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TOWARDS A NEW CULTURE OF REFLEXIVE AND DIVERSE MARINE TRANSDISCIPLINARITY

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Abstract

This chapter contains the concluding remarks to the book “Transdisciplinary Marine Research”. It highlights the strengths, challenges, practices and new directions of different approaches to marine transdisciplinarity presented in the chapters of this book. Importantly, it highlights key aspects to consider in future research agendas to overcome difficulties and develop new transdisciplinary approaches in the co-production of culturally sensitive knowledge, as well as in the assessment of socio-ecological interactions that need to be incorporated into management and governance systems to effectively implement the transition to sustainable oceans and seas. Taking into account the concepts, methods and case studies in this book, transdisciplinarity in marine science is defined as a research paradigm that aims at merging different ways of knowing the sea to produce a knowledge pool grounded in science, empirical assessment, and social and cultural experiences which should inform actionable political decision-making.

Contemporary transdisciplinary challenges

Transdisciplinarity in marine science is a research paradigm that aims at merging different ways of knowing the sea to produce a knowledge pool grounded in science, empirical assessment, and social and cultural experiences which should inform actionable political decision-making.

Since the ‘participatory turn’ in the 1990s, the engagement of non-scientists has been a key element of transdisciplinary research both in terms of participation in the scientific process itself as well as in research governance (Jasanoff 2003, Wynne 2007). From the 2000s onwards, new approaches to transdisciplinarity signal a shift from a scientific-theoretical orientation toward problem-oriented research (Hirsch-Hadorn et al., 2008; Mobjork et al., 2010) highlighting the necessary pragmatic, practical, and ‘real-world’ engagement of research on complex environmental problems (Jahn et al. 2012). Hence, transdisciplinarity pivots at the science-society-policy interface, undermining the contextually rooted problems towards transformative political change. Reflexivity addressing research practice is an important step in this consecution (Jahn et al, 2012). The practice of reflexivity ensures the testing of knowledge in the real world by constructing a space for "joint problem solving" with the participation of all societal agents. Knowledge emerges from iteration and reflection for the

creation of a common pool of knowledge, and as a way of assessing the quality of knowledge (Gibbons et al., 2010) - ensuring a democratic process.

Investigating real-world problems to master socio-ecological complexity requires us to think of them as a whole, taking into account their culturally embedded context dependency (Sholtz, 2006). Therefore, case studies facilitate an empirical approach from the viewpoint of local practice and everyday experiences with a view to producing a large-scale disruptive process towards socio-ecological transformation.

Despite the long history of the terminology of transdisciplinarity, a common and standardised definition of transdisciplinarity is still lacking (Jahn et al., 2012; cf. Chapter 1). At the same time, as argued by Brum et al. in Chapter 2, marine management policies that are still based on traditional approaches show clear signs of failure. This double shortcoming reflects weaknesses in the evolution of the transdisciplinary approach itself, at the same time as environmental problems persist or worsen, making an urgent orientation towards problem-solving research necessary.

In the 1970s Rosenfeld (1972), focusing on the research process, pointed out that “transdisciplinary refers to a process in which representatives of different disciplines work jointly for extended periods to produce novel and shared conceptual frameworks that have the promise of generating transcendent theoretical avenues” (1972:1351). In the early 2000s, transdisciplinarity subsumed interdisciplinary collaboration by blurring disciplinary boundaries, and was seen as a process of exchange over, as Godemann (2008) calls it, a “common knowledge base” that bridges science and society by involving all social actors participating in the production of problem-oriented knowledge:

“Transdisciplinarity is a critical and self-reflexive research approach that relates societal with scientific problems; it produces new knowledge by integrating different scientific and extra-scientific insights; its aim is to contribute to both societal and scientific progress; integration is the cognitive operation of establishing a novel, hitherto non-existent connection between the distinct epistemic, social–organizational, and communicative entities that make up the given problem context.” (Jahn et al. 2012: 9)

The contemporary challenge is to ensure democracy, equity, and justice in addressing the claims of all social groups, taking into account cultural diversity that may integrate other principles of thought that do not always coincide with those of Western society. As Petriello and his co-authors underline in Chapter 7 of this book, governance systems, technological solutions to climate change, and environmental protection measures intersect with gender, ethnicity, class, and indigenous claims. Responses to complex socio-ecological problems often do not take into account whether they match or counteract the beliefs and values of affected human populations or the multifaceted connections between them and their environment. The question of the appropriate cooperation of science, social actors, business, and public administration in this new scenario opens up new challenges in the constantly evolving transdisciplinary approach. Although the need for transdisciplinary studies is well recognised in theory, a constant review of transdisciplinary approaches is therefore needed to facilitate their implementation in the most appropriate way.

