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Collaborative bottom-up Trust Missions: a perspective on long-term strategies with and for people and Nature

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The environmental and climate crises are linked to rising global inequity. Because of its centrality in the living Earth, the Ocean represents a unique opportunity to restore equity, engaging society through harmony with Nature. The United Nation's Ocean Decade and European Union's Mission Ocean and Waters recognize this centrality, but have focused on top-down actions. Here, we advocate for collaborative Trust Missions, aimed at empowering citizens through networking and bottom-up transformative actions.

Both the European Union (EU) and the United Nations (UN) recognize that a healthy environment is essential for sustainable development[1–3]. The central relevance of a healthy and resilient Ocean is further underlined by the two largest international programs in Ocean Sciences, the EU Mission Restore our Oceans and Waters by 2030 and the UN Decade of Ocean Science for Sustainable Development[4,5]. These top-down programs focus on technical remediation and adaptation actions to reconcile a healthy environment with economic growth and development. However, the disappointing current regional and global development statistics evidence a need of prioritizing qualitative overall development over quantitative economic growth. In this perspective, we argue that the strategy for overall development should include both top-down and bottom-up programs, orchestrating them to effectively support the participation of people in communities that prime individual and collective happiness in harmony with Nature.

Top-down approaches have undoubtedly created important policy frameworks, but their implementation requires intermediate structures and they may further lack the local legitimacy and adaptive capacity required for effective operation. Bottom-up approaches can be much better linked to the reality of each specific case but they are usually more limited in scale and may have substantial difficulties for coordination[6–8]. Here we examine how the UN and the EU have incorporated citizen engagement in their sustainability programs and conclude that there is an urgent need to create collaborative Trust (hope and care) Missions, empowering the citizens and communities to seek and implement bottom-up preventive and transformative environmental actions. The current technical Missions focus on short- or mid-term economic growth, while the proposed Trust Missions would be a long-term investment with and for people and Nature. The challenge is to prioritize individual, collective and societal development for the present and future generations, via the support and empowerment of bottom-up movements. In these times of social, environmental and climatic crises, empowering individuals and communities is likely the best strategy not only for a healthy and resilient socio-economic system, but also for a society that values non-cognitive personal and collective development as much as knowledge and physical wellbeing.

Following its creation in 1945, the United Nations (UN) set its initial goals at securing peace, protecting human rights, and creating the framework for international justice and social progress. Eighty years later, the UN

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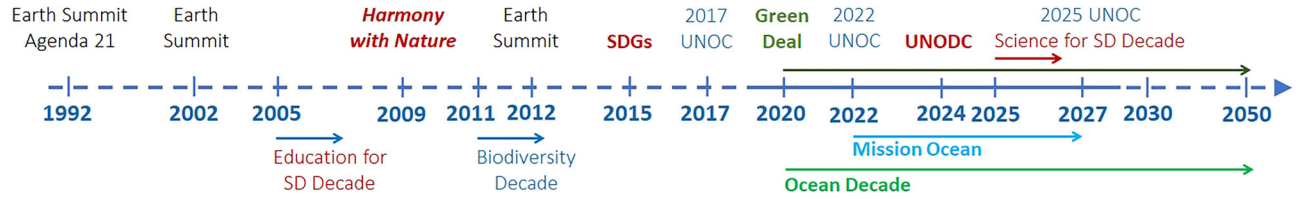

Fig. 1 | Time evolution of the major international sustainability programs that have the Ocean at their core. The introductory section of this article sets the historical context that in 2015 led to the UN SDGs while the remaining sections explore the connections between the UN and EU programs on SD, with emphasis on those related to the Ocean. Bold letters highlight those events that are most connected with citizen engagement; the UN General Assembly resolution on Harmony with Nature is italicized to emphasize its strong symbolism. SD sustainable development, SDG SD goal, UNOC UN Ocean Conference, UNODC UN Ocean Decade Conference.

has widely expanded its objectives by highlighting 29 major evolving issues that require urgent international attention[1]. Only two of these current goals are directly related to the environment – oceans and the law of the sea, and climate change – but there is no doubt that many of the other major UN priorities, from food and poverty to water and health, are intimately linked to a healthy environment, including the Ocean. Indeed, the current UN motto[9] – *Peace, dignity and equality on a healthy planet* – sends a very clear message that the planetary crises are closely linked to the overexploitation of planet Earth and the waste of resources by a minority[10–15]. (Throughout this article we follow the UN in its declaration of Harmony with Nature, see next section, and capitalize both Nature and Ocean to emphasize their unicity and living condition, in the same way as it is done with the living Earth, and further use Ocean in singular to stress its global interconnection; the only exceptions are when quoting text or when using it in compound nouns, e.g. ocean literacy.)

In the early 1990s, the UN formally acknowledged that lasting social development must be firmly rooted on environmental sustainability. At the UN Conference on Environment and Development (Earth Summit, 1992), the UN General Assembly (UNGA) launched the Agenda 21 with the central objective of achieving global sustainable development (SD) by the year 2000, through a dozen environmental topics, including the protection of oceans, seas and coastal regions (Fig. 1). However, at the two subsequent UN conferences on SD, the Earth Summit 2002 and the Earth Summit 2012, only slow effective progress was made. Nevertheless, the last summit produced the document *The Future we Want*[16], with precise phases towards implementing a global sustainability strategy. It also marked the start of a process that led to the 2015 UN Sustainable Development Summit, where the UNGA adopted the resolution *Transforming our world: the 2030 Agenda for Sustainable Development* (Agenda 2030) with 17 global Sustainable Development Goals to be achieved by year 2030[1,2,17,18] (SDGs; Fig. 1).

The SDGs provide the basis for a resilient and inclusive pathway to achieve the economic, social and environmental dimensions of development, recognizing the interconnection of the individual and social crises with the environmental and climate crises. The 29 UN compelling global issues[19] can be summarized as global crises in equity – which involve all sort of human egoisms and exploitations of people and Nature, ranging from poverty to wars – and in individual-community happiness – which reaches far beyond physical wellbeing by including integrative-health aspects such as eco-anxiety[20–23] and lack of personal peace (*solastalgia*)[24,25]. Nevertheless, the environmental and climate crises are possibly the clearest expression of our lack of harmony with Nature, our excesses in using rather than our will of being part of planet Earth.

The goal of this article is to analyze how the UN and EU policies on scientific research have evolved in terms of promoting and supporting citizen engagement with the Ocean. We review the ideas behind economic growth and overall development under the SDGs, and examine how the EU plans to become a global leader in environmental sustainability. We then explore how the UN has incorporated ocean sciences and citizen engagement to reach the SDGs, and how the EU has incorporated the Ocean in its strategy towards sustainability through its principal research funding program, Horizon Europe, and further consider the relevance and role of citizen engagement in this process. We conclude that the mobilization and engagement of individuals, organizations and networks is the only way for a meaningful economic, societal and environmental transformation, and that this approach must be actively supported via collaborative bottom-up *Trust* Missions.

