cogitatio

OCEAN AND SOCIETY

The Outliers: Stories of Success in Implementing Sustainable Development Goal 14

Volume 1

2024

Open Access Journal

ISSN: 2976-0925

Edited by Sarah Lothian and Bianca Haas

Ocean and Society, 2024, Volume 1
The Outliers: Stories of Success in Implementing Sustainable Development Goal 14

Published by Cogitatio Press
Rua Fialho de Almeida 14, 2º Esq.,
1070–129 Lisbon
Portugal

Design by Typografia®
http://www.typografia.pt/en/

Cover image: © Nuture from iStock

Academic Editors
Sarah Lothian (University of Wollongong)
Bianca Haas (University of Wollongong)

Available online at: www.cogitatiopress.com/oceanandsociety

Table of Contents

Ocean and Society
2024 • Volume 1 • Article 9404
https://doi.org/10.17645/oas.9404

cogitatio

EDITORIAL

Open Access Journal

The Outliers: Stories of Success in Implementing Sustainable Development Goal 14

Sarah Lothian and Bianca Haas

Australian National Centre for Ocean Resources and Security, University of Wollongong, Australia

Correspondence: Sarah Lothian (lothians@uow.edu.au)

Submitted: 14 October 2024 **Published:** 24 October 2024

Issue: This editorial is part of the issue "The Outliers: Stories of Success in Implementing Sustainable Development Goal 14" edited by Sarah Lothian (University of Wollongong) and Bianca Haas (University of Wollongong), fully open access at https://doi.org/10.17645/oas.i402

Abstract

SDG 14 "life below water" aims to conserve and sustainably use the oceans, seas, and marine resources for sustainable development. As SDG 14 is considered one of the most difficult goals to achieve, for the most part, academic discourse on SDG 14 tends to focus on the negatives. More specifically, the lack of progress, limitations and barriers in achieving its seven targets and three sub-targets. While the study of the challenges in reaching key targets is critical in understanding the myriad of issues facing the world's oceans and seas, this thematic issue provides an important opportunity to explore a key question, namely whether we failing to give due recognition to the important work and innovative approaches being undertaken at a local, regional, and global level to implement SDG 14 and improve the health of our coastal and marine environments? This thematic issue provides a platform for showcasing success stories in implementing SDG 14, thereby departing from the usual focus on the negatives.

Keywords

informal science learning programs; ocean literacy; plastic pollution; Sustainable Development Goals; SGD 14

For decades, concerns have been expressed that our oceans are heading towards an ecological and societal tipping point and are literally in a state of crisis (Hoegh-Guldberg et al., 2013; Richardson et al., 2023; Rockström et al., 2009). The 1972 UN Conference on the Human Environment marked the beginning of a global effort to preserve our natural environment. In deciding to convene the conference, the UN General Assembly emphasised that "new approaches" would be required to address the mounting number of issues facing the global environment, with the oceans identified as a key priority area (UN, 1972a). These "new approaches" came in the form of the Declaration of Principles for the Preservation and Enhancement of the Human Environment, which for the first time set out "common principles to inspire and guide the

peoples of the world" (UN, 1972b) and established a benchmark in international environmental protection (Czybulka, 2017).

Influenced by a "rising tide of environmentalism" (Falk & Elver, 1999), the 1992 UN Conference on Environment and Development (Earth Summit) adopted a further Declaration of Principles along with Agenda 21, a non-binding plan of action (UN, 1992). Chapter 17 of Agenda 21 underlined that the world's oceans, seas, and adjacent coastal areas form "an integrated whole that is an essential component of the global life-support system and a positive asset that presents opportunities for sustainable development" (UN, 1992). Agenda 21 stressed that "new approaches" were required for marine and coastal area management, at the national, regional, and global levels and "brought the concept of sustainable development into common parlance if not making it a household phrase" (Dodds et al., 2012, p. 5).