The chapters in this book have identified the weaknesses and strengths of transdisciplinarity, as well as pointed out issues to be addressed in future research agendas in order to take a step further towards achieving a transition towards social, economic, and ecological sustainability of the seas and oceans (see Fig. 14.1, p. 258). The chapters are embedded in current debates on transdisciplinarity to shed light on new directions to help achieve this goal.

The main conclusion of this book is that the key transdisciplinary principle is to recognise the value of the “common good”, to think in plural, trust, and acknowledge the knowledge of the other by using inclusive methodologies that subscribe to dialogical and relational ontologies and epistemes. As highlighted throughout this book, transdisciplinarity is a research paradigm that aims at the appropriate merging of different ways of knowing to produce a knowledge pool grounded in science, empirical assessment, social and cultural experiences, and practices that should inform actionable political decision-making

Table 14.1. Book chapters and key insights. C = conceptual; M = methodological; E = empirical/case study

Chapter	Type	Focus topic	Key insight(s)
1 Grünhagen et al.	C	Understandings of transdisciplinarity in the marine sciences	Definitions of transdisciplinarity are multifaceted across all marine fields, scientists and stakeholders. This can promote collaboration and knowledge exchange.
2 Brum et al.	C	Societal constructions of the ocean now and in the past	‘Humanising’ conceptualisations of the ocean fosters discussions about power relations, cultural discourses and representations of the marine.
3 K. Collins	C	How theories of space can help contextualise ocean knowledges	Societal views of the sea and shaped by underlying beliefs, values, cultural backgrounds, and ethics. Deconstructing them is key to problem-solving.
4 P. Buchan	C	Democratisation of the human-ocean relation via marine citizens	Marine citizens can diversely enrich the peer community of ocean research, but institutional and personal barriers to knowledge sharing exist.
5 Carrick & Fitzsimmons	M	Critical reflection of a stakeholder process that used Bayesian Belief Networks (BBN)	BBNs are a useful tool for improving stakeholder participation by visually representing qualitative data, but their complexity can be a pitfall.
6 McAteer & Flannery	M	The impacts of professionalising marine citizen science	Professionalisation reduces the capacity of citizen science projects to empower local knowledge and to transform marine management processes.
7 Petriello et al.	M	Knowledge co-production with Intuit communities in Canada	Knowledge co-production benefits from iterative self-reflection and the deconstructions of meanings, purpose, processes, and outcomes.
8 Schaber et al.	M	Assessing stakeholders’ views on sustainability via a quantitative survey	Sustainability is defined differently across stakeholders and groups; finding and using common ground can improve fisheries management.
9 J. SaCuoto	E	Ethnography can help consider fishers’ knowledge in sustainable policies in Portugal	Co-production of transdisciplinary ocean knowledge needs valuable local, embodied, and empirical knowledge from communities, and so does sustainable ocean management.
10 Ramos et al.	E	Collecting local ecological knowledge from fishers in Uruguay	Incorporating local knowledge into research provides initiatives for effective management and promote dialogue between stakeholders.

11 Franco et al.	E	Using a participatory methodology to understand impacts of an oil spill on fishers in Brazil	Collaborative research principles constitute an important tool in the study of environmental disasters, which are complex and transdisciplinary.
12 Florido & Abbot	E	Analysing a political stakeholder process around a marine reserve in Conil, Spain	If plural stakeholder knowledges are not effectively integrated into a political process, participants lose trust. Transdisciplinarity can help to address socio-ecological challenges.
13 Steins et al.	C	Reflecting long-standing collaboration with fishers, ways forward for marine transdisciplinarity are discussed	Not more scientific knowledge will solve marine management problems, but transdisciplinary approaches to both science and management that transform our marine governance systems.