Harmony with Nature and the Green Deal

Remarkably, but possibly much less known than the SDGs, in 2009 the UNGA acknowledged that "*in order to achieve a just balance among the economic, social, and environmental needs of present and future generations, it is necessary to promote harmony with Nature and the Earth*" and furthermore recognized "*the interdependence that exists among human beings, other living beings and the planet we all inhabit*" by declaring April 22 as the International Mother Earth Day[26–28]. In these 15 years since this declaration, a total of 12 resolutions on Harmony with Nature have been adopted by the UNGA, often in the form of dialogues, addressing a wide range of issues that include science and education, SD, biodiversity, Earth jurisprudence, ethical economy and consumption patterns, poverty eradication and climate justice, human health and the engagement of citizens and societies. In all cases, the focus has been on social participation with a non-anthropocentric vision of Nature, promoting an Earth-centered rather than a people-centered implementation of the SDGs agenda.

The UN movement on Harmony with Nature, however, has had little impact on governmental policies and practices. Sustainability is still viewed from a utilitarian, paternalistic and anthropic perspective that focuses on a healthy Earth system rather than on the search for an individual and collective sense of pertinence to Mother Earth. The economic system is based on immediate returns with a utilitarian view of Nature, and happiness is promoted from the perspective of *having* rather than *being*[29], which distances us from the harmonious rhythms of Nature (see section on Growth and Economy in the Supplementary Materials). The widespread use of Gross Domestic Product (GDP)[30] as a measure of a country's relative development or progress is a good example of this. GDP is a purely quantitative measure of the monetary value of economic output and ignores anything more qualitative such as environmental health, wellbeing and happiness. Our current patterns of resource extraction and consumption – the "bleeding" of planet Earth – causes climate change and ecosystem degradation, largely impacting the less-developed and most-vulnerable populations and jeopardizing the wellbeing of the future generations. Yet, humankind still appears to rely on unknown or insufficiently tested bioengineering solutions to the environmental and climate crises, excluding the indispensable social and institutional changes. The inevitable consequence is that the Earth's overexploitation will not only persist, but will likely increase.

Since the 1960s, socio-ecological movements around the globe have prompted governments to move away from nonrenewable energy sources, initially out of fear of nuclear power and more recently in response to climate change[31]. During the 1970s energy crisis and recently, because of the Russia-Ukraine war, public investment in renewable energy sources – and nuclear in several countries – has been driven by the economic need to cope with the soaring oil and gas prices. The last decade has witnessed an

exponential growth of these grassroots movements – as evidenced by the worldwide manifestations, particularly of young people, during the Conferences of the Parties – denouncing the overexploitation of the Earth's resources by a minority. This loud call for a more harmonious relation with Nature – which has received both extensive criticism and praise – should be envisioned by governments not only as a pressing social imperative but also as an extraordinary opportunity for transformative individual and societal wellbeing.

These grassroots movements, and the green political parties that share some of their views, prompted the EU into a block strategy to tackle climate change, biodiversity loss and pollution – the 2020 Agenda[3] for a circular and carbon-neutral economy by 2050 – known as the Green Deal (Fig. 1). The citizen-engaged components of the Green Deal, in particular the Horizon Europe research and innovation program, represent a major step towards more participatory and democratic governance, beyond any possible doubts on their real transformative potential, institutional influence and practical convenience[32,33]. Horizon Europe, for example, actively funds several projects that implement deliberative democratic activities such as citizen and stakeholder assemblies (e.g. PREP4BLUE[34]), or that promote greater social inclusion and diversity in European marine sciences and policies (e.g. TIDAL ArtS[35]). This represents a real possibility to harness the enthusiasm and innovation of civil movements into the social transformative process, setting the true interests of people – rather than those determined by the economic interests of a minority – at the heart of the EU agenda. Horizon Europe is indeed a unique opportunity for placing Harmony with Nature as the leading vision for transformative change in Europe that can serve as a worldwide model.

The Ocean in the UN and EU development strategies

The SDGs are outlined in terms of targets, each with one or more specific indicators of progress, but their implementation relies largely on the committed work of UN agencies, supported by the member states through their voluntary contributions. As a result, resources for an international operational plan that goes beyond promoting the engagement of all stakeholders, from citizens to governments, are very limited. When it comes to Ocean health, logistics rely on the Intergovernmental Oceanographic Commission (IOC) of the UN Educational, Scientific and Cultural Organization (UNESCO)[36], founded in 1960 and composed of 150 member states. The IOC promotes the advancement of marine sciences towards SD through international cooperation and capacity development in ocean monitoring, management, research and literacy. In particular, the IOC contributes to and reports on SGD 14 (Life below water: Conserve and sustainably use the oceans, seas and marine resources for SD).

Building on meetings that began in 2017, the IOC launched the Decade of Ocean Sciences for Sustainable Development (hereafter Ocean Decade), to run between 2021 and 2030 (Fig. 1). The Ocean Decade directly addresses SDG 14[37] but extends to all other SDGs because of the economic, social and environmental relevance of the Ocean. Under the motto "*The science we need for the Ocean we want*", the Ocean Decade aims to be a bottom-up "*revolution to unlock innovative science solutions*" towards SD. This ambition is most evident in the implementation of the Decade's Challenges 9 (Skills, knowledge, technology and participatory decision-making for all) and 10 (Restoring society's relationship with the ocean)[38,39].

Challenge 9 explicitly calls for participation in science and governance, and Challenge 10 seeks to integrate non-academic knowledge into marine science and innovation. The inclusive enlightenment foreseen in Challenge 10 is expressed in its main objective – "*to understand the values and services of the ocean for human well-being, culture and SD, and identify and overcome behavior barriers for changing humankind relation with the Ocean*"[31] – which is to be accomplished through the inclusion of qualitative sciences, such as arts and philosophy, as well as traditional and local knowledge that recognizes the benefits of respecting Nature, such as indigenous codesigned and integrative science[40]. Both Challenges 9 and 10 are supported by the activities in thousands of Ocean Decade actions[4] around the globe – many of which are bottom-up and participatory in essence.

Complementary to the Ocean Decade bottom-up strategy, the UN has also organized three high-level top-down Ocean Conferences (2017, 2022 and 2025)[41], attended by high-level representatives of national governments and other relevant stakeholders. These Conferences aimed to demonstrate progress towards SDG 14 by adopting intergovernmental declarations of voluntary national commitments for the conservation and sustainable use of the Ocean. France, the co-host country of the 2025 UN Ocean Conference, organised three special events in order to involve the ocean community and stakeholders at large: the One Ocean Science Congress, the Blue Economy and Finance Forum, and the Ocean Rise and Coastal Resilience Coalition Summit[42].

The EU Green Deal – launched in December 2019, approved in January 2020, and largely implemented in 2020 and 2021[43,44] – is set to transform the EU's economy and society towards climate-neutrality by 2050, turning Europe into the first climate-neutral continent. The Green Deal strategy promotes, supports, and enforces sustainable transport, clean-technology manufacturing, clean energy sources, renovated and efficient homes, the restoration of natural ecosystems, and the establishment of international commitments towards climate neutrality. To deploy and implement the Green Deal strategy, the EU will mobilize no less than €1 trillion, equivalent to 30% of its multiannual budget (2021–2028), which includes one-third of the €1.8 trillion NextGenerationEU Recovery Plan[45]. The implementation is based on numerous interconnected programs, including the conservation and restoration of Nature (biodiversity strategy), the development of environmental policies (environmental action program), as well as action plans (APs) for unpolluted air, water and soil (zero pollution AP) and sustainable circular economy (circular economy AP). It also includes Horizon Europe, a research and innovation program designed to drive transformative change by developing and deploying the necessary scientific, societal and economic innovations, with the particularity of engaging citizens in the process.