To mark the Earth Summit's 20th anniversary, more than 100 heads of state and government gathered in Rio de Janeiro for the UN Conference on Sustainable Development (Rio+20) in June 2012 to renew their political commitment to sustainable development and assess the progress of Agenda 21 goals (UN, 2012). Although Agenda 21 had acquired considerable coverage among states, its implementation was uneven (UN, 2012). It was clear that further action would be required to accelerate the sustainable development agenda and close implementation gaps (UN, 2012). The outcome document of Rio+20, entitled The Future We Want called for the development of SDGs, a set of measurable targets aimed at shifting the world onto a more sustainable path (UNDP, n.d.).

Thus, in an effort to change course, the 2030 Agenda for Sustainable Development was adopted by UN member states in 2015, providing a blueprint for peace and prosperity for all people and the planet, both now and into the future (UN, 2015). At the heart of the 2030 Agenda are 17 SDGs, which recognise that "ending poverty and other deprivations must go hand-in-hand with strategies to improve health and education, reduce inequality, and spur economic growth" whilst also combatting climate change impacts and preserving our forests and oceans (UN, n.d., para. 1).

Covering 70% of the Earth's surface, the oceans are the biophysical "engines of our planet" (Marlow, 2018). More than 50% of the world's oxygen is produced by the ocean's phytoplankton, kelp, and algae plankton (IUCN, 2019). As Earth's largest carbon sink (Woodall et al., 2017), the ocean also provides a vital buffer against climate change impacts, absorbing over 25% of anthropogenic CO_2 emissions annually and storing 93% of resultant heat (Gjerde et al., 2019). Aside from providing key ecosystem services, the ocean provides protein for human consumption, energy resources and biomedical products, as well as cultural services through recreation and leisure activities (Lothian, 2022). In addition, it plays a vital role in the traditions, customs, and identity of coastal communities (Lothian, 2022). Having said that, the marine environment faces unprecedented threats and challenges from acidification to pollution, overfishing, and habitat and biodiversity loss, just to name a few.

SDG 14 "life below water" aims to conserve and sustainably use the oceans, seas, and marine resources for sustainable development. As SDG 14 is considered one of the most difficult goals to achieve (Haas, 2023), for the most part, academic discourse on SDG 14 tends to focus on the negatives. More specifically, the lack of progress, limitations, and barriers in achieving its seven targets and three sub-targets (e.g., Andriamahefazafy et al., 2022; Sachs et al., 2022). While the study of the challenges in reaching key

targets is critical in understanding the myriad of issues facing the world's oceans and seas, together as academics, we recognised an important opportunity to explore a key question in this thematic issue, namely whether we are failing to give due recognition to the important work and innovative approaches being undertaken at a local, regional, and global level to implement SDG 14 and improve the health of our coastal and marine environments?

This thematic issue highlights stories of success in implementing SDG 14 from so-called "outliers." Cinner et al. (2016) suggested that the theory and practice of identifying and learning from outliers could assist in combatting the ongoing decline in the world's coral reefs. Outliers being places where marine ecosystems are found to be performing substantially better than expected given the environmental conditions and socioeconomic drivers they are exposed to (Cinner et al., 2016). Furthermore, highlighting bright spots and positive outliers might result in increased translation of scientific knowledge into policy (Cvitanovic & Hobday, 2018).

Expanding upon this idea of outliers, this thematic issue presents success stories in implementing SGD 14 targets, including contributions that detail new approaches and innovative ways of engaging with legal, scientific, and sociological perspectives as well as initiatives, programmes, projects, and plans being undertaken in an effective way to conserve and sustainably use our oceans, seas, and marine resources.