Source: own compilation based on this book

The social and the ecological are melted into a unique purpose, that of preserving and conserving our oceans and seas to keep both them and us alive. The conceptual, methodological and practical considerations outlined in the different chapters of this book (see Table 14.1) clearly highlight the necessity of integrating diverse types of knowledge, diverse practices of living off and with the ocean, and diverse ways of managing its resources in order to create conditions that respect the needs of human and non-human communities interwoven with the marine. In order to achieve this goal, we think that the following cornerstones should be integrated in future approaches to transdisciplinarity in the marine domain.

1) Who takes part in transdisciplinary approaches and how?

Among the most common questions that arise from the contributions in this book is who comes into play in transdisciplinary processes. What role do different actors take on in the co-production of new knowledge? What is the value of their participation, the establishment of relationships between the participating parties, and the translation of research results into actions for the socio-ecological transformative turn? The multifaceted image of the term transdisciplinarity explored in Chapter 1 illustrates how the uses of the concept can vary depending on the disciplines involved, the research topic addressed, the research objectives, the complex socio-ecological problems addressed, the types of knowledge involved, as well as its understanding of society and its involvement in transforming the environment. All these determinants can be placed at the interface of a cross-scale linkage (from the most local to the global) involving multiple actors (see Fig. 14.1). The contributions in this book address key points such as who asks the research question(s), what questions are in focus, and for what purpose we shape different approaches to transdisciplinarity. It is thus not about setting a standard or agreed-on definition, but about understanding the patterns of transdisciplinarity and the general meaning as a perspective of inquiry in the pursuit of cooperation between knowledges. Janico argues that “transdisciplinary vision offers hope for humanity with its advocacy of an open-minded rationality that embraces natural science, social science, and humanities” (2012: 221). In addition, we claim that society taking part at different levels of marine reality forms a key component of transdisciplinarity practice, and so do the institutions involved. Beyond a theoretical, epistemological, and methodological approach, transdisciplinarity is a research attitude that is internalized by researchers, as “[w]hen

transdisciplinarity is considered as a way of being, it is inseparable from personal life and extends far beyond the professional activities of a researcher” (Rigolot, 2020).

Transdisciplinarity is not a stage of research, a process, but a research perspective to address and understand complex issues, a new research paradigm. Understanding transdisciplinarity in this way means producing new concepts and opening up new approaches that bring together all disciplines in the definition of the subject of study where all prisms of the socio-ecological front are included. To practice transdisciplinarity, we need sufficiently broad concepts that imply the involvement of different actors and their knowledge committed to the challenge of solving complex socio-ecological problems. Depending on the conceptualization of the real-world problem to be addressed, the social aspect will be incorporated in the research, underpinning one or another understanding of transdisciplinarity. Modulable in its content in relation to the actors referred to in the socio-ecological relationships, the disciplines evoked to address the research questions, and the understanding of the reality described, transdisciplinarity must be embedded in new concepts. New concepts imply targeting new research problems and objectives in which different disciplines are integrated and which go beyond their own internal disciplinary logic.

< Figure 14.1 here >

Figure 14.1. Infographic – Strengths, challenges, practices and new directions of Marine Transdisciplinarity. Source: based on all chapters in this book. © Vera Köpsel

Therefore, relying on new ontologies and epistemes of knowledge or, as Wheaton et al. (2021) highlighted, “conflicts of knowledge”, and “contextuality” considering a co-learning process at the local level is a constant negotiation. A negotiation is here viewed as a mutual learning process and appreciation of the difference, and it is not contradictory to producing a common ground of knowledge when “unbridgeable differences such as incommensurability of certain knowledges or knowledge communities where integration by consensus is not a viable or preferred option” (Pohl, 2021: 23). On the contrary, as underlined in Chapter 7, indigenous knowledge negotiation can become assimilation that reproduces colonial practices, while indigenous voices are silenced and lost in the confusion of scientific jargon and specific technical language divorced from society. The practices of knowledge co-production described by Petriello et al. (Chapter 7) brought to the table the precariousness and weaknesses of collaborative work when conducting research among indigenous peoples. The chapter rightly appeals to humanize collaborative projects. In addition, Sá Cuoto highlights in Chapter 9 the need to preserve fisherfolk’s knowledge as key knowledge for facing challenges such as climate change.

