunming-Montreal Global Biodiversity Framework to limit biodiversity loss.⁵

Several international legal instruments exist to manage ocean pollution,⁶ yet implementation is often a challenge. UN member states are, in 2024, negotiating another legally binding treaty

to limit one type of ocean pollution: plastic. While the treaty was still in draft format at the time of this roadmap's publication, negotiators are considering how to reduce not just solid plastic waste but also the chemicals and other matter, such as micro- and nanoplastics, that leach into the marine environment as plastics break down. Developing a holistic understanding of the extent and effects of ocean pollution will be critical to assessing the treaty's efficacy.

Another reason it is crucial to develop a deeper understanding of marine pollution is that economic trends suggest it is likely to increase. The production and use of synthetic chemicals is growing rapidly, and forecast to do so for the foreseeable future, particularly in countries with less stringent environmental protections.⁷ Economic development means more people will have access to the products that contribute to ocean pollution. Nascent industries such as offshore renewables and deep-sea mining may worsen ocean pollution. Decision-makers in government and the private sector will increasingly be called on to balance the competing considerations of development and conservation, and to mitigate any adverse effects of their decisions. Reliable and usable data on where pollution and its impacts occur is vital to support these decisions.

Many of the scientists Back to Blue interviewed or consulted over the past two years expressed a similar frustration: a lack of data should not preclude action. Yet those who have the power to act—policymakers, regulators, business leaders, investors and others—are unlikely to do so without compelling evidence. Some have a vested interest in “business as usual”. Others have good intentions but many competing priorities. Whatever the reason, we are unlikely to see widespread action to “beat” marine pollution without first developing a clear understanding of its impacts and causes, and of the efficacy of solutions.

WHAT IS OCEAN POLLUTION?



Persistent bio-accumulating and toxic compounds (PBTs)

that accumulate in the environment over long periods. This includes persistent organic pollutants (POPs), per- and poly-fluoroalkyl substances (PFAS, sometimes dubbed “forever chemicals”), and some pesticides.



Heavy metals, including mercury, lead, copper and cadmium.



Nutrients: fertilisers and organic matter, including human and animal waste, that lead to eutrophication, where algal blooms consume so much oxygen from the water that other sea life dies.



Plastics, including solid plastic waste as well as micro- and nanoplastics. Plastics are a chemical pollutant in their own right and can pick up and transport other chemicals long distances.



Pharmaceuticals, including medications for humans and animals, with antibiotics a central concern given their overuse or misuse.



Radioactivity, including recent contamination (eg, the 2011 Fukushima disaster in Japan), the historical dumping of radioactive waste, and radiation from natural sources.



Oil, including the toxic chemicals used to clean up spills.



Household and consumer chemicals: many cleaning products contain toxic chemicals, as do numerous cosmetics, shower gels and sunscreens.



Pseudo-persistent chemicals: these would dissipate relatively quickly in the aquatic environment, except that their concentrations keep rising because they are so prevalent in products.



Other chemicals, including a wide variety of the approximately 300,000 chemicals in use, most of whose effects on the environment and human health are unknown.

This list is not exhaustive, and any working definition of ocean pollution must be flexible enough to include new pollutants as they emerge. It is also preferable to group substances (eg, POPs or plastics) rather than attempt to identify the many thousands of compounds that can be ocean pollutants. “The Invisible Wave” created this definition guided by an expert scientific panel.⁸

MOST OCEAN POLLUTION COMES FROM LAND-BASED SOURCES

Many substances have essential uses for society and the economy, but their overuse or ineffective waste management means they end up in the ocean as pollutants, often via rivers or soil. Some important sources of ocean pollution are:



Farming and agriculture

Fertilisers and other chemicals are applied to crops and soil. These leach into the ocean, either directly or through freshwater systems such as rivers.



The chemicals industry

Around 95% of all goods made and consumed across the global economy contain synthetic chemicals.



Manufacturing and construction

From the deliberate dumping of industrial effluent to liquid waste pollution on building sites and ineffective end-of-life management of consumer goods such as plastics, pharmaceuticals and electronics.



Cities and towns

Untreated or poorly treated wastewater and stormwater are common causes of ocean pollution. Intensifying storm surges caused by climate change are expected to put further pressure on civil and industrial waste-management infrastructure, likely increasing ocean pollution.



Shipping and transport

Fuel emissions and spills, direct discharges at sea, and chemical contamination from harbours and ports.



Mining

Mine tailings, including those from land-based mining, either dumped in the ocean directly or leached from contaminated soil, and from the nascent deep-sea mining industry.



Governments and defence

Dumping or storing legacy chemical stockpiles, munitions and fire-retardant chemicals, and dredging, which can release pollutants resting on the seabed into the water column.



