Knowledge for a thriving ocean

Geopolitical shifts are fracturing global agendas, sidelining Sustainable Development Goals as well as climate and biodiversity commitments. This is especially risky for the ocean, a key climate regulator and biodiversity hub that has the potential to underpin a regenerative blue economy. In 2020, it generated US$2.6 trillion in goods and services, fed over three billion people, and absorbed a large share of CO_2 emissions and associated excess heat—yet faces accelerating degradation due to climate change, overexploitation, pollution, and weak governance. Amid global polarization, science remains open, multilateral, and vital to ocean stewardship. Scientific, Indigenous, and local knowledge systems—if adequately funded, integrated, and applied—can drive governance, innovation, and sustainability. Yet they remain somewhat disconnected from policy. This *Policy Brief* produced by the International Scientific Committee of the One Ocean Science Congress identifies concrete steps to link knowledge systems with decision-making and strengthen ocean health, resilience, and inclusive prosperity.

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KEY MESSAGES

- In an era of rising uncertainty, open and shared knowledge is our first line of defense. Without strong and efficient knowledge-sharing systems, we cannot assess risks, guide marine policy, or build adaptive capacity.
- Strengthening science and knowledge is a political choice. Ocean research—from biodiversity monitoring and deep-sea exploration to climate modeling—remains underfunded. Rising military and commercial conflicts risks weakening vital investment in knowledge creation and sharing. Prioritizing knowledge in budgets and cooperation is key to meeting global ocean goals and building a regenerative blue economy.
- Integrating diverse knowledge systems makes decisions more legitimate, relevant, and fair. Indigenous, local, and scientific knowledge should be connected through knowledge co-production with stakeholders and right-holders, and this should become standard practice.
- Knowledge must lead to action. Investment in knowledge can drive measurable outcomes—from ecosystem restoration to marine resource management and resilience in coastal communities.
- UN Ocean Conferences should be a defining moment to secure a knowledge-based ocean future. UNOC3 offers a rare chance to align leadership, policy, and funding for inclusive partnerships and lasting impact.

INTRODUCTION

Today's rapidly shifting geopolitical landscape is narrowing the dominant political agendas to focus on short-term economic, security and resource access issues—often to the detriment of efforts to achieve Sustainable Development Goals and tackle the climate and biodiversity crises. This is particularly dangerous for ocean action, which requires multilateral collaboration to deliver policies that address the role of a healthy ocean as a critical regulator of the global climate, a reservoir of biodiversity, and the foundation of a regenerative blue economy.

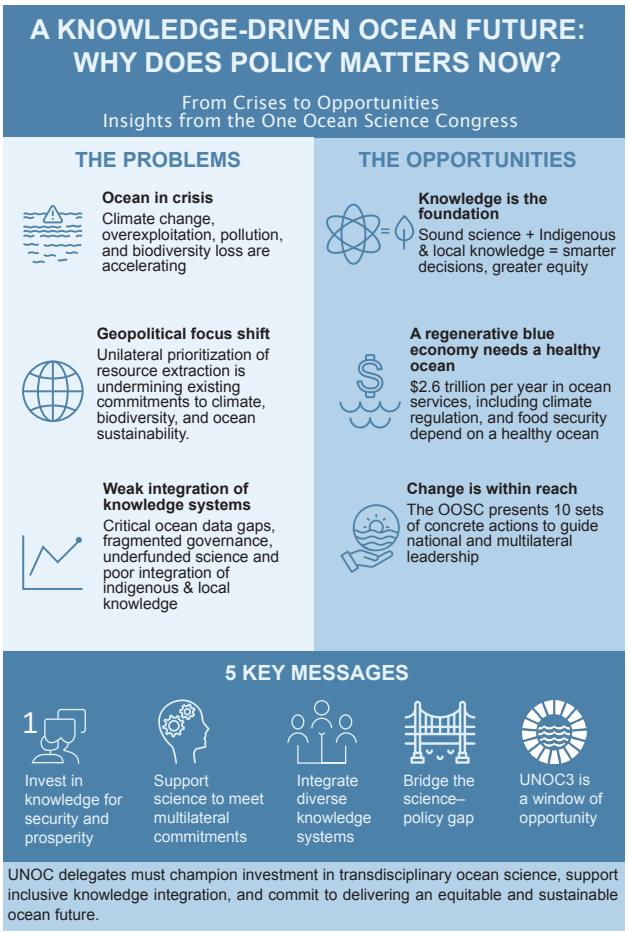
The ocean contributed an estimated US$2.6 trillion in goods and services in 2020 (OECD, 2025). It feeds over three billion people (FAO, 2020), absorbs about 25% of anthropogenic CO_2 emissions, and stores more than 90% of excess heat due to human activity (Gattuso *et al.*, 2015). Yet, ocean health is deteriorating due to intensifying climate change, overexploitation, pollution, and fragmented governance.