Collaboration with the participation of the affected social agents becomes paramount to producing sound problem-solving actions, especially in the face of environmental disasters such as the oil spill described by Franco et al. in Chapter 11. As concluded by the chapter authors, “conceptual theoretical models that emerge from participatory processes, can contribute to a better understanding of the research results and favour greater integration of the

knowledge acquired with intervention actions, generating more co-participatory and co-designed solutions” (p. 214 of this book).

Although timidly introduced, wide-ranging conceptions have begun to proliferate, encompassing social and environmental purposes and describing current issues to be addressed at the science-society-policy interface. They present themselves as a promising alternative for a transdisciplinary perspective following a holistic approach. The notion of ocean health, for example, places the need to understand "how health and marine environments and people are intertwined" at the centre of the problematisation of the marine socio-ecological crisis (pp. XX). The concept encapsulates concerns about sustainability, human well-being, and ocean health, which are inextricably linked. It captures new ideas about conservation in which the relationship between humans and the marine environment is the driver of the central research questions in which society is viewed as part of the problem but also part of the solution. As highlighted by Brum et al. in Chapter 2, considering this kind of conceptualization of reality implies new ways of producing theory, methods, and practices from different worldviews and forms of knowledge, even overcoming limits and obstacles of the disciplinary frameworks themselves, building what Franke et al. (2020) call meta-disciplines such as "ocean and human health" (Franke et al., 2020). This is an emerging line in a lot of universities and research centres pioneering in transdisciplinary approaches (Lloret et al., 2020).

II) How do we relate to others?

As formulated in Chapter 2 of this book, the way we relate to each other becomes the critical focus for understanding contemporary socio-environmental problems. This implies being critical of the dominant knowledge production paradigms which are predominantly based on the ontology and epistemology of Western societies, underpinned by the nature-culture dualism that undermines binary boundaries. This worldview, however, fosters classifications and categorizations that attribute roles which polarise social and gender relations, reproducing asymmetries and inequalities of power. A renewed epistemological, ontological, and paradigmatic approach that takes a more dialogical, integrative perspective of diverse and multi-scalar knowledge can ensure that all dimensions at stake are considered. The contemporary socio-ecological crisis is the consequence of the disregard of some of the cogs in the socio-ecological system. The failure of management policies in fisheries, for instance, reflects this unbalance (Gómez and Maynou, 2021) that occurs when transdisciplinarity is dominated by few as summarized in by Steins et al. in Chapter 13 and observed in its practice by McAteer & Flannery in Chapter 6. Knowledge research in the field of fisheries is already well-researched, as is reflected by the contributions in this book (see Chapters 9, 10, 12, 13). Based on longstanding collaboration with fishers, Chapter 13 illustrates very well this experience of knowledge co-production with fishers and the fishing industry.

Knowledge production and values reflect our relational position towards the environment, whether hierarchical or equitable, reciprocal or defined according to an order of precedence that guides the importance of factors in this relationship (which can be situated between the most anthropocentric to the most ecocentric). As described by Collins in Chapter 3, the reasons

to support conservation may vary, but it is the position of social actors in all processes of knowledge creation in a socio-ecological relationship that sheds light on the ethical and moral orientation of values and beliefs. As highlighted in Chapter 3, “understanding the foundations of these beliefs is crucial for understanding how decisions are made” (p. 63). Concretising the abstract theoretical assumptions that science has about real-world problems helps to unmask the power relations and inequalities that can prevent alleged nature-based solutions from producing strong dissent because of the social consequences these solutions might produce (see Chapter 5). As stated in Chapter 3, acknowledging the uncertainty of scientific knowledge post-normal science assumes that by incorporating local knowledges, traditional scientific knowledge is supplemented with ethical, moral, and cultural values central for ensuring democracy.