Offshore industries

Including oil and gas drilling, renewables, fisheries and aquaculture. Pollutants can be dumped (eg, discarded fishing gear), leached from vessels or equipment, or inadvertently spilled.



Air, soil and freshwater pollution

Airborne particles settle directly into the ocean, and land-based pollution washes into the ocean through rivers and run-off.⁹

What we don't know about marine pollution

A diverse range of organisations across the UN system, governments, the private sector, universities and research institutes collect data about ocean pollution.¹⁰ Yet significant gaps remain. Oceanographic data sets often do not contain data on pollution. Geography is a major determinant: data on ocean pollution is overwhelmingly focused on coastal areas, mostly around large and wealthy countries. Little data is collected about the effects of pollution in the open ocean or around countries in the global south. Ocean pollution is, by nature, a global phenomenon: pollutants move with the currents and tides. But most data focuses on territorial waters.

Some pollutants, such as solid plastics and nutrients, are widely studied. There is little to no data available for most others. Moreover, study of many pollutants occurs under laboratory conditions that may not accurately reflect those in the ocean. For example, many pollutants are likely to affect ocean health differently as the temperature or salinity changes, or in the presence of other pollutants. There is little data about the combined and cumulative effects of pollutants on the ocean.

In addition, organisations may collect data about land-based and freshwater pollution, chemical use, biodiversity loss, industry trends or other indicators that do not directly measure ocean pollution but could contribute to building a comprehensive picture of the impact of pollution on the ocean.

In many cases, data is collected but not made publicly available. Data about ocean pollution can be sensitive. Government agencies, navies and companies all collect data that they keep private for political, security or commercial reasons. Others lack the resources or incentive to publish data in a usable format.

Perhaps most critically absent is large-scale time-series data about ocean pollution over the long term. Most pollution studies cover a point in time and focus on a specific geography or pollutant, often due to resource constraints. There is no baseline measure of the cumulative extent and impact of pollution on the global ocean, and no global and comprehensive assessment of pollution trends over time. While many studies and data sets exist, no metastudy gives a global view, and there has been no worldwide attempt to knit together all existing studies.

Four priority data gaps to fill

1. **The scale gap.** Scientists have specific knowledge but lack comparable data to draw robust conclusions about the wider ocean.
2. **FAIRness gaps.** Data sets often do not adhere to the FAIR principles: findability, accessibility, interoperability and reuse of digital assets.
3. **The geography gap.** Most studies focus on coastal areas around large and wealthy countries. There is less data on the deep or open ocean, or on coastal waters in the global south.
4. **The long-term monitoring gap.** Point-in-time studies make it difficult to discern trends.¹¹

A global ocean free from the harmful impacts of pollution: vision and objectives

“A Global Ocean Free from the Harmful Impacts of Pollution: Roadmap for Action” sets out a pathway to close data gaps by amplifying and harmonising the activities of the many organisations working to address ocean pollution.

The vision of a **global ocean free from the harmful impacts of pollution by 2050** reflects the ambition of not only Back to Blue but also many others. The scale of the task demands a collective effort. The roadmap responds to one of ten United Nations Ocean Decade Challenges, to “understand and beat marine pollution”. It aims to integrate into the decade framework and build on the work of other scientists and stakeholders responding to this challenge, including the Vision 2030 working group of which Back to Blue is a member.¹²

United Nations Ocean Decade challenge one

United Nations Ocean Decade challenge #1: “Understand and map land and sea-based sources of pollutants and contaminants and their potential impacts on human health and ocean ecosystems and develop solutions to remove or mitigate them.”¹³

This collaborative global effort must spark and underpin **action** across the public and private sectors, including among financial institutions, to curb the impact of pollution on the ocean. Throughout Back to Blue’s consultations, stakeholders repeatedly stressed that building an evidence base about ocean pollution is only a first step to achieving a global ocean free of the harmful impacts of pollution. Data is of limited value unless it can effectively support decision-making. To ensure its efficacy and relevance, decision-makers must be central actors in the effort to build an evidence base.

Impact is another critical point. Stakeholders, particularly scientists, told us that the presence of pollution is of less concern than its effect on the ocean. This roadmap considers ocean pollution’s impact across three dimensions:

1. **Environmental impacts**, including ecosystem functioning, biodiversity and interdependencies with climate change.
2. **Impacts on human health and society**, including through seafood consumption, direct and indirect exposure to toxic pollutants, and loss of amenity.
3. **Economic impacts**, including direct costs to industry,¹⁴ economic costs to coastal communities, the indirect economic cost of degraded ecosystems, and ESG-related risks to exposed companies and industries.

Achieving this shared vision will require a step-by-step process to close the data gap, implement and assess solutions, engage an ever-wider group of stakeholders and, critically, attract the investment required to fund these activities.