Horizon Europe has an indicative budget of about €95 billion[46–49], supporting three pillars as well as a program to strengthen and expand research collaboration. The largest of these pillars is the one on excellent science, innovation, and global challenges and industrial competitiveness (GC&IC), with an estimated funding of some €55 billion, comprising six Clusters and five Missions (see section on The Ocean in the Horizon Europe Program in the Supplementary Materials.) Three of the GC&IC Clusters are directly related to environmental sustainability: Cluster 2 (Culture, Creativity and Inclusive Society), Cluster 5 (Climate, Energy and Mobility) and Cluster 6 (Food, Bioeconomy, Natural Resources, Agriculture and Environment). Additionally, three of the Missions are also directly connected to environmental sustainability: Adaptation to climate change, hereafter Mission Climate; Restore our Ocean and waters by 2030, hereafter Mission Ocean; and Climate-neutral and smart cities, hereafter Mission Cities[5,50,51].

Social objectives are indeed present in the three Clusters and three Missions related to the environment, albeit with different emphasis. In particular, Ocean research appears in all Clusters and Missions but stands out in Mission Ocean. Table 1 provides a qualitative overview, based solely on the keywords found in the objectives and strategies in the implementation plans, showing how connected these programs are to environmental protection and regeneration (both to Nature in general and to the Ocean in particular) and how much they intend to engage citizens in this process. Notably, Cluster 6 and Mission Ocean are the only programs highly connected to both the environment and citizen participation but, as expected, only Mission Ocean is deeply focused on restoring the health of the Ocean and water bodies. The total commitment for all five Missions during the 2021–2023 implementation period was €1.9 billion[52], and Mission Ocean launched calls for a total of €197.4 million for the 2023–2024 work program[53].

The UN Ocean Decade and the EU Mission Ocean and Waters

The health of the Ocean, the principal and essential component of the living Earth, is at stake[6]. The environmental and climate crises are driving deep

Table 1 | Qualitative assessment of linkages with Nature, Ocean and citizen engagement, for the EU Clusters and Missions related to environmental sustainability

Program	Nature	Ocean	Citizen engagement
Cluster 2 - Culture, Creativity and Inclusive Society	Moderate	Low	High
Cluster 5 - Climate, Energy and Mobility	Moderate	Low	Moderate
Cluster 6 - Food, Bioeconomy, Natural Resources, Agriculture and Environment	High	Low	High
Mission Climate - Adaptation to climate change	Moderate	Low	High
Mission Ocean - Restore Our Ocean and Waters by 2030	High	High	High
Mission Cities - 100 climate-neutral and smart-cities by 2030	Moderate	Low	Moderate

The low, moderate and high levels stand for not showing, marginally present or centrally present, respectively, in the general and specific objectives or enablers of the Clusters and Missions. This qualitative rating reflects our interpretation of the program documents and may not reflect the full complexity of implementation practices or outcomes; we recognize that different stakeholders may assess these relationships differently.

changes whose evolution is difficult to predict: the marine ecosystems are degrading, with a dramatic loss of biodiversity and resilience, and the Earth's thermodynamic state is likely approaching a threshold towards an unknown state of equilibrium[54]. Such an exceptional challenge requires a multiscale approach, involving the cooperation of governmental units at all levels, from small to large, as well as the bottom-up participation of very diverse citizen organizations, in what has been termed a polycentric governance[6–8,55–57]. Such a polycentric approach — characterized by multiple-overlapping decision-making centers that operate at different scales — is a promising alternative to centralized top-down models in climate and environmental governance. The Ocean Decade and the Mission Ocean are examples of two different multi-stakeholder approaches within this polycentric landscape.

Prompted by the severity of the climate-environmental crisis, the UN launched the Ocean Decade as part of the strategy to achieve SDG 14 on Life below water, and the EU launched Mission Ocean as part of the Horizon Europe research and innovation program under the Green Deal. The Ocean Decade promotes bottom-up participation, transdisciplinary co-construction and co-production of knowledge by engaging scientists, indigenous communities, civil society and policy makers in collaborative processes to create actionable ocean science[58,59]. In contrast, the EU's Mission Ocean pursues a mission-oriented innovation policy framework characterized by structured, targeted actions, clear objectives and cross-sectoral coordination to accelerate systemic change in ocean and water policy[5]. These complementary approaches illustrate the dynamic interplay between decentralized innovation and strategic policy-making in modern environmental policy. Both the Mission Ocean and the Ocean Decade have proven to flexibly adapt and evolve to the observed deficiencies, the changing situations and the emerging opportunities.

The Ocean Decade naturally matured during its conception and initial implementation. From the original desideratum of seven outcomes linked to all 17 SDGs[60], the Decade is now mainly expressed in terms of 10 grand challenges[61], each of them to be accomplished through a sequence of three objectives via the establishment of actions (Fig. 2). The objectives are: to identify the knowledge required for SD and deliver the necessary ocean data and information; to build capacity and generate comprehensive interdisciplinary ocean knowledge; and to increase the use of this knowledge towards sustainable solutions. The actions are both top-down and bottom-up initiatives that include programs (from regional to international), projects, activities, all types of contributions and the establishment and/or backing of citizen and stakeholder networks.

The 2024 UN Ocean Decade Conference (UNODC)[62], held in Barcelona in April 2024, was an excellent forum to promote and network citizen and civil organizations within the Ocean Decade, highlighting the progress made and setting the pace for many meetings before, during and after the conference. One tangible outcome is the set of ten Ocean Decade Vision 2030 White Papers (one per Decade outcome)[63], which contributed to the Ocean action panels in the top-down 2025 UN Ocean Conference (UNOC)[41,64]. The UNODC main event and more than 100 bottom-up satellite events, largely coordinated by civil organizations and networks, confirmed the growing strength of networking within the global Ocean community.

Mission Ocean has also evolved substantially since the original 2018 ideas[65], turning more interdisciplinary and cross-sectoral, and diversifying both the strategies and the number and topics of the calls for proposals[5]. Currently, there are also plans for cross-mission topics, a natural consequence of the centrality of climate and environmental action in the Climate and Cities Missions. A distinctive feature in the formulation of Mission Ocean is that its three objectives (protect and restore marine and freshwater ecosystems, prevent and eliminate pollution, and make the blue economy carbon neutral and circular) are pursued through two enablers (Fig. 2). The first one is the digital twin of the Ocean – a virtual ocean and water knowledge system that builds on existing and planned infrastructures and services, aimed at monitoring and forecasting – a fairly concrete and knowledge-oriented tool. In contrast, the second enabler is a ground-based collaborative and inclusive facilitator aimed at empowering society towards transformation, particularly to mobilize, engage and interconnect people for the conservation and regeneration of the Ocean.