The contribution of Vierros et al. (2024) focuses on SDG 14.1 which aims to prevent and reduce pollution of all kinds by 2025, including marine debris. An estimated 12.7 million tonnes of plastic pollution enters our ocean annually (Vierros et al., 2024), with plastic accounting for 80% of all debris from surface waters to deep-sea sediments (IUCN, 2021). While some ocean problems are amendable to a bilateral or regional solution (Lothian, 2024), the global scale of plastic pollution is a problem no state can combat on its own. Vierros et al. (2024) underscore the importance of the voluntary commitments registered at the 2017 UN Ocean Conference in furthering SDG 14.1 by building global awareness of the plastic pollution crisis and generating momentum for the development of an international treaty to tackle this issue. While global targets in SDG 14 are an important driver for managing plastic pollution, they cannot be implemented effectively without local and national initiatives (Vierros et al., 2024). The authors show the critical link between local actions and global policy by highlighting important efforts being undertaken at a grassroots level, one example being Ecosurf which has resulted in the successful removal of more than 40 tonnes of rubbish from Brazilian beaches. By drawing attention to these bright spots the authors demonstrate how local measures can substantially contribute to the achievement of SGD 14.1 and provide solutions and lessons for the ongoing negotiation and implementation of a plastic pollution treaty.

Turning to the second contribution in this thematic issue. In recent years, there has been a growing call for improved understanding of the complex and diverse relationships between humans and the ocean. This has resulted in a "boom" of marine social science research, often framed through the lens of ocean literacy (McKinley et al., 2024). Acknowledged as a key mechanism for change within the UN Ocean Decade's goals (McKinley et al., 2023), ocean literacy has "captured the imagination and momentum of global ocean policy discourse" (McKinley et al., 2024, p.2). As qualitative and arts-based research approaches have remained on the periphery of ocean research, McKinley et al. (2024) adopt a novel approach to communicate the importance of the oceans in ways that bridge the space among marine social science, arts-based research, and UK coastal communities focusing on performance pieces in Lerwick, Shetland, Scotland, and Portsmouth

as part of the Diverse Marine Values project. By adopting a transdisciplinary approach that is grounded in both applied theatre practices and qualitative methodologies, the authors demonstrate the value of theatre not only as a tool for science communication but also as a research method to explore a range of ocean literacy dimensions and a way of building community and relationships. Based on the case studies, McKinley et al. (2024) provide recommendations for facilitating a shift of arts-based research from an "outlier" to a core component of ocean literacy.

The last contribution to this thematic issue is a commentary by Cvitanovic et al. (2024). This commentary highlights the importance of informal science learning programs, such as marine summer schools for early-career marine scholars (Cvitanovic et al., 2024). Drawing on their experience as organisers and lecturers of the Integrated Marine Biosphere Research ClimEco summer school, Cvitanovic et al. (2024) demonstrate how a well-organised summer school can support the development of "soft skills" such as communication, teamwork, and stakeholder engagement. Given the importance of informal science learning programs for marine early career researchers, the authors provide a list of how to plan and implement a successful summer school (Cvitanovic et al., 2024).

Overall, this thematic issue provides a platform for showcasing success stories in implementing SDG 14, thereby departing from the usual focus on the negatives. By allowing room for optimism, the contributions in this thematic issue highlight the importance of voluntary commitments, leading to increased political momentum and public awareness, the effectiveness of unique transdisciplinary research approaches such as theatre research in increasing ocean literacy, and the use of informal science learning programs, such as marine summer schools, to train the next generation of marine researchers.

Conflict of Interests

The authors declare no conflict of interests.

References

Andriamahefazafy, M., Touron-Gardic, G., March, A., Hosch, G., & Palomares, M. L. D. (2022). Sustainable development goal 14: To what degree have we achieved the 2020 targets for our oceans? *Ocean and Coastal Management*, *227*, Article 106273. https://doi.org/10.1016/j.ocecoaman.2022.106273

Cinner, J. E., Huchery, C., MacNeil, M. A., Graham, N. A. J., McClanahan, T. R., Maina, J., Maire, E., Kittinger, J. N., Hicks, C. C., Mora, C., Allison, E. H., D'Agata, S., Hoey, A., Feary, D. A., Crowder, L., Williams, I. D., Kulbicki, M., Vigliola, L., Wantiez, L., . . . Mouillot, D. (2016). Bright spots among the world's coral reefs. *Nature*, *535*, 416–419. https://doi.org/10.1038/nature18607

Cvitanovic, C., Blythe, J., van Putten, I., Maddison, L., Bopp, L., Brodie, S., Fulton, B., Lopes, P., Pecl, G., Penca, J., & Sumaila, R. (2024). Building successful international summer schools to enhance the capacity of marine early career researchers: Lessons from the IMBeR ClimEco series. *Ocean and Society*, *1*, Article 9328.