The roadmap assumes that implementation begins in 2025, halfway through the UN Decade for Ocean Science. The first task will be to comprehensively review and analyse all existing data and solutions by 2030, in line with the decade’s objective “to identify, generate and use critical ocean knowledge to manage the ocean

sustainably”.¹⁵ Achieving this in a relatively short five-year period will require a motivated coalition of stakeholders to voluntarily collaborate, prioritising speed and efficiency. By 2040, it should be possible to create a comprehensive data “map” of ocean pollution. Governments, businesses and investors should be actively using this information to make decisions.

If these milestones are achieved, a global ocean free from the harmful impacts of pollution may just be possible. The table below details a framework for achieving this bold vision.

A framework for achieving the vision: four objectives

Objective	By 2030	By 2040	By 2050
Closing the data gap	<p>A comprehensive review of all available evidence about ocean pollution has been conducted. This will involve knitting together existing data sets using AI and other technologies, and drawing conclusions about pollution’s impact on the ocean.</p> <p>An analysis of data gaps, including a strategy for closing them is available, identifying priority areas for action and providing globally consistent monitoring, data collection, storage and sharing protocols.</p>	<p>Large-scale and ongoing monitoring of marine pollution makes it possible to create a comprehensive evidence “map” of ocean pollution and deduce trends.</p> <p>Data about the impact of marine pollution and the efficacy of solutions to combat its negative effects is comprehensive and widely available.</p> <p>Where data gaps exist, a strategy is in place to close them.</p>	<p>Monitoring of marine pollution is ongoing and widespread; the vast majority of data gaps have been closed.</p> <p>The most relevant and critical information is widely available to inform decision-making about solutions.</p>
Solutions to address the impacts of ocean pollution	<p>An analysis of solutions has been completed to address and prevent the negative effects of marine pollution, including recommendations on how stakeholders from the public and private sectors, including policymakers, businesses and financial institutions, can successfully enact solutions.</p>	<p>A growing cohort of public- and private-sector stakeholders are enacting solutions to prevent and address the impacts of ocean pollution, including:</p> <ul style="list-style-type: none"> • policy and regulation; • voluntary and mandated changes in corporate behaviour; and • public- and private-sector investment in innovation and technology. 	<p>Action to prevent the negative effects of ocean pollution is widespread across the public and private sectors.</p>
Engaging stakeholders	<p>A voluntary coalition of decision-makers from the public and private sectors and other stakeholders have collaboratively developed a global strategy to understand and beat marine pollution.</p>	<p>A growing cohort of public- and private-sector stakeholders and organisations are working collaboratively to monitor the effects of ocean pollution and enact and test solutions to prevent and address it.</p>	
Securing funding	<p>A wide range of stakeholder organisations can access ongoing funding from government, philanthropic and private-sector sources to collect and analyse data about the impact of ocean pollution.</p>	<p>Sustainable, ongoing funding is available for widespread global monitoring of ocean pollution and its impacts, solutions to which enjoy substantial and growing investment.</p>	

Guiding principles

1. A partnership of partnerships

Many organisations are already working to understand and beat marine pollution. Others are working in closely related areas. Stakeholders overwhelmingly indicated that they do not wish to see this existing work replicated.

A “partnership of partnerships”, a diverse group of organisations, each with their own objectives and focus areas, which voluntarily commit to working towards a shared vision, will be the most efficient way to understand and beat ocean pollution by 2050. The global effort should primarily be one of co-ordination and strategic oversight rather than the establishment of a new data-collection agency.

Moreover, the scale of the data-collection challenge is so vast that it cannot be undertaken by a single organisation or project. It will be critical to “crowd in” a diverse and global group of stakeholders from multiple UN bodies, government agencies, scientific research institutes, universities, NGOs and the private sector.

2. A multidisciplinary, multi-stakeholder effort

The causes and sources of ocean pollution are many and varied. Therefore, the global effort to understand and beat marine pollution must include stakeholders well beyond those typically concerned with ocean health, including:

- Scientists researching air, land and freshwater-based pollution, particularly those specialising in the freshwater hydrosphere.
- Scientists, policymakers, industry groups and NGOs specialising in climate change, biodiversity loss and plastics, which are closely related to the challenge of ocean pollution. Solutions must consider interdependencies and shared benefits.
- The broadest possible range of policymakers, and regulatory, business, insurance and finance leaders, all of whom make decisions that affect ocean pollution—both positively and negatively.
- People and organisations with capabilities in technology and big data, from the public, private and non-profit sectors. One important step to understanding and beating marine pollution is to make better use of existing data.
- Traditional and local communities, particularly coastal communities.