Citizen engagement within the Ocean Decade and Mission Ocean

While there are national governments that do not recognize climate change, and even justify the need of a high ecological footprint, in many nations and regions there is a growing awareness of the reality and impact of these global crises. Indeed, most people in many developed and even less-developed countries are aware of the reality of the environmental and climate crises[66], and even recognize that their ecological footprint often contributes to an unsustainable socio-economic pathway, yet they do not change their daily negligent behavior. This lack of response to these crises reflects a major disconnection between knowledge and emotions, possibly combined with other feelings such as fatalism (nothing can be done), skeptic denial (the crises are false or exaggerated, because the changes are difficult to appreciate at daily scales), selfishness (complete lack of empathy towards vulnerable communities and future generations), or unrealistic confidence that humankind can continue overexploiting the Earth because miraculous bioengineering solutions will appear. The truth is that transformative social changes can only be accomplished with the engagement of people, a responsibility that goes from small daily actions to multiplicative local-to-international committed networking.

Collaborative citizen engagement and networking is an important component of the Ocean Decade (Fig. 2). Outcome 7 (An inspiring and engaging Ocean, understood and valued in relation to human well-being and SD) and Challenge 10 point directly to the relevance of mobilizing citizens. However, supporting and engaging people requires financial resources, thus the implementation plan of the Ocean Decade[67] (hereafter Decade Plan) is largely dedicated to stakeholder engagement with the Ocean, proposing diverse measures to secure resources.

In practice, organizations get involved in the Ocean Decade mainly by leading or participating in a Decade action. While the success of the

Fig. 2 | Linking Ocean Decade and Mission Ocean goals. A linkage between the five Mission Ocean objectives/enablers and the 10 Ocean Decade challenges shows that only one Mission enabler and two Decade challenges focus on citizen engagement.

UNODC confirmed the interest of many local-to-global bottom-up movements on the Ocean Decade, it also showed that the Decade has not yet been able to secure funding to support most of these groups. Currently, only three thematic Decade Coordination Offices are being directly funded – one of them on Connecting people and Ocean – and four thematic Decade Collaborative Centers are run by international or regional institutions. Additionally, there are five regional centers/offices, over 40 national committees, and over 50 Decade thematic programs[4]. However, only five of these programs directly aim at promoting citizen engagement actions: Ocean literacy with all, Decade of Ocean empathy, Ocean voices, Ocean cities network, and Cultural heritage framework. Organizations can also engage through the Ocean Decade Network platform[68], a virtual tool that allows exploring and connecting with a limited number (12) of existing communities of practices (CoPs), although none centrally focused on citizen engagement.

Mission Ocean has also incorporated citizen engagement and mobilization as one of its key enablers, a singularity not found in any other Mission (Table 1). The Implementation Plan of Mission Ocean[5] (hereafter Mission Plan) emphasizes that this transformative facilitator must address the following: fill the knowledge-emotional gap; promote the EU global leadership on Ocean & waters sustainability and governance; develop and pilot frameworks and processes; test and apply deliberative democracy mechanisms and social innovation practices; and promote ocean literacy, education and training, and citizen science. The Mission Plan explicitly recognizes that people too often lack responsibility for sustainability in their daily actions, largely because of a knowledge-emotional disconnection, and emphasizes that citizens can be *agents of change*[5].

The Mission Plan is an evolving strategy that feeds from inputs from the Mission projects. One key example is the recently finished PREP4BLUE project[34], the first one funded under Mission Ocean, which aimed to develop the strategies and tools required to achieve the Mission objectives during its development and piloting first phase (2022–2025), thus preparing for the deployment and upscaling during the second phase (2026–2030). Notably, one of the objectives of PRPE4BLUE was to engage, mobilise and network

citizens in the co-design and implementation of the Mission goals, including the development of strategies and tools for citizen mobilisation[69,70]. After three years working closely with numerous and diverse types of citizen organisations[71], a main outcome has been the recognition of the extraordinary potential – physical, intellectual and emotional – that lays behind collective work for reconnecting with the Ocean. Clearly aligned with the Mission Plan, PREP4BLUE recognizes that engaging with the Ocean is, above all, a synergistic process that runs in parallel with the creation and development of inclusive, participatory and democratic networks committed with the environment[5,71]. Promoting citizen involvement implies "*mobilising and empowering citizens for the co-design and co-implementation of solutions*". The citizen engagement enabler must "*facilitate broad ownership and education and co-design the transitions within the communities*" towards the Green Deal targets. The keyword is collaboration[5]: the Mission *"will leverage social innovation throughout the co-design, co-development, co-implementation, and co-monitoring of solutions for sustainable use of the ocean and waters"*.

The Mission Ocean Charter[72] also provides a participatory instrument for engaging private and public stakeholders. Any interested party can pledge "*to co-design, propose and implement policies, programs, projects or initiatives that will contribute to the restoration of our ocean and waters*." By submitting their pledge, the organizations become part of the Mission community, opening up opportunities for collaboration and participation in Mission events.

Trust Missions

Despite the unquestionable relevance given to citizen engagement in both the Mission Ocean and the Ocean Decade, these programs focus primarily on the technical aspects of applied marine sciences. Transformative social science has much less weight, as reflected by the relatively low number of related challenges/objectives in the Decade/Mission. In the Ocean Decade, only one among seven outcomes – Outcome 7 on an inspiring and engaging Ocean – is related to citizen engagement; and only two out of 10 challenges address this topic: Challenge 10 on the relation of humanity with the Ocean and Challenge 9 on knowledge and technology for all, the latter indirectly linked through capacity building (Fig. 2). Regarding Mission Ocean, only one single enabler (public mobilization and engagement in the co-design and co-delivery of the solutions) out of three objectives and two enablers addresses the need to strengthen citizen commitment with the Ocean. The relatively low importance of citizen engagement in the overall strategy of both programs is evidenced in the Decade Network and Ocean Charter platforms, as there is no way for individual citizens to get involved. Both platforms do encourage organizations to submit actions but there is no funding channel.

The lack of effective and clear instruments to engage individuals and to fund ocean-related civil organizations is a major constraint in the implementation of either Mission Ocean or the Ocean Decade. The shortage of resources to support grassroot movements, which is understandable in an Ocean Decade that is still trying to secure funding channels, is a significant handicap in setting up truly transformative programs aimed at empowering civil organizations. Equally binding is that individuals have no clear path to get involved in either the Ocean Decade or Mission Ocean. Both weaknesses call for a rethinking of priorities in both the Decade and Mission Plans, finding and identifying direct and indirect channels for individuals to participate and organizations to get funded. They also point at the benefits of recognizing and supporting projects in Marine Social Sciences that can design and pilot innovative and transformative methods and strategies[71–75].

The technical focus of the Mission Ocean and Ocean Decade programs is no surprise, it simply responds to the dominance of economic growth in the development concept (see section on Growth and Economy in the Supplementary Materials). In the case of Mission Ocean, this emphasis reflects the prominence of the green/blue and circular economy models in the Green Deal strategy, which does not renounce to economic growth. A similar priority can be found in development reports from either the Conferences of the Parties or various private stakeholders[76–80], albeit with some notable exceptions[81]. The truth is, however, that all these approaches have limited effectivity, as shown by diverse climatic, environmental and social indicators: the substantial worldwide increase (+8.5%) and moderate EU decrease (−1.7%) in greenhouse gas emissions between 2015 and 2023[82,83]; the progressive transgression of the planetary boundaries (critical levels in key global processes that could ensure the maintenance of a stable and resilient Earth) between 2009 and 2023[11–15]; the uncertain evolution of poverty over the last three decades, with a global decline thanks to valuable progress in China and India but with negative results in Latin America and especially Africa, and with over one-fifth of the European population at risk of poverty or social exclusion in 2023[84,85].