Cvitanovic, C., & Hobday, A. J. (2018). Building optimism at the environmental science-policy-practice interface through the study of bright spots. *Nature Communications*, *9*, Article 3466. https://doi.org/10.1038/s41467-018-05977-w

Czybulka, D. (2017). Part XII of the protection and preservation of the marine environment: Section 1 general provisions. In A. Proelss & C. H. Beck (Eds.), United Nations Convention on the Law of the Sea: A commentary (pp. 1277–1327). Bloomsbury.

Dodds, F., Schneeberger, K., & Ullah, F. (2012). *Review of implementation of Agenda 21 and the Rio*. UN. https://sustainabledevelopment.un.org/content/documents/641Synthesis_report_Web.pdf

Falk, R., & Elver, H. (1999). Comparing global perspectives: The 1982 UNCLOS and 1992 UNCED. In D. Vidas & W. Ostreng (Eds.), *Order for the oceans at the turn of the century* (pp. 145–156). The Hague.

Gjerde, K. M., Clark, N. A., & Harden-Davies, H. R. (2019). Building a platform for the future: The relationship of the expected new Agreement for Marine Biodiversity in Areas Beyond National Jurisdiction. *Ocean Yearbook Online*, *33*(1), 3–44. https://brill.com/view/journals/ocyo/33/1/article-p1_1.xml?language=en

Haas, B. (2023). Achieving SGD 14 in an equitable and just way. *International Environmental Agreements: Politics, Law and Economics*, *23*, 199–205. https://link.springer.com/article/10.1007/s10784-023-09603-z

Hoegh-Guldberg, O., Aqorau, T., Arnason, R., Chansiri, T., Del Rio Chairman, N., Demone, H., Earle, S., Feeley, M. H., Gutierrez, D., & Hilborn, R. (2013). *Indispensable ocean: Aligning ocean health and human well-being*. Blue Ribbon Panel. https://dusk.geo.orst.edu/Indispensable_Ocean.pdf

IUCN. (2021). *Marine plastic pollution*. https://iucn.org/sites/default/files/2023-11/marine-plastic-pollution-issues-brief_nov21-nov-2023-correction.pdf

Lothian, S. (2022). *Marine conservation and international law: Legal instruments for biodiversity beyond national jurisdiction*. Routledge.

Lothian, S. (2024). International cooperation: The linchpin to the successful implementation of the BBNJ agreement. In R. Brears & J. Lindley (Eds.), *Palgrave studies in sustainable futures: The Palgrave handbook of environmental policy and law* (pp. 1–21). Springer. https://link.springer.com/referenceworkentry/10.1007/978-3-031-30231-2_12-1

Marlow, J. (2018). *The high seas are being exploited. Exploration must keep pace*. UNDARK. https://undark.org/2018/03/06/high-seas-conservation-exploration

McKinley, E., Burdon, D., & Shellock, R. J. (2023). The evolution of ocean literacy: A new framework for the United Nations ocean decade and beyond. *Marine Pollution Bulletin*, *186*, Article 114467. https://doi.org/10.1016/j.marpolbul.2022.114467

McKinley, E., Hughes, E., Georgia, S., Bowyer, C., Fradera, K., Fairbrass, A., & Potts, J. (2024). Bringing the ocean to the stage: Performing coastal values and marine management. *Ocean and Society*, *1*, Article 8678.