3. A balance of impact and breadth

The global effort to understand and beat marine pollution must adopt an expansive definition of pollution, recognising the need to understand the effect of new pollutants as they emerge. At the same time, activities must be targeted to support rapid and widespread action by decision-makers from the public and private sectors. These priorities must be carefully balanced through a multi-track approach that concurrently:

- is demand-led, ensuring that policymakers, investors and other end-users have immediate access to the evidence they need to support decision-making;
- attends to existing data-rich areas, such as estuaries and coastal waters, to achieve “quick wins” with a view to progressively developing a more comprehensive understanding of marine pollution;
- gives particular focus to areas identified as being at high risk in at least one of the three dimensions of pollution impact (environmental, human health and economic), for example high-value ecosystems or known pollution hotspots;
- balances a focus on known causes of pollution with active and ongoing monitoring of emerging contaminants of concern, and brings on a shift from mostly point-in-time studies to long-term time-series studies; and
- lays the foundations for ultimately achieving a comprehensive understanding of the cumulative effect of pollution and its effects on biodiversity and ecosystem function across the entire ocean, including areas that are currently under-studied, such as the deep and open ocean as well as coastal waters in the global south.

4. Open, interoperable data

This roadmap does not recommend creating a single database of ocean pollution. Instead, the global effort to understand and beat marine pollution must support data collectors and custodians in sharing and using data to collaboratively achieve the vision of a global ocean free from the harmful impacts of pollution by 2050.

Much data about ocean pollution already exists but is not publicly available, lacks metadata or is otherwise not usable. Unlocking existing data and supporting data custodians to make their data available and usable should take priority over collecting new data.

As far as possible, all data should adhere to the FAIR Guiding Principles for scientific data management and stewardship.¹⁶ Data should be findable, accessible, interoperable and reusable.

5. Equity and inclusion

Most marine pollution studies are of coastal waters around rich countries. A major gap in marine pollution data concerns waters in the global south. At the same time, ineffective waste-management infrastructure and poor environmental regulation or enforcement mean that coastal communities in these areas are likely to feel the effects of pollution particularly severely. Closing this data gap is critical to ensuring the delivery of equitable solutions to beat marine pollution.

Coastal communities should actively participate in the global effort to understand and beat marine pollution. Traditional and local knowledge should be part of monitoring ocean pollution and developing solutions to mitigate its impact.

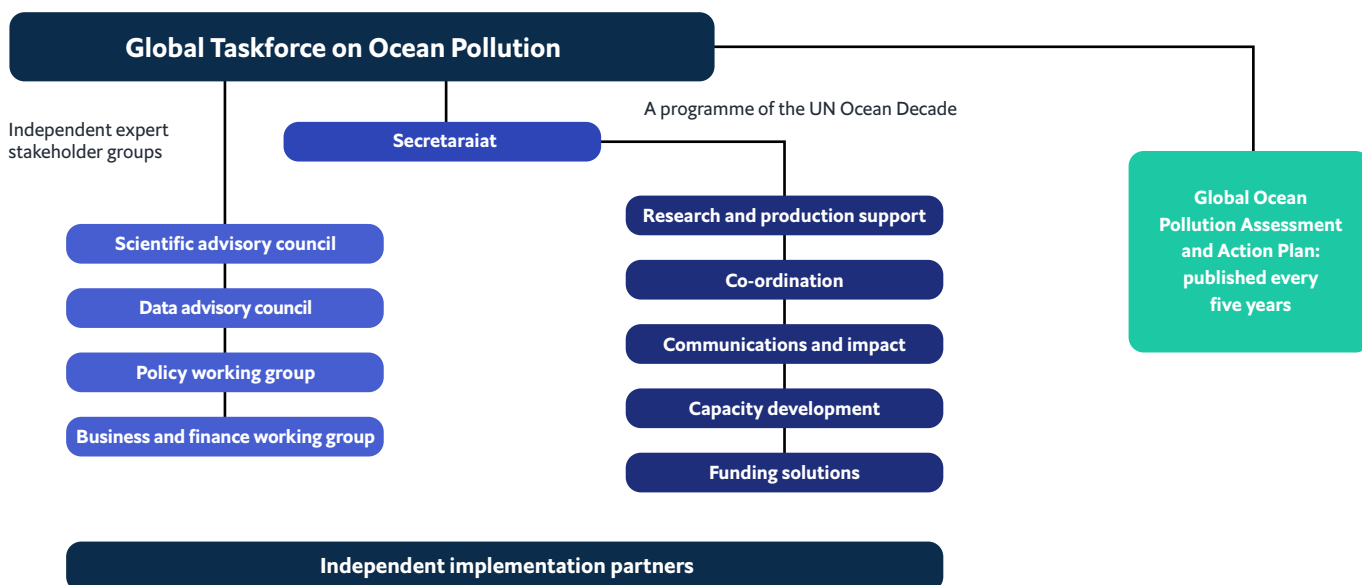
To enable citizen scientists and low-income countries to participate, data-collection protocols should make simplicity and ease of use a higher priority than application of the best available technology.¹⁷