The above scenario points at the need for an urgent shift towards a new paradigm of SD: the promotion of overall qualitative development rather than quantitative economic growth through a sense of pertinence and harmony in Nature rather than with a utilitarian anthropic perspective. This implies moving from quantitative to qualitative values, from economic growth to integrative development, effectively involving people and, if necessary, proposing and supporting specific measures for economic degrowth (see section on Growth and Economy in the Supplementary Materials).

To back this new paradigm, we propose that there should be two types of Missions: scientific-technical and collaborative. Current programs, with Mission Ocean and the Ocean Decade as good examples, focus mainly on the search for technical solutions. They start from a general idea, call it objective or challenge, and look for remediation (e.g. a clean Ocean) or adaptation (e.g. a safe Ocean) measures. The alternative is to support people in their search and participation in networks and CoPs that prime individual and collective happiness over economic growth. In this complementary approach, citizens and communities would be empowered to design, test and implement preventive measures (e.g. an Ocean that inspires harmony and collaboration) through networking and transformative bottom-up actions. We name these collaborative *Trust* Missions, a name that reflects both hope and care.

The scientific-technical Mission is of short- or mid-term economic interest that prioritizes economic growth, while the Trust Mission is a long-term investment for people and Nature that primes overall development. Certainly, well-communicated science is a powerful enabler for curiosity, emotion and ultimately for people to care for Nature; however, this is a necessary but not sufficient condition: knowledge alone is hardly transformative as people respond mostly to emotions[86,87]. Technology has the power to largely improve human welfare, and planet Earth has reached a situation that does require remediation and adaptation measures, but there is no question that the best science will not deliver effective solutions if humanity – each of us – does not end its excesses, even bioengineering solutions will only delay and exacerbate the problem. The challenge is to find the ways to close the knowledge-emotional gap, as clearly recognized in the Mission Plan[5].

How should these Trust Missions be framed? Given the complexity of the challenges to be addressed – especially the climate and environmental crises — what goals should be pursued? Complex problems require complex integrative solutions, they demand inclusive, collaborative and democratic processes in all phases, from the conception to the implementation of strategies. This suggests that it is time to go back to the origins, to return to larger and more integrative views, possibly mirroring the evolution of applied sciences. From the holistic scientific insight of the great naturalists in the 19th and first half of the 20th century, science moved into an age of overspecialization in the second half of the 20th century, which brought important technological advances but also led to isolation and a consequent loss of scientific creativity and innovation. Major exceptions, such as the development of antibiotics and the structure of DNA[88], indeed were the outcome of interdisciplinary collaboration on complex questions. Conversely, interdisciplinary teams have emerged in the last decades to tackle complex problems – with clear successful examples in fields such as biophysics and complex systems[89].

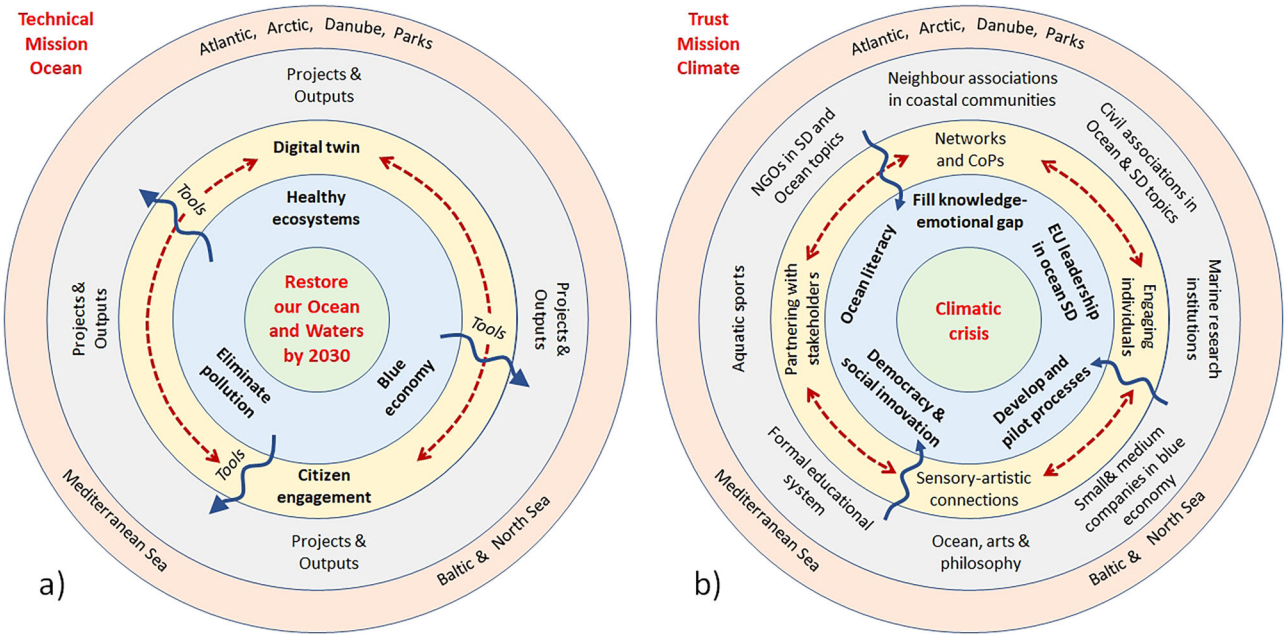

Fig. 3 | A comparative of technical and Trust missions. a Mission Ocean, as an example of a technical Mission: the central green+blue circle represents the general and thematic objectives, encircled by a yellow ring that represents their enablers; these are encircled by technical projects-outputs (gray ring) and the target basins (outer orange ring); the outward-going arrows representing technical and scientific methods and tools developed to carry out the projects and obtain the products. **b** The Climate-Ocean Trust Mission: the central green circle represents the grand (integrative) climate challenge, encircled by a blue ring with citizen engagement objectives and a yellow ring for mobilization strategies; these are encircled by the social actors (gray ring) and the target basins (outer orange ring); the inward arrows represent the co-creation/co-design of collaborative inclusive and democratic methods to reach the citizen engagement objectives.

Building on these experiences, Trust Missions could be framed around the central crises of our time, turning them into opportunities. Global crises – especially the environmental and climate crises – would become naturally interlinked Trust Missions, the most urgent and compelling integrative and transversal programs that require an interdisciplinary and cross-sectoral response from all actors. Trust Missions would refresh the bottom-up participatory role of citizens and civil organizations at multiple levels in developing a polycentric governance. Clearly, technical and Trust Missions are not antithetical or exclusive but naturally reciprocal and complementary. In the presence of proper drivers, or communication mechanisms, the synergetic effect of technical and Trust missions could be extraordinary.