As the world polarizes into fragmented geopolitical blocks engaged in difficult economic and political interactions, science remains multilateral, open and universal, and is increasingly essential to underpin shared ocean use and stewardship. Scientific, Indigenous, and local knowledge systems—when properly supported, integrated, and applied—provide the foundation for effective ocean governance, innovation, risk management, and sustainable economic development (Abram *et al.*, 2019). Yet, ocean science remains chronically underfunded, and, along with other knowledge systems, undervalued, and insufficiently connected to decision-making. Gaps in monitoring, inequities in access, and silos between disciplines and cultures, further deepen the disconnect between ocean knowledge and decision making, and hinder our ability to act effectively.

At this critical juncture, we have an opportunity to change course. This policy brief lays out actionable areas to align knowledge systems with policy frameworks—ranging from ocean observing and modeling to knowledge co-production, that can propel the path toward a regenerative blue economy, which multiplies the contribution of the ocean to the global economy while ensuring improved ocean health.

These recommendations are not just about science—they are about building resilience, legitimacy, and accountability in ocean governance. They position knowledge as a strategic lever for climate adaptation, biodiversity protection, and inclusive prosperity. Here we provide a summary of a set of recommendations[1] as well as associated key messages prepared by the International Scientific Committee of the One Ocean Science Congress (OOSC): text in parentheses refer to the recommendations of the full document.

1. Gattuso J.-P., Houllier F., Adams J., Amon D., Bambridge T., Cheung W., Chiba S., Cortes J., Duarte C., Frölicher T. L., Gelcich S., Gephart J., Gjerde K., Greaves D., Haugan P., Li D., Takoko M., Tuda A., 2025. Recommendations to Heads of State and Government from the Internatio-nal Scientific Committee of the One Ocean Science Congress, Nice, 3-6 June 2025. https://doi.org/10.5281/zenodo.14361191.



BOX. UNOC AS A WINDOW OF OPPORTUNITY.

The United Nations Ocean Conferences (UNOC) are specifically designed to advance the implementation of Sustainable Development Goal 14 (SDG 14). The third edition, UNOC3, to be held in Nice, France, is centered on the theme *"Accelerating action and mobilizing all actors to conserve and sustainably use the ocean"* (UNOC3 website).

"Ocean action" encompasses the full spectrum of strategies and initiatives aimed at tackling the challenges facing the ocean while ensuring its long-term health and sustainability. UNOC serves as the only multilateral platform where ocean issues are addressed in a comprehensive, cross-cutting manner—moving beyond siloed discussions confined to individual conventions, agreements, or treaties.

UNOC3 represents a pivotal moment to catalyze transformative change through voluntary commitments by participating countries, as well as through the outputs of the Ocean Action Panels (OAPs), which are expected to shape the formal negotiations.

To ensure that ocean action is grounded in the best available scientific knowledge, a major scientific congress will precede UNOC3. The *One Ocean Science Congress*—organized by its International Scientific Committee, acting as the scientific pillar of UNOC3—has been mandated to deliver

science-based recommendations that directly inform Heads of State and Government participating in the conference.

The ocean is inherently interconnected with numerous global policy frameworks and is a critical component of the biosphere necessary for achieving the goals of the United Nations Framework Convention on Climate Change and Convention of Biological Diversity. Addressing climate, sustainable development, and biodiversity goals together can help overcome tradeoffs and create win-win synergies (Pörtner *et al.*, 2023; United Nations, 2023). We advocate for a collaborative effort where ocean scientists and stakeholders advising on various conventions work together to map opportunities for urgent actions that can simultaneously advance global targets for climate, biodiversity, land degradation (acknowledging that many drivers of ocean impacts originate on land), and sustainable development. While multilateral law-making faces challenges, the Law of the Sea has shown signs of progress (e.g., Freestone *et al.*, 2024), reflecting a willingness among nations to address gaps in ocean governance and stewardship. This presents a significant opportunity to create a robust platform for ocean science to drive actionable outcomes for the ocean's future.

RECOMMENDATIONS

A Global Vision for a Global Commons

The ocean is a vital global commons that sustains life, regulates climate, and supports cultures and economies across the planet. To protect this shared heritage, humanity must transition from an extractive relationship with the ocean to one of stewardship, responsibility, and reverence (R1). This shift requires embracing a plurality of knowledge systems, especially those held by Indigenous Peoples and Local Communities, whose deep-rooted understanding of marine ecosystems complements scientific perspectives. Fostering this inclusive approach also means recognizing the rights of the ocean and its ecosystems, valuing cultural heritage, and promoting community guardianship. Supporting this vision, the equitable management of marine and coastal ecosystems must be prioritized by designating at least 30% of the ocean as effectively protected Marine Protected Areas and restoring 30% of degraded zones, using holistic strategies that address land-sea interactions and enhance biodiversity (R3). Moreover, a unified global effort must be underpinned by strong scientific infrastructure and long-term investment in interdisciplinary knowledge production that guides policy and empowers decision-makers to act in the interest of both people and the planet (R10). This integrated vision for the ocean as a global commons ensures that all nations and communities have a shared stake in its protection, fostering cooperation, inclusiveness, and long-term resilience.

Concrete, Actionable Solutions Grounded in Science

Facing unprecedented climate and ecological crises, the path to ocean sustainability must be based on bold, science-backed solutions. A phase-out of fossil fuels and a rapid transition to net-zero marine infrastructure—such as offshore renewables and low-carbon technologies—are crucial to achieving global climate goals (R2). Marine and coastal ecosystems must be protected through integrated planning and restoration at scale, targeting biodiversity loss and improving resilience against climate impacts and economic activities (R3). In the deep ocean, harmful human activities like mining and bottom trawling must be paused until scientific knowledge ensures sustainable, equitable use of these ecosystems, which play critical roles in carbon storage and planetary regulation (R4). The benefits derived from marine genetic resources should be shared fairly, through robust legal frameworks, open-access databases, and inclusive technology transfer—especially to countries with limited access (R5). Combating illegal, unreported, and unregulated fishing requires ending harmful subsidies and building port state capacities to enforce existing regulations (R6). Ocean-based food systems can be made more resilient and equitable by supporting small-scale fishers, integrating Indigenous practices, and ensuring the nutritional safety and accessibility of seafood (R7). Ending marine plastic pollution demands a full life-cycle approach—reducing unnecessary plastic production and promoting circular economies (R8). To reduce the environmental footprint of maritime transport, international collaboration must support green fuels, port upgrades, and low-impact ship design while protecting particularly sensitive sea areas (R9). Together, these science-informed actions offer a comprehensive and integrated path forward.

A Commitment to Justice, Equity, and Inclusion

Ocean sustainability cannot be achieved without addressing deeply-rooted social inequities and ensuring that all communities—not just powerful actors—have a voice in shaping the future of marine governance. Global efforts must recognize the knowledge, values, and roles of Indigenous Peoples and Local Communities, as custodians of marine spaces, and the rights of all humans to live in balance with a healthy nature (R1). This commitment to justice must extend to climate action, ensuring that the unique impacts and risks faced by marginalized and Global South communities—such as sea level rise, habitat loss, and food insecurity—are met with culturally relevant and equitable adaptation strategies (R2). As the world debates the future of deep-ocean activities, fairness demands a pause of harmful extractive practices, and a shift towards inclusive research, governance, and benefit-sharing frameworks (R4). The wealth generated by marine genetic resources must not be concentrated in the hands of a few; rather, equitable access, technology sharing, and the recognition of non-monetary benefits are essential for fairness between nations and generations (R5). Equity also applies to labor and food systems: fishers, seafood workers, and small-scale producers—many of whom are women—must be protected and supported across the value chain, with fair policies and legal protections (R6, R7). Building a just ocean future requires democratizing knowledge production and access, recognizing social innovation derived from public awareness and mobilization, ensuring that research is accessible, inclusive, and co-produced with affected communities (R10). Only by embedding equity into every layer of ocean governance can we secure a truly sustainable and fair ocean future.

Ensuring Transparency and Accountability

Effective ocean governance relies on systems that foster transparency and demand accountability from all actors. Marine genetic resources, increasingly valuable for pharmaceuticals, biotechnology, and industry, must be accessed and shared through transparent legal frameworks and open data repositories that ensure traceability and equitable use (R5). Ensuring transparency in trade, licensing, and access arrangements is also important to tackle illegal, unreported, and unregulated fishing (R6). Marine plastic pollution poses a multifaceted threat, and robust accountability frameworks are needed to track the full life cycle of plastics, from production to ocean leakage. Global harmonization of monitoring methodologies will allow for consistent reporting and policy evaluation, while life-cycle assessments and extended producer responsibility will help identify polluters and reduce waste at the source (R8). In maritime transport, accurate emissions tracking, satellite-based monitoring, and standardized reporting systems are critical to enforcing decarbonization goals. Ports must be equipped with the infrastructure to handle low-emission vessels, and regulatory gaps must be closed to prevent evasion of international standards. Protecting particularly sensitive sea areas and monitoring ship strikes, oil spills, and underwater noise require enforcement mechanisms that go beyond symbolic designations (R9). These efforts must be underpinned by accessible data and clear governance structures to build public trust, ensure compliance, and hold violators to account. When institutions operate transparently, and responsibilities are clearly defined, sustainable ocean management becomes possible.

Investing in Knowledge as the Foundation for a Sustainable Ocean

Sustainable ocean action depends on strong scientific foundations. Climate mitigation and adaptation must be guided by high-resolution ocean observation systems and integrated models capable of forecasting changes, measuring impacts, and informing policy (R2). Understanding biodiversity and ecosystem function is crucial to maximise conservation success of coastal and marine ecosystems (R3). Particularly, advancing knowledge on the vulnerability of deep-sea ecosystems to human disturbance is urgently needed to support long-term decision-making and to ensure that potential uses, such as deep-sea mining or carbon sequestration, are sustainable and equitable (R4). The exploration and application of marine genetic resources demand transparent, accessible databases, and international cooperation to level the playing field for nations with limited scientific capacity (R5). At the heart of these strategies is the need for ambitious, interdisciplinary research programs that connect natural sciences with engineering, digital technologies, and the social sciences (R10). Investment is also needed in innovation—such as new sensors, autonomous vehicles, and digital twins—to improve data collection and analysis. Fostering social innovation should also be viewed as a collective response to advance social and solidarity-based ocean economies, which are urgently needed in the context of the global crisis. Crucially, infrastructure for monitoring, forecasting, and sharing information must be equitably distributed, enabling all nations around the world to engage fully in marine scientific research and evidence-based governance. Funding gaps must be closed through multilateral support, public-private partnerships, and dedicated financing for SDG14. Scientific excellence, inclusivity, and collaboration must become the norm if we are to equip decision-makers with the tools to manage ocean resources wisely and sustainably. Current shocks to science are revealing vulnerabilities that weaken the resilience of ocean science, by excessively relying on infrastructure supported by one, or a few, nations. Designing more robust global cooperative ocean science efforts should lead to more resilience products and outcomes.

CONCLUSION

The future of the ocean—and by extension, of humanity—depends on our ability to reconnect science, equity, and governance. As geopolitical tensions and environmental crises converge, the ocean remains a unifying force and a vital source of life, prosperity, and resilience. Yet, the threats it faces are accelerating, while the systems designed to protect and manage it remain fragmented and under-resourced. The International Scientific Committee of the One Ocean Science Congress has outlined a clear, actionable agenda: embed knowledge at the heart of ocean policy, ensure equitable access and participation, invest in science and in all forms of innovation, including social innovation, and enforce transparency and accountability across sectors. These are not aspirational ideals—they are political, financial, and moral imperatives. With the Third UN Ocean Conference on the horizon, the global community has a critical opportunity to commit to a knowledge-driven, inclusive, and just ocean future. The time to act is now—decisively, collectively, and boldly.

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