Summary of recommendations

To achieve the vision of a global ocean free from the harmful impacts of pollution by 2050, in line with the principles set out above, this roadmap recommends:

1. establishing a **high-level global multi-stakeholder co-ordinating task force** charged with mobilising, supporting and harmonising existing and emerging initiatives;
2. publishing a **Global Ocean Pollution Assessment and Action Plan** every five years;
3. convening a network of independently operated and funded **implementation partners** from across the UN, universities, and the public, private and not-for-profit sectors, to work collaboratively to implement the roadmap;
4. establishing **four independent stakeholder groups** to advise the co-ordinating task force:
 - a. scientific advisory council,
 - b. data advisory council,
 - c. policy working group, and
 - d. business and finance working group; and
5. establishing a **secretariat** to support the co-ordinating task force.

Structure: a global co-ordinating task force on ocean pollution



Detailed recommendations

These recommendations are intended to be informative rather than prescriptive. The co-ordinating task force should have the flexibility to implement the recommendations as it sees fit, in line with the guiding principles.

1. High-level global multi-stakeholder co-ordinating task force

Existing projects to close the marine pollution data gap are fragmented, sometimes overlapping and rarely interoperable. A global, multi-stakeholder co-ordinating task force would provide strategic vision and lead collaboration between implementation partners.

One or more lead organisations will be required to host the co-ordinating task force and secretariat. The IOC/UNESCO, UNEP or a collaboration of the two agencies could be the lead co-ordinator. The co-ordinating task force should be a programme of the UN Ocean Decade, and should interface closely with those working on other decade challenges.¹⁸

The co-ordinating task force should:

- Include representatives of the natural and behavioural sciences, encompassing not just marine science but also other related areas, including freshwater pollution, climate science and biodiversity, as well as environmental economics and behavioural science.

- Include end-users of data on ocean pollution, representing both the public sector (policymaking, regulation and standard-setting) and the private sector (industry and investors).
- Be globally representative and inclusive.
- Include other ocean stakeholders, such as coastal communities.
- Be composed of high-level and influential people who can represent the co-ordinating task force and advocate for its work in national and international forums.

2. Global Ocean Pollution Assessment and Action Plan

With support from the secretariat, the co-ordinating task force should oversee the publication, every five years, of a comprehensive **Global Ocean Pollution Assessment and Action Plan (GOPAAP)**.

The GOPAAP should closely align with and complement existing scientific surveys, including (but not necessarily limited to) the IOC/UNESCO State of the Ocean Report,¹⁹ the World Ocean Assessment²⁰ and the UNEP Global Chemicals Outlook.²¹ The GOPAAP should also reflect any processes that emerge as part of the global treaty on plastic pollution, particularly those related to

chemicals in plastics, micro- and nanoplastics, and their impact on the ocean. It should align with existing international instruments such as the Basel, Rotterdam and Stockholm conventions, and should also interface with relevant knowledge and data on freshwater and land pollution.

The GOPAAP should substantially contribute to and catalyse the achievement of a global ocean free of the harmful impacts of pollution by 2050. Its contents and format should respond to this roadmap's framework, and may include:

- a global census of ocean pollution;²²
- an analysis of data gaps and a strategy to fill them;
- an examination and assessment of solutions to address the impacts of ocean pollution;
- tactics to engage public- and private-sector stakeholders as end-users of the GOPAAP;
- tactics to promote and enable investment and funding to address ocean pollution; and
- other topics as directed by the co-ordinating task force.

The GOPAAP should facilitate adaptive decision-making in both government and the private sector, consolidating granular data sources into a comprehensive overview of the ocean and linking pollution impacts to their sources and causes. The inaugural assessment must include an analysis of gaps and recommendations for how science could fill them over a decade or two. A clear, co-ordinated, global strategy for this will be vital. Over time, the report should move to focus on monitoring and verifying solutions. The four independent stakeholder groups should advise and, where appropriate, contribute to the GOPAAP to achieve this.

3. Implementation partners

While the task force is responsible for leading and co-ordinating the effort to achieve a global ocean free of the harmful impacts of pollution by 2050, a network of independently operated and funded projects, initiatives and organisations should implement much of the programmatic work. The scale of the task is too great for any single initiative.

Implementation partners may include UN agencies or bodies, government and regional agencies or bodies, NGOs, universities, philanthropic organisations, for-profit companies and investors, consolidated initiatives at the global, regional, sub-regional or national levels, or other organisations the co-ordinating task force deems appropriate.