In order to address the environmental or climate crises, the Earth system cannot be divided into lithosphere, hydrosphere, atmosphere, cryosphere and biosphere, as all these components are intrinsically connected, nor does it make sense to ask citizens to engage with one of these five components and neglect the others. Hence, the Trust Missions should also be Earth-system oriented, with some structuring into different chapters for practical reasons but never from a conceptual point of view, e.g. the citizen engagement strategies in a coastal town should likely differ from those in a rural inland community but the goals are the same. Figure 3 illustrates, as an example, the fundamental difference between Mission Ocean and a Trust Mission focused on climate and seaside communities.

Agents of change

We are all agents of change. Each of our apparently tiny daily sustainability actions is significant, they all are the necessary building blocks not only to reduce our ecological footprint but, most important, to spread thoughts and actions towards SD. These daily actions go far beyond a lifestyle without excesses, which prioritizes the principles of recycling, reusing, and especially reducing. They necessarily include an active awareness towards the use of sustainable products – those that come from the circular and local economy – and the investment in equity and sustainable funds and transactions, plus a continuous pressure on policy leaders to avoid unsustainable policies and developments, always prioritizing truly essential infrastructures.

Our personal evolution, both in terms of inner meditation and outer action, is indeed tightly linked to the development of our community. This is a progressive multi-level feedback process: as I evolve and have the will and support to express and share this evolution, then the community will evolve and, in turn, I will feed from the increasing maturity of the community and each of its members. These same generous individual daily steps – apparently small but totally indispensable – work out at the community level, with civil organizations locally adding up towards the global transformation[90,91]. This is a slow but enduring pathway towards lasting transformations, based on continuous feedback between individuals, communities and the entire society, which is then naturally scaled up by national societies and supranational unions such as the EU and the UN.

This process between individuals and the community may often require intermediate structures. As communities get larger, as in neighborhoods of large cities, individuals usually interact with the community through fairly simple social structures that work for the common wellbeing, such as non-profit civil associations of multiple kinds. Further networking can be established among associations with similar objectives, and the resulting networks can link with other networks that have different but related objectives, creating an interdisciplinary and often transectorial CoP. As the networks scale up in size and complexity, individual and collective efforts may not be sufficient to address systemic problems. The challenge is to develop the proper public structures and policies to facilitate and endorse the growing bottom-up opportunities[90,91].

The wonderful thing is that networking and bottom-up actions are a reality. They are already happening in many places without public support, driven by the selfless and empathetic character of many people who believe that they can become agents of change in the face of global crises, people who think globally and act locally. Indeed, pilot actions to engage and mobilize citizens[92] have proven that small investment can lead to significant transformative actions. This is a clear and loud message: investing in citizen mobilization and engagement is an outstanding opportunity to maximize SD results. All public stakeholders should take good note of this opportunity

and create the mechanisms to support the bottom-up initiatives and actors: individuals to evolve not only cognitively through capacity building and ocean literacy, but especially in positive values and emotions through sensory-artistic experiences; associations to attract motivated individuals, carry out their non-profit community service, and network with other civil entities; and networks to explore synergies and develop positive dynamics that lead to transectorial CoPs.

The challenge for public stakeholders is to think not only in terms of immediate economic return but rather to fully value the long-term individual, collective and societal development – for the present and future generations – creating and supporting the right mechanisms to materialize the transition towards a sustainable society with and for people and Nature. In this perspective article, we have proposed that such a profound societal transformation requires the endorsement of bottom-up movements that address the knowledge-emotional gap, and have launched the idea that an effective supporting public strategy would be the creation of Trust-type Missions that engage and mobilize citizens to address the environmental and climate crises. By fully harnessing the power of collaborative work for overall development of people and Nature, the Trust Missions would identify, design and support effective actions and engaging pathways to promote and spread local-to-global sustainability.

In these times of social, environmental and climate crises – and personal crises in much of the developed world[93] – supporting individuals and communities is likely the best strategy not only for a healthy, resilient, productive and fair socio-economic system, but especially to embrace Harmony with Nature. Trust Missions can have an extraordinary transformative value at relatively low cost, investing in a society that cherishes knowledge and physical wellbeing but equally treasures non-cognitive personal and collective development in values such as peace, empathy, sensibility, joy, happiness and love. We encourage the EU, as a global leader in sustainability, to prioritize this bottom-up Trust approach in shaping the Green Deal, its Horizon Europe research and innovation program, and the upcoming European Oceans Pact[94].

Data availability

No datasets were generated or analyzed during the current study.

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References

1. UNGA. *Resolution adopted by the United Nations General Assembly (UNGA) on 25 September 2015 (70/1): Transforming our world: the 2030 Agenda for Sustainable Development*, https://documents.un.org/doc/undoc/gen/n15/291/89/pdf/n1529189.pdf (2015).
2. UN. *Transforming our world: the 2030 Agenda for Sustainable Development, from the United Nations (publication)*. https://sdgs.un.org/publications/transforming-our-world-2030-agenda-sustainable-development-17981 (2015).
3. Charveriat, C. *The Green Deal: Origins and Evolution. Groupe d'études géopolitiques*, https://geopolitique.eu/en/articles/the-green-deal-origins-and-evolution/ (2023).
4. UN. *United Nations Decade Actions - Ocean Decade*, https://oceandecade.org/decade-actions/1 (2024).
5. European Commission. *Ocean and Waters Implementation Plan*, https://research-and-innovation.ec.europa.eu/system/files/2021-09/ocean_and_waters_implementation_plan_for_publication.pdf (2021).
6. Wiener, J. B. Think globally, act globally: the limits of local climate policies. *Univ. PA Law Rev.* **155**, 1961–1979 (2007).
7. Ostrom, E. A general framework for analyzing sustainability of social-ecological systems. *Science* **325**, 419–422 (2009).
8. Ostrom, E. Nested externalities and polycentric institutions: must we wait global solutions to climate change before taking actions at other scales?. *Econ. Theory* **49**, 353–369 (2012).
9. UN. *The United Nations motto: Peace, Dignity and Equality on a Healthy Planet ("About us" page)*, https://www.un.org/en/about-us (2024).
10. Meadows, D. H., Meadows, D. L., Randers, J., Behrens III, W. H. The Limits to Growth. A Report for the Club of Rome's Project on the Predicament of Mankind. (Potomac Associates, 1972).
11. Richardson, K. et al. Earth beyond six of nine planetary boundaries. *Sci. Adv.* **9**, eadh2458 (2023).
12. Lin, D. & Wackernagel, M. *Estimating the Date of Earth Overshoot Day 2024. Global Footprint Network*, https://overshoot.footprintnetwork.org/content/uploads/2024/06/2024-Nowcast-explained.pdf (2024).
13. Persson, L. et al. Outside the safe operating space of the planetary boundary for novel entities. *Environ. Sci. Technol.* **56**, 1510–1521 (2022).
14. Halpern, B. S. Building on a decade of the Ocean Health Index. *One Earth* **2**, 30–33 (2020).
15. Jouffray, J.-B., Blasiak, R., Norström, A. V., Österblom, H. & Nyström, M. The blue acceleration: the trajectory of human expansion into the ocean. *One Earth* **2**, 43–54 (2020).
16. UN. *The Future We want: Outcome of the United Nations (UN) Conference on Sustainable Development (A/CONF.216/L.1). Rio de Janeiro, Brazil, 20-22 June 2012*, https://digitallibrary.un.org/record/3826773 (2012).
17. UN. *Transforming Our World: the 2030 Agenda for Sustainable Development, from the United Nations (webpage)*. https://sdgs.un.org/2030agenda (2015).
18. UN. *The United Nations 17 Goals for Sustainable Development*, https://sdgs.un.org/goals (2015).
19. UN. *United Nations section on Global Issues*, https://www.un.org/en/global-issues (2024).
20. Hickman, C. et al. Climate anxiety in children and young people and their beliefs about government responses to climate change: a global survey. *Lancet Planet. Health* **5**, e863–e873 (2021).
21. Pearson, H. The rise of eco-anxiety: scientists wake up to the mental-health toll of climate change. *Nature* **628**, 256–258 (2024).
22. Diffey, J. et al. Not about us without us – The Feelings and Hopes of Climate-Concerned Young People around the World. *Int. Rev. Psychiatry* **34**, 499–509 (2022).
23. Hurley, E. A., Dalglish, S. L. & Sacks, E. Supporting young people with climate anxiety: mitigation, adaptation, and resilience. *Lancet Planet. Health* **6**, e190 (2022).
24. Albrecht, G. et al. Solastalgia: the distress caused by environmental change. *Australas. Psychiatry* **15**, S95–S98 (2007).
25. Galway, L. P., Beery, T., Jones-Casey, K. & Tasala, K. Mapping the Solastalgia literature: a scoping review study. *Int. J. Environ. Res. Public Health* **16**, 2662 (2019).
26. UNGA. *Resolution adopted by the United Nations General Assembly (UNGA) on 22 April 2009: International Mother Earth Day (A/RES/63/278)*. https://documents.un.org/doc/undoc/gen/n08/487/47/pdf/n0848747.pdf (2008).
27. UN. *The International Mother Earth Day page (22 April)*, https://www.un.org/en/observances/earth-day (2024).
28. UN. *United Nations: Harmony with Nature*, http://www.harmonywithnatureun.org/ (2024).
29. Fromm, E. *To Have or to be?* 2nd ed, 216 (A&C Black, Bloomsbury Revelations, 2013).
30. Van den Berg, H. *Economic Growth and Development*, 3rd edn (World Scientific Publishing Company, 2016).
31. Staggenborg, S. *Grassroots Environmentalism* (Cambridge University Press, 2020).
32. Kopnina, H. Education for the future? Critical evaluation of education for sustainable development goals. *J. Environ. Educ.* **51**, 1–14 (2020).
33. Cooke, B., Kothari, U. (eds) *Participation: the New Tyranny?* 207, (Zed Books, 2021).