Richardson, K., Steffen, W., Lucht, W., Bendtsen, J., Cornell, S. E., Donges, J. F., Drüke, M., Fetzer, I., Bala, G., von Bloh, W., Feulner, G., Fiedler, S., Gerten, D., Gleeson, T., Hofmann, M., Huiskamp, W., Kummu, M., Mohan, C., Nogués-Bravo, D., . . . Rockström, J. (2023). Earth beyond six of nine planetary boundaries. *Science Advances*, *9*(37), Article eadh2458. https://doi.org/10.1126/sciadv.adh2458

Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F. S., III., Lambin, E., Lenton, T. M., Scheffer, M., Folke, C., Joachim, H., Schellnhuber, H. J., Nykvist, B., de Wit, C. A., Hughes, T., van de Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P. K., Costanza, R., . . . Foley, J. (2009). Planetary boundaries: Exploring the safe operating space for humanity. *Ecology and Society*, *14*(2), Article 32. http://www.jstor.org/stable/26268316

Sachs, J. D., Lafortune, G., Kroll, C., Fuller, G., & Woel, F. (2022). *Sustainable development report 2022*. Cambridge University Press. https://s3.amazonaws.com/sustainabledevelopment.report/2022/2022-sustainable-development-report.pdf

UN. (n.d.). *The 17 goals*. https://sdgs.un.org/goals

UN. (1972a). *Resolutions adopted on the reports of the Second Committee*. https://documents.un.org/doc/resolution/gen/nr0/270/27/pdf/nr027027.pdf

UN. (1972b). *Report of the United Nations Conference on the Human Environment*. https://documents.un.org/doc/undoc/gen/nl7/300/05/pdf/nl730005.pdf

UN. (1992). *Report of the United Nations Conference on Environment and Development* (A/CONF.151/26 (Vol. I)). https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_CONF.151_26_Vol.I_Declaration.pdf

UN. (2012). *Report of the United Nations Conference on Sustainable Development*. https://documents.un.org/doc/undoc/gen/n12/461/64/pdf/n1246164.pdf

UN. (2015). *Transforming our world: The 2030 Agenda for sustainable development (A/RES/70/1)*. https://documents.un.org/doc/undoc/gen/n15/291/89/pdf/n1529189.pdf

UNDP. (n.d.). *Sustainable development goals: Background on the goals*. https://www.undp.org/sdg-accelerator/background-goals#:~:text=The%20Sustainable%20Development%20Goals%20(SDGs,economic%20challenges%20facing%20our%20world

Vierros, M., Nelson, G., Caldeira, M., Polejack, A., Schütz Veiga, J., & Sekinairai, A. (2024). Building global momentum towards managing marine plastic pollution through SDG 14. *Ocean and Society*, *1*, Article 8388. https://doi.org/10.17645/oas.8388

Woodall, L., Stewart, C., & Rogers, A. (2017). *Function of the high seas and anthropogenic impacts science update 2012–2017*. High Seas Alliance.

About the Authors

Sarah Lothian is a senior lecturer and academic barrister at the Australian National Centre for Ocean Resources and Security (ANCORS) at the University of Wollongong. Sarah's research focuses on the protection of biodiversity beyond national jurisdiction (BBNJ) and involves multi-faceted aspects of international law, ocean governance, and marine environmental law. Sarah's teaching portfolio encompasses core areas of the law of the sea and specialised electives that align with her research expertise in marine resources law and biodiversity law.

Bianca Haas is a research fellow at the Australian National Centre for Ocean Resources and Security (ANCORS) at the University of Wollongong. Bianca's research focuses on equity concerns within transboundary fisheries, with a special emphasis on tuna fisheries. Bianca is also interested in the potential regime interaction between the agreement for biodiversity beyond national jurisdiction (BBNJ) and regional fisheries management organisations (RFMOs).