III) Knowing the knowledge systems

As highlighted by Steins et al. in Chapter 13, knowledge pool production means relying on each other’s expertise, disciplines, stakeholders, industry and administration. Blurring disciplinary boundaries to find spaces of interaction and exchange does not mean abandoning one’s disciplinary identity but, on the contrary, reinforcing it and getting to know it better, as suggested by Florido & Abbot in Chapter 12. It is necessary for each of us to hold an internal knowledge of our own expertise, but also of others in order to know our role in relation to them and to suitably trespass disciplinary boundaries. We can get to this point via the comprehension of and cooperation with other professionals to avoid adulteration of concepts, perspectives, methodologies, and theories originally produced in the frame of other disciplines than our own. Borrowing perspectives from other disciplines that are inappropriately reinterpreted can produce a significant distortion by trivializing power relationships and reproducing, rather than changing, the inequalities they are intended to redress. Considering social aspects in environmental assessments does not only mean to invite stakeholders to participate in our research, but to recognise their knowledge in the results (see Chapter 6). Recognizing the potentials of each disciplinary expertise whilst cooperating with professionals from different backgrounds instead of trying to produce transdisciplinary assessments from single dominant disciplinary perspectives may help to bridge different ontologies. Chapter 12 shows us clearly how misunderstandings and incomprehension in knowledge transfer and risk sharing can lead to failure in transdisciplinary projects. Instead, researchers should deliberately deal with disciplinary differences to fuel feedback processes since outputs and inputs are co-dependent (Blythe et al., 2017).

At the forefront of misunderstandings remains the recognition of the value of different kinds of knowledge. By the standards of Western science, objectivity is what attributes value and legitimacy to knowledge. Experiential knowledge contains judgement based on perceptions, feelings, beliefs, and, ultimately, variable subjectivities according to interests that traditionally place it as supplementary to the production of ‘real’, objective scientific knowledge. In line with Wheaton et al. (2021), the chapters in this book show us that knowledge production is - and always has been - politically and historically at the interface of the field of political economy. Moreover, the subjective dimension of the objective valorisation of concerns and

problems can reveal mismatches between abstract knowledge produced according to large-scale global political and economic values and local-scale ecological, socio-cultural, and economic specificities. This can fuel claims for rights, dissent, and conflict (see Chapter 3). The disqualification of subjective knowledge can unfold an escalation of misunderstandings between the different social actors involved in the production of knowledge for policymaking.

The key to transdisciplinarity, as Semenyuk (2019) points out, is not so much the integration of knowledge per se, but "the integration of more or less distant objective-subjective and methodological branches of knowledge" (ibid: 4). Between "soft" (social scientific) and "hard" (natural scientific) disciplines, an integration implies approaching divergent epistemologies. Here, methodological design can crucially influence the degree of permeability between the social and natural sciences. Greater or lower permeability of knowledge may tip the balance towards one or the other knowledge system by reproducing existing hierarchies, for example when experiential knowledge is used as complementary to validate traditional Western scientific knowledge. Notwithstanding, also the contrary effect may be produced when knowledges are integrated in a balanced way by making other ways of knowing known and respected (Noël-Knapp et al., 2019).

Participatory processes are underpinned as those methodological inquiry systems best suited to merge qualitative (subjective) and quantitative approaches. As shown by Carrick & Fitzsimmons in Chapter 5, the combination of participatory models and flexible methods such as PAR allows subjectivity to penetrate the rigidity of quantitative methodologies by integrating 'soft' science (narratives, emotions, perceptions, beliefs, values) into 'hard' science, thus helping to give social and cultural meaning to quantitative assessments. Nonetheless, as concluded in Chapter 5, flexible methodologies do not equal malleable or manipulable approaches that co-opt dissenting voices during participatory and reflexive processes by trying to situate supposedly socially-embedded solutions on their ground through the mere process of consultation or communication with stakeholders. Despite this, in some cases, consultation or the use of local knowledge to complement and shed light on scientific assertions may help to introduce data that otherwise would remain unattained. In Chapter 10, for instance, Ramos et al. highlight the value of using local knowledge to identify factors that may influence the vulnerability of fishing communities.

IV) Shaping the politics of participation

McAteer & Flannery describe in Chapter 6 how "politics of participation", as it is called by Kok et al. (2019), drive the dynamics of transdisciplinary processes. The power to decide who may participate in producing knowledge not only obliges to define the role of scientists and science in relation to society, but also the actors involved in relation to science and to who they are. Depending on this definition the direction of society's engagement in research will vary. Designing and implementing well-moderated participatory processes is the way of bridging science and society with the political will to produce a transformative turn at the science-society-policy interface.