Participation is voluntary: implementation partners are simply organisations that see the value, however they define it, of contributing to the vision of a global ocean free of the harmful impacts of pollution by 2050.

Where appropriate, and following the requirements set out by the UN Ocean Decade, implementation partners may apply for their initiatives to become Ocean Decade Actions.

The co-ordinating task force should, as required, issue guidance, best practices or other information to assist independent implementation partners in achieving the vision. For example, with advice from the data advisory council, the co-ordinating task force may issue guidance on protocols for collecting and sharing data. With advice from the business and finance working group, the co-ordinating task force may issue investor guidelines.

The task force, secretariat and independent stakeholder groups may convene or co-ordinate implementation partners, and implementation partners may also choose to form alliances independently. The secretariat may offer capacity-building or other support to selected implementation partners if directed by the co-ordinating task force.

4. Independent stakeholder groups

As it sees fit, the co-ordinating task force, supported by the secretariat, should determine the terms of reference, including term limits, for four independent stakeholder groups: a scientific advisory council, a data advisory council, a policy working group and a business and finance working group. Terms of reference should be published within three months of the first meeting of the co-ordinating task force and updated as required. Stakeholder groups should be required to report to the task force regularly.

Implementation partners may host or lead one or more of the stakeholder groups at the co-ordinating task force's direction. The co-ordinating task force (and host organisation, where relevant) should determine each group's work plan and objectives, which can be updated as required.

The co-ordinating task force should actively oversee collaboration between the four groups, ensuring that definitions, priority areas and scientific guidance effectively enable and catalyse solutions across the public and private sectors.

The responsibilities listed in this roadmap should be taken as a starting point only. The co-ordinating task force may amend or add to these recommendations. Responsibilities and activities may include convening the following groups, given with their potential functions:

Scientific advisory council

- Developing a comprehensive and adaptable definition of marine pollutants and updating it as new evidence emerges.
- Identifying priority areas for action. These could be specific pollutants, groups of pollutants (eg, PFAS) or spatial priorities (eg, at-risk ecosystems such as mangroves), and may draw on existing lists such as the Candidate List of the European Chemicals Agency.²³
- Identifying metrics or indicators for ocean pollution aligned with relevant global targets, including SDG 14 and those related to climate change and biodiversity loss.
- Promoting interdisciplinary integration and a systems perspective. This may include working with disciplines that cover air, soil and freshwater pollution, as well as engaging experts to conduct trade-off analyses using data and systems models.²⁴
- Issuing guidance on how implementation partners can use emerging technologies (including digital technologies such as artificial intelligence and physical ones such as autonomous underwater vehicles or satellite monitoring), giving priority to technologies that are low-cost and accessible.
- Collaborating with relevant scientific bodies, UN agencies (eg, the Global Framework on Chemicals)²⁵ and other stakeholders.
- Recommending strategies for incorporating local knowledge on ocean protection.
- Supporting capacity-building measures for pollution monitoring in low-income countries.

Data advisory council

- Establishing simple and standardised information management, metadata and sharing protocols, in line with the FAIR principles, that support the development of a consistent time-series metric for the global monitoring of ocean pollution.
- Issuing guidance on data, information management and knowledge management for implementation partners.
- Co-ordinating implementation partners to develop a federated architecture of interoperable ocean-pollution data sets, prioritising equitable access, user-friendly experiences and user control of data.
- Facilitating the integration of pollution data into projects such as ocean digital twins.
- Collaborating with existing frameworks and initiatives (for example, the IOC Ocean Data and Information System, ODIS)²⁶ to avoid duplication and enable data-sharing.
- Supporting the integration of marine pollution data with data on land and freshwater pollution, and with other major scientific data sets related to climate change and biodiversity loss.
- Advocating for open data accessibility and collaborating with the policy and business and finance working groups to encourage governments and the private sector to contribute to monitoring ocean pollution and sharing data. This may include identifying commercial opportunities, addressing legal concerns and promoting the benefits of data-sharing.
- Establishing simple-to-use guidelines that would enable citizen scientists and coastal communities to participate in data-collection efforts, supporting capacity-building measures in low-income countries.

Policy working group

- Identifying and assessing policy, regulatory and legal responses to achieve a global ocean free of the harmful impacts of pollution by 2050. These may range from monitoring and assessment to policy, regulatory or fiscal instruments to reduce or address the effects of pollution on the ocean (including exploring polluter-pays models).
- Collaborating with the scientific advisory council to raise awareness among policymakers about the effects of and solutions to ocean pollution.
- Collaborating with national governments and international policy instruments, such as the Stockholm, Rotterdam and Basel conventions and any global treaty on plastic pollution as it emerges.
- Providing best-practice guidance for national governments to support data collection, solutions and innovation.
- Supporting capacity-building measures for low-income governments.