Ocean and Society
2024 • Volume 1 • Article 8388
https://doi.org/10.17645/oas.8388

cogitatio

ARTICLE

Open Access Journal

Building Global Momentum Towards Managing Marine Plastic Pollution Through SDG 14

Marjo Vierros [1], Gemma Nelson [1], Mariana Caldeira [1], Andrei Polejack [2], Júlia Schütz Veiga [3], and Alumita Talei Sekinairai [1]

[1] Nippon Foundation Ocean Voices Programme, University of Edinburgh, UK
[2] National Institute for Ocean Research, Brazil
[3] NOVA IPSI Knowledge Centre, NOVA University of Lisbon, Portugal

Correspondence: Marjo Vierros (mvierros@shaw.ca)

Submitted: 1 April 2024 **Accepted:** 22 May 2024 **Published:** 30 July 2024

Issue: This article is part of the issue "The Outliers: Stories of Success in Implementing Sustainable Development Goal 14" edited by Sarah Lothian (University of Wollongong) and Bianca Haas (University of Wollongong), fully open access at https://doi.org/10.17645/oas.i402

Abstract

Target 1 of SDG 14 on marine pollution has been instrumental in building momentum towards a coordinated response to the plastic pollution crisis facing the world's ocean. The 2017 UN Ocean Conference saw a record number of registered voluntary commitments related to stemming plastic pollution, from local grassroots action to scientific research, as well as government initiatives limiting single-use plastics. By the time of the second UN Ocean Conference in June 2022, the UN Environment Assembly had, in March 2022, already adopted a resolution to develop by 2025 an international legally binding agreement to end plastic pollution. This international instrument is currently under negotiation and is facing contentious discussions influenced by petroleum interests. However, the very existence of these negotiations is owed to a large degree to the grassroots momentum built through SDG 14 Target 1 and a growing public concern about linkages between plastic pollution and human health and nascent national blue economies. This article will trace the pathway through which SDG 14 voluntary commitments, from local to global, have led by example while building a global sense of urgency to address the plastic pollution crisis. The article will also provide examples of how local communities and governments have experienced and responded to the crisis. Lessons learned from these local examples will be provided to link local measures and priorities to the global level in a way that can inform how the plastic pollution treaty is both negotiated and implemented.

Keywords

plastic pollution; Small Island Developing States; SDG 14; UN Ocean Conference

1. Introduction

SDG 14 has been instrumental in building momentum towards addressing plastic pollution in the marine environment. In 2015, when Agenda 2030 and the associated SDGs were adopted, the plastic pollution crisis had permeated global consciousness. With plastic consumption increasing each year, up to 12.7 million tonnes of plastic pollution has been estimated to enter the ocean annually (Jambeck et al., 2015) and is predicted to reach 300 million tonnes by 2030 (Geyer et al., 2017). In 2016, a report stated that, according to the best estimates, the ocean is expected to contain "by 2050, more plastics than fish (by weight)" (World Economic Forum, 2016, p. 7). This graphic quote was used ubiquitously in speeches held by politicians and advocates at various international events, including by the secretary-general of the UN in a speech in 2018 (UN, 2018).

The following years have brought a better, although by no means complete, understanding of the problem, including that no part of the ocean is left untouched. Even the deepest trenches were found to have a considerable accumulation of plastics (Chiba et al., 2018). Plastic pollution and microplastics were also found in soil, water, and air, potentially endangering human health (Amato-Lourenço et al., 2021). Severe impacts on marine biodiversity were documented, along with negative consequences to blue economy sectors such as tourism, shipping, and fishing (Barboza et al., 2018; Löhr et al., 2017). The majority of plastic pollution was found to originate from land-based sources, although fishing gear also played a major role in some areas (Burt et al., 2020). With plastic pollution crossing jurisdictions, national efforts alone are not enough, and international cooperation is required to address the problem (Tessnow-von Wysocki & Le Billon, 2019).

The Covid-19 pandemic caused yet another increase in plastic pollution and demonstrated how dependent humanity is on plastic. In particular, the waste produced by the health and food and beverage sectors was striking (Silva et al., 2021). With environmental measures put on hold while Covid-19 was dealt with, the ocean received a great portion of the plastic waste generated to maintain human well-being.