When it comes to determining who may participate in a research process, Kok et al. (2019) point out the necessity to politicise the inclusion of actors as it is a conscient political act. If we

do not consciously define who are our stakeholders, we risk (re)producing inequalities and reproducing interests. Moreover, it is necessary to combine pragmatic choices weighting representation with deliberation (Kok et al., 2019). In Chapter 8, Schaber et al. state aptly that “it is very difficult to gauge whether a stakeholder speaks for him- or herself, or on behalf of the whole group. In fact, they may relate to several groups, and groups may be diverse themselves. Since the inclusion of everyone is usually not possible, some kind of bias is very likely to occur” (p. 161). Making ourselves aware of this potential bias and working around it as well as possible is an important responsibility that we, as the scientists who engage, carry in the participatory processes we initiate.

Despite these social limits that revert to the position of facilitators to build bridges (Gómez and Maynou, 2021, Kok et al., 2021), funding agencies often restrict the requirements for engagement processes, the identification of participants, and the definition of transdisciplinarity. The institutionalisation of citizen science discussed in Chapter 6 shows how this disempowers local knowledge and reinforces top-down governance by neutralising bottom-up procedures. This bears the danger of reducing the role of society to data collection, education, and awareness-raising, with citizen science understood as acquiring responsibility rather than acting as a catalyst for citizens' rights and duties (see Chapter 4). This reveals the hierarchy of knowledge, disqualification, and mistrust of non-academic knowledge, while social aspects are considered and integrated for the sole purpose of ‘ticking the participation box’. This logic follows a process of knowledge transfer or communication. Defining a common understanding of who the societal actors involved are and what roles they occupy is a frequent problem in transdisciplinary research. The same is true for the term “participatory” or “consultative”, as highlighted by Grünhagen et al. in Chapter 1. At the boundary between “inclusion” and “transformation”, stakeholder participation can be defined as part of “consultative transdisciplinarity” or “participatory transdisciplinarity” research (Mobjork, 2010).

Stakeholder engagement is often viewed from the participants’ passive position. The roles of stakeholders are reduced to receiving information from science, or sharing their perspectives which are ultimately masked under administrative decisions or attenuated by research funding agencies. In the practice of co-management models, Gómez et al. (2021: 8) note that “[t]he lack of agility hampered by the multiple bodies between down and top often results in concealing power relations, which neutralises the conflict as a way of claiming rights. The agreement can be reduced to a socialisation process that achieves social capital, mutual knowledge, and trust, neutralising the effect of fighting for equity and rights”.

Significant in defining the role of the actors involved is the way in which they are referred to as “stakeholders”, “social actors”, “practitioners” or “citizens” when producing “citizen science”. Beyond the names and roles assigned to actors is their potential as activists to bridge science and action, with attention to the power and access to decision-making. It is not enough to build trust and understanding among participants; it requires the commitment of science and society, but also of public administration and business to take transformative action. This also implies an integration of the value of the common good.

The potential of ethnography in transdisciplinary approaches

Throughout the chapters in this book, the potential of ethnography to build bridges between ontologies, cultural systems, and the realms of science and society is repeatedly underlined. In Chapter 9, Sá Cuoto highlights the potential of ethnography to capture the knowledge of fisherfolk that is at risk of disappearing under neoliberal models in fisheries. Ethnography enables the recovery of social and cultural skills to re-establish successful socio-ecological relationships in the face of the uncertainties of climate change. Knowledge is lost through the process of alienation of fishers in relation to fisheries production. In Chapter 11, Franco et al. show how the application of anthropological concepts and ethnographic methods to collect epidemiological knowledge in the context of culturally embedded everyday life allows for a "dialogue of knowledge" (p. 200ff).

The ability of social anthropology to capture the ethical components encapsulated in the subjectivities (aspirations, frustrations, feelings, emotions) entailed in the ontologies of social groups makes it a promising discipline to consider in future transdisciplinary projects. As already pointed out by Noël-Knapp et al. (2019: 8), "documentation of different ways of knowing are common in cultural ethnographies arising in anthropology". The exercise of transdisciplinarity emerges from social anthropology as it attempts to "transcend the narrow scope of disciplinary worldviews" since presenting itself as a "general science of humans" (Pohl et al., 2021). When joining forces in transdisciplinary processes, the non-natural sciences of anthropology, ethnology, social sciences, and humanities carry great potential for better understanding the human activities and societal dynamics at play in managing our marine spaces and, at the same time, for developing the applied solutions we need for bridging science and society in times of an ocean in crisis.

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