34. PREP4BLUE. *Preparing the Research & Innovation Core for Mission Ocean, Seas & Waters*, https://prep4blue.eu/ (2022).
35. TIDAL ArtS. *TIDAL ArtS: Transforming and Inspiring Aquatic Landscapes Through Art and Sciences*, https://tidalarts.eu/ (2024).
36. UNESCO-IOC. *The Intergovernmental Oceanographic Commission (IOC) of UNESCO: IOC Medium-Term Strategy 2022–2029*, https://unesdoc.unesco.org/ark:/48223/pf00003813881 (2022).
37. Global Goals. *Goal 14: Life Below Water*, https://www.globalgoals.org/goals/14-life-below-water/1 (2017).
38. Arbic, B. et al. *Ocean Decade Vision 2030 White Papers–Challenge 9: Skills, Knowledge, Technology, and Participatory Decision-Making for All*, https://doi.org/10.25607/k5ptfp54 (2024).
39. Glithero, L. et al. *Ocean Decade Vision 2030 White Papers-Challenge 10: Restoring Society's. Relationship with the Ocean* https://unesdoc.unesco.org/ark:/48223/pf0000390126 (2024).
40. Buchan, P. et al. A transdisciplinary co-conceptualisation of marine identity. *People Nat.* **6**, 2300–2324 (2024).
41. UN. *The 2025 Ocean Conference*, https://sdgs.un.org/conferences/ocean2025 (2025).
42. UN. *Ocean 2025 Special events. United Nations*, https://sdgs.un.org/conferences/ocean2025/special-events (2025).
43. European Commission. *Delivering the European Green Deal (webpage)*, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en (2021).
44. European Commission. *Delivering the European Green Deal. Publications Office of the European Union*, https://commission.europa.eu/publications/delivering-european-green-deal_en (2021).
45. European Commission. *Recovery plan for Europe (NextGenerationEU)*, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en (2020).
46. European Commission. *European Commission: Directorate-General for Research and Innovation. Horizon Europe strategic plan 2021-2024*. Publications Office of the European Union, https://data.europa.eu/doi/10.2777/083753 (2021).
47. European Commission. *European Commission: Directorate-General for Research and Innovation. Horizon Europe strategic plan 2025-2027*. Publications Office of the European Union, https://data.europa.eu/doi/10.2777/092911 (2021).
48. European Commission. *Horizon Europe, the EU Research and Innovation Programme 2021-2027, General Overview* https://research-and-innovation.ec.europa.eu/document/download/cccea35e-6fe5-4881-85a3-867f98f09376_en (2021).
49. European Commission. *Implementation strategy for Horizon Europe*, https://research-and-innovation.ec.europa.eu/document/download/4663fdfc-42a9-4fde-b0a0-417fd95aee07_en (2020).
50. European Commission. *Climate Change Adaptation Mission Implementation Plan*, https://research-and-innovation.ec.europa.eu/system/files/2021-09/climat_mission_implementation_plan_final_for_publication.pdf (2021).
51. European Commission. *100 Climate-Neutral and Smart Cities by 2030: Implementation Plan*, https://research-and-innovation.ec.europa.eu/system/files/2021-09/cities_mission_implementation_plan.pdf (2021).
52. European Commission. *Questions and Answers: The EU's 2021-2027 Long-term Budget & NextGenerationEU*, https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_4748 (2021).
53. European Commission. *Horizon Europe Work Programme 2023-2024: Missions*, https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-12-missions_horizon-2023-2024_en.pdf (2021).
54. Lenton, T. Early warning of climate tipping points. *Nat. Clim. Change* **1**, 201–209 (2011).
55. Lubell, M. & Morrison, T. H. Institutional navigation for polycentric sustainability governance. *Nat. Sustain.* **4**, 664–671 (2021).
56. Acton, L., Gruby, R. L. & Nakachi, A. Does polycentricity fit? Linking social fit with polycentric governance in a large-scale marine protected area. *J. Environ. Manag.* **290**, 112613 (2021).
57. Morrison, T. H. et al. Building blocks of polycentric governance. *Policy Stud. J*. https://doi.org/10.1111/psj.12492 (2023).
58. Pendleton, L. H., Alexandroff, S. J., Clausen, A., Schmidt, J. O. & Browman, H. I. Co-designing marine science for the ocean we want. *ICES J. Mar. Sci.* **80**, 342–346 (2023).
59. Bassan, N. Co-design and co-production in the Ocean Decade. *One Ocean Science Congress*, OOS2025-1458, https://doi.org/10.5194/oos2025-1458 (2025).
60. Pelegri, J. L., Gili, J. M. & Martinez de Albeniz, M. V. *The Ocean We Want: Inclusive and Transformative Ocean Science*. (Consejo Superior de Investigaciones Científicas (España), 2022).
61. UN. *Ocean Decade 10 Challenges*, https://oceandecade.org/challenges/ (2024).
62. UN. *Ocean Decade: the 2024 Ocean Decade Conference*, https://oceandecade-conference.com (2024).
63. Ocean Decade. *The Ocean Decade Vision 2030 White Papers*, https://oceandecade.org/publications/ocean-decade-vision-2030-white-papers/ (2024).
64. UN. *2025 UN Ocean Conference Stakeholder Consultation Summary Report*, https://sdgs.un.org/sites/default/files/2024-10/2025 UN.Ocean Conference Stakeholder Consultation Summary Report.pdf (2024).
65. European Commission. *Mission-Oriented Research & Innovation in the European Union: A Problem-solving Approach to Fuel Innovation-led Growth. Publications Office of the European Union*, https://www.horizon-europe.gouv.fr/sites/default/files/2022-11/mazzucato-report-2018-pdf-7474.pdf (2018).
66. Flynn, C. et al. *People's Climate Vote 2024 Results. UNDP & University of Oxford*, https://peoplesclimate.vote/document/Peoples_Climate_Vote_Report_2024.pdf (2024).
67. UNESCO. *The United Nations Decade of Ocean Science for Sustainable Development (2021-2030)*: Implementation Plan, https://unesdoc.unesco.org/ark:/48223/pf0000377082 (2021).
68. UN. *The Ocean Decade Forum*, https://forum.oceandecade.org/ (2024).
69. PREP4BLUE. Work Package 3: Empowering Citizens to Engage with the Mission and Implementation Activities to Support the Mission, https://prep4blue.eu/work-packages/work-package-3/ (2025).
70. PREP4BLUE. Tool Box for Citizen Engagement. https://prep4blue.eu/portfolio/toolbox-for-citizen-engagement/ (2025).
71. Pelegrí, J. L. et al. A co-created portfolio of mission-relevant pilot activities to support evaluation of project tools and methods. *Zenodo* https://doi.org/10.5281/zenodo.14771623 (2025).
72. European Commission. *Mission Charter: Restore our Ocean and Waters*, https://projects.research-and-innovation.ec.europa.eu/en/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/restore-our-ocean-and-waters/mission-charter (2021).
73. Kelly, R. et al. Empowering young people with climate and ocean science: Five strategies for adults to consider. *One Earth* **5**, 861–874 (2022).
74. McKinley, E. et al. Development and expansion in the marine social sciences: Insights from the global community. *Iscience* **25**, 104735 (2022).
75. Whyte, D. et al. Planning for citizen participation in the EU mission to restore our ocean and waters by 2030. *Marit. Stud.* **23**, 44 (2024).
76. Climate Champions. *2030 Climate Solutions: An Implementation Roadmap*, https://climatechampions.unfccc.int/2030-climate-solutions-an-implementation-roadmap/ (2023).