It was against the backdrop of increasing attention to plastic pollution in the ocean that Agenda 2030 was adopted in September 2015. Amongst the associated SDGs was SDG 14 on "life below water," which made history by bringing ocean issues into the sustainable development realm. Its adoption was only made possible through a collective diplomatic campaign by the Small Island Developing States (SIDS), whose lives, livelihoods, and cultures are dependent on the ocean and its health (Quirk & Hanich, 2016). The predecessor of the SDGs, the Millennium Development Goals, only had one goal on environmental sustainability (no. 7), which did not single out the ocean. Moreover, the Millennium Development Goals were targeted only at developing countries, a mistake that was corrected with the SDGs, now encompassing the whole world. The universality of the SDGs, as well as their comprehensive nature in encompassing 17 goals relating to environmental, economic, and social aspects of sustainable development, made them an appropriate framework for tackling complex cross-sectoral, multistakeholder, and global-scale problems such as plastic pollution.

SDG 14 has been recognized as the most interconnected of the goals, with its achievement linked to all other SDGs (Singh et al., 2018). Despite this, it has been the least prioritized goal by many governments, particularly those in the Global South that tend to invest more in SDGs with direct social implications, such as the goals on education, poverty, and hunger (Custer et al., 2018). However, with the ocean increasingly linked to economic development through national blue economy ambitions, improved ocean governance is becoming more of

a global priority (Lee et al., 2020). With close linkages to SDG 12 (sustainable consumption and production), among others, the implementation of SDG 14 could take into account upstream and downstream connections, which was particularly vital for addressing plastic pollution. The 2017 UN Ocean Conference, attended by a broad set of stakeholders, provided a timely venue for this discussion.

This article demonstrates how the 2017 UN Ocean Conference, including the voluntary commitments that were its major outcomes, was crucial in building momentum to address the interconnected issue of plastic pollution in the ocean. While causality is difficult to demonstrate, it is likely that this momentum eventually led to the ongoing negotiations for an international legally binding instrument on plastic pollution. Section 2 provides an overview of the content of the voluntary commitments. Section 3 examines grassroots actions in more detail, including some lessons learned. Section 4 discusses how these developments led towards the negotiation of the plastic pollution treaty. Overall, the article aims to show that more informal soft law instruments, such as SDG 14, along with public opinion, can be instrumental in bringing together diverse stakeholders and testing new ideas towards the development of a legally binding agreement.

2. The 2017 UN Ocean Conference Voluntary Commitments on Plastic Pollution

With SDG 14 adopted, there was a desire by certain countries to accelerate its implementation. The first UN Ocean Conference, held in June 2017 and co-hosted by Fiji and Sweden, aimed to kickstart implementation and draw attention to solutions that would help reverse the decline in ocean health. It also sought to:

> Involve all relevant stakeholders, bringing together Governments, the United Nations system, other intergovernmental organizations, international financial institutions, non-governmental organizations, civil society organizations, academic institutions the scientific community, the private sector, philanthropic organizations and other actors to assess challenges and opportunities relating to, as well as actions taken towards, the implementation of Goal 14. (United Nations General Assembly, 2016, p. 2)

One of the main outputs of the 2017 UN Ocean Conference, aimed specifically at fostering inclusive engagement, was the voluntary commitments. Any commitment to furthering SDG 14, along with the framework of the Agenda 2030, could be registered. The commitments could be new initiatives or build on and expand existing initiatives. They should include means of implementation (such as finance or capacity building) to ensure their long-term sustainability and be designed under the SMART criteria. Any stakeholder could register a commitment, and by the time the 2017 UN Ocean Conference had ended, over 1,400 voluntary commitments had been registered in the secretariat's database (Vierros & Buonomo, 2017).

Target 1 of SDG 14, which is to "prevent and significantly reduce," by 2025, "marine pollution of all kinds, particularly from land-based activities, including marine debris and nutrient pollution" (United Nations General Assembly, 2015, pp. 23–35), attracted the second highest number of commitments (after SDG 14 Target 2 on management and protection of marine ecosystems), totalling 14% of all the commitments registered across all ten SDG 14 