Business and finance working group

- Convening, catalysing or collaborating with industry coalitions.
- Issuing best-practice guidance for industry sectors on avoiding and mitigating the effects of ocean pollution.
- Examining ways to unlock private-sector innovation in areas such as monitoring, data analysis, waste management and green chemistry, collaborating with the scientific advisory council.

- Educating the financial sector on the regulatory, legal and financial risks, and investment opportunities, that will come from the transition to a global ocean free of the harmful impacts of pollution, in alignment with climate-related risks and transition frameworks.
- Issuing guidance on integrating ocean pollution into existing environmental, social and governance (ESG) disclosure frameworks such as those issued by the International Sustainability Standards Board, the Task Force on Climate-related Financial Disclosures and the Taskforce on Nature-Related Financial Disclosures.
- Collaborate with the data advisory council to facilitate data-sharing on companies' impact on ocean pollution and exposure to ESG-related risk, including along their supply chains.
- Facilitating collaboration between industry and investors to uncover opportunities for transition financing and "blue" finance products to encourage investment.
- Co-ordinate and support implementation partners, providing capacity development for global south partners and coastal communities, including government agencies, as directed by the co-ordinating task force.
- Undertake capacity assessments and make recommendations for increasing the capacity of stakeholders in each GOPAAP.
- Support the co-ordinating task force to secure sustainable funding. Explore funding from governments, philanthropy, private-sector capital and self-funding models.
- Disseminate information, provide training and support capacity-building for government and non-government agencies.
- Maintain a focus on inclusive and equitable project rollout.
- Lead or commission a global communications campaign to engage the public, using storytelling to catalyse action. The campaign should:
 - Translate data into usable information for consumers, including through visual storytelling.
 - Increase literacy on ocean pollution among decision-makers.
 - Mobilise the participation and resources of NGOs and local communities.
 - Capitalise on global interest in biodiversity and climate to spark meaningful action on ocean pollution.

5. Secretariat

A co-ordinating body, potentially the IOC/ UNESCO, UNEP or a collaboration of the two agencies, should host the secretariat, which should:

- Produce and publish the Global Ocean Pollution Assessment and Action Plan, as directed by the co-ordinating task force.
- Co-ordinate and support independent stakeholder groups.

About this report

“A Global Ocean Free from the Harmful Impacts of Pollution: Roadmap for Action” is a report from Back to Blue, an initiative of Economist Impact and The Nippon Foundation. The report was written by Economist Impact. The lead author was Jessica Brown, while editorial management was provided by Naka Kondo. The initiative lead for Economist Impact is Charles Goddard.

This roadmap draws substantially upon Back to Blue’s previously published research and engagement activities, including:

- [“The Invisible Wave: Getting to Zero Chemical Pollution in the Ocean”](#), a first-of-its-kind examination of the extent and impact of this issue, informed by an expert panel of eminent scientists and drawing on more than 100 interviews with industry leaders, investors, scientists, activists and policy experts.
- [“The Zero-Pollution Ocean: A Call to Close the Evidence Gap”](#), which called for a co-ordinated response to build a comprehensive and global evidence base about the extent and impact of marine pollution.
- [“Closing the Marine Pollution Data Gap: A Roadmap in the Making”](#), which proposed a framework for this roadmap.
- Five stakeholder workshops conducted between June and November 2023, which explored:
 - [defining a science-based and purpose-driven approach to marine chemical pollution](#);
 - [leveraging existing pollution data sources and knowledge](#);
 - [building a federated architecture of interoperable databases](#);
 - [technology to increase the visibility of marine chemical pollution](#); and
 - [financing and implementation](#).
- A virtual “hackathon” that invited detailed comments on several aspects of the roadmap.

Thank you to all of the interviewees and workshop participants whose insights contributed to the development of this roadmap. Please refer to the individual reports and workshop summaries for a full list. Thank you to the experts and individuals who shared their views over the past two years.

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Centre for Environment Justice and Development, Kenya	REV Ocean
China Water Risk	Rise Up Blue Call to Action
City University of Hong Kong	Roadmap to Zero
Clariant	Royal Netherlands Institute for Sea Research
Climate Adaptation Center	SCCP, Romania
Cornell University	Seabed 2030
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ETH Zurich	Tech to the Rescue
EyeSea	UK Centre for Ecology & Hydrology
Federal University of Bahia, Brazil	UN Environment Programme (UNEP)
Food and Agriculture Organisation of the UN	UN Foundation
Friends of the Upper Wye	UN Global Compact
Global Ocean Trust	UNEP Finance Initiative
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International Chemical Secretariat (ChemSec)	University of Newcastle
International Maritime Organisation	University of Queensland
International Pollutants Elimination Network	University of the Western Cape
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Japan National Institute for Environmental Studies	University of Toronto
Kenya Marine and Fisheries Research Institute	Varda Group
Lonely Whale	Venezuelan Institute for Scientific Research
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Monterey Bay Aquarium	Wildlife Conservation Society
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National Sea Rescue Institute	World Business Council on Sustainable Development
Nekton Foundation	World Maritime University
Nexus3 Foundation	World Resources Institute
Norwegian University of Science and Technology	World Wide Fund for Nature (WWF)
Ocean Community Association	ZDHC Foundation
Ocean InfoHub Project	