77. European Commission. *Global Gateway*, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/stronger-europe-world/global-gateway_en (2023).
78. World Bank Group. *World Bank Group and The 2030 Agenda*, https://www.worldbank.org/en/programs/sdgs-2030-agenda (2016).
79. World Economic Forum. *Sustainable Development Impact Meetings – Transformative Action on the SDGs*, https://www.weforum.org/press/2024/09/sustainable-development-impact-meetings-transformative-action-on-the-sdgs/ (2024).
80. UN Framework Convention on Climate Change (UNFCCC). *UNFCCC Standing Committee on Finance: 2nd Report on the Determination of the Needs of Developing Country Parties Related to Implementing the Convention and the Paris Agreement*, https://unfccc.int/sites/default/files/resource/UNFCCC_NDR2_Report_Web_Final.pdf (2022).
81. Berg, C. *Sustainable Action: Overcoming the Barriers*. Routledge, https://s3.amazonaws.com/sustainabledevelopment.report/2024/sustainable-development-report-2024.pdf (2020).
82. Eurostat. *Quarterly Greenhouse Gas Emissions in the EU*, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Quarterly_greenhouse_gas_emissions_in_the_EU (2024).
83. Crippa, M. et al. *GHG Emissions of All World Countries - 2024 Report*. Publications Office of the European Union, Luxembourg, https://edgar.jrc.ec.europa.eu/report_2024 (2024).
84. Eurostat. *Living Conditions in Europe - Poverty and Social Exclusion*, https://ec.europa.eu/eurostat/statistics-explained/index.php/Living_conditions_in_Europe_-_poverty_and_social_exclusion (2024).
85. Eurostat. *Key Figures on European Living Conditions – 2023 Edition. Publications Office of the European Union*, https://ec.europa.eu/eurostat/documents/15216629/17704280/KS-HC-23-001-EN-N.pdf (2023).
86. Markus, H. R. What moves people to action? Culture and motivation. *Curr. Opin. Psychol.* **8**, 161–166 (2016).
87. Tamir, M., Schwartz, S. H., Oishi, S. & Kim, M. Y. The secret to happiness: feeling good or feeling right?. *J. Exp. Psychol. Gen.* **146**, 1448 (2017).
88. Casadevall, A. & Fang, F. C. Specialized Science. *Infect. Immunity* **82**, 1355–1360 (2014).
89. Massachusetts Institute of Technology. *The Third Revolution: The Convergence of the Life Sciences, Physical Sciences, and Engineering*. MIT White Paper, https://www.aplu.org/wp-content/uploads/MITwhitepaper.pdf (2011).
90. Avelino, F. & Rotmans, J. Power in transition: an interdisciplinary framework to study power in relation to structural change. *Eur. J. Soc. Theory* **12**, 543–569 (2009).
91. Newell, P., Twena, M. & Daley, F. Scaling behaviour change for a 1.5-degree world: challenges and opportunities. *Glob. Sustain.* **4**, 1–13 (2021).
92. PREP4BLUE. *Funding for Pilot Actions – Winners Announced*, https://prep4blue.eu/prep4blue-funding-for-pilot-actions-winners-announced/ (2024).
93. Helliwell, J. F. *World Happiness Report 2024*. Report No. ISBN 978-1-7348080-7-0, (Wellbeing Research Centre, University of Oxford, 2024).
94. European Commission. *Shaping the European Oceans Pact: Commission Launches Call for Evidence. European Commission*, https://oceans-and-fisheries.ec.europa.eu/news/shaping-european-oceans-pact-commission-launches-call-evidence-2025-01-20_en (2025).

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Author contributions

J.L.P. conceived and wrote the first draft of the manuscript; J.L.P., N.B., P.P. and D.W. critically reviewed the manuscript first draft, developed new specific sections, provided additional bibliography and wrote the original and final submitted manuscripts; P.A., H.K., T.K., C.O.Q., I.O., E.P., C.S. and A.V.T. performed critical reviews and contributed with new ideas and references to the original and revised manuscripts; J.L.P., N.B. and P.P. contributed with artwork and table contents and formatting; all other co-authors (I.t.B., I.v.B., M.E.C., N.F., I.G.-L., H.H.-S., F.L. and J.P.) revised and approved the manuscript contents.

Competing interests

The authors declare no competing interests.

Additional information

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