Notes

- 1 Back to Blue, "The Invisible Wave: Getting to Zero Chemical Pollution in the Ocean" (2022), <https://backtoblueinitiative.com/the-invisible-wave-getting-to-zero-chemical-pollution-whitepaper/>
- 2 IOC/UNESCO, "State of the Ocean Report 2022", <https://www.unesco.org/en/articles/state-ocean-report-2022>
- 3 See "About This Report" on page 23 of this document.
- 4 Inger Andersen, "The Triple Planetary Crisis: Forging a New Relationship between People and the Earth" (speech delivered for the subcommittee meeting of the committee of permanent representatives, UNEP, July 14th 2022), <https://www.unep.org/news-and-stories/speech/triple-planetary-crisis-forging-new-relationship-between-people-and-earth>
- 5 See Convention on Biological Diversity, "Kunming-Montreal Global Biodiversity Framework", <https://www.cbd.int/gbf/>
- 6 For example, the Basel, Rotterdam and Stockholm conventions to address hazardous chemicals and waste in the ocean, the Minamata Convention on Mercury and various regional conventions.
- 7 Back to Blue, "The Invisible Wave", 82-83.
- 8 This infographic is an edited extract from "The Invisible Wave", 23-25.
- 9 This infographic is created from an edited extract of "The Invisible Wave", 44-45.
- 10 For more details, see Back to Blue, "Closing the Marine Pollution Data Gap: A Roadmap in the Making" (2023), <https://backtoblueinitiative.com/closing-the-marine-pollution-data-gap-a-roadmap-in-the-making/>
- 11 This is an edited extract from Back to Blue, "The Zero-Pollution Ocean: A Call to Close the Evidence Gap" (2022), <https://backtoblueinitiative.com/the-zero-pollution-ocean-a-call-to-close-the-evidence-gap>
- 12 IOC/UNESCO, "Vision 2030", <https://oceandecade.org/vision-2030/>
- 13 IOC/UNESCO, "10 Challenges", <https://oceandecade.org/challenges/>
- 14 See, for example, the Economist Intelligence Unit's case study "Quantifying the Economic Impact of Dead Zones", published in "The Invisible Wave", 114-119.
- 15 IOC/UNESCO, "The Ocean Decade", <https://oceandecade.org/>
- 16 See Go FAIR, "FAIR Principles", <https://www.go-fair.org/fair-principles/>
- 17 The "good enough" principle. For more context on how this can apply to environmental monitoring, see David Johnson, "Environmental Indicators: Their Utility in Meeting the OSPAR Convention's Regulatory Needs", *ICES Journal of Marine Science*, 65, no. 8 (November 2008), 1387-1391, <https://doi.org/10.1093/icesjms/fsn154>
- 18 Including challenge 2: "Protect and restore ecosystems and biodiversity," challenge 7: "Expand the Global Ocean Observing System," challenge 8: "Create a digital representation of the ocean," and challenge 9: "Skills, knowledge and technology for all". See IOC/UNESCO, "10 Challenges".
- 19 IOC/UNESCO, "State of the Ocean Report 2022".
- 20 United Nations, "United Nations Member States Endorse Outline of Third World Ocean Assessment Draft that Will Expand Knowledge of All Ocean Aspects Including Sustainability", April 20th 2023, <https://press.un.org/en/2023/sea2177.doc.htm>
- 21 UNEP, "Global Chemicals Outlook", <https://www.unep.org/explore-topics/chemicals-waste/what-we-do/policy-and-governance/global-chemicals-outlook>
- 22 As recommended by the UN Ocean Decade Vision 2030 Working Group 1; white paper forthcoming.
- 23 See European Chemicals Agency, "Candidate List of Substances of Very High Concern for Authorisation", <https://echa.europa.eu/candidate-list-table>
- 24 This approach aligns with recommendations from Imperial College London's Transition to Zero Pollution Initiative. See Imperial College London, "Transition to Zero Pollution", <https://www.imperial.ac.uk/academic-strategy/academic-strategy-projects/transition-to-zero-pollution/>
- 25 See "Global Framework on Chemicals: For a Planet Free of Harm from Chemicals and Waste", <https://www.chemicalsframework.org/>
- 26 "IOC Ocean Data and Information System", <https://odis.org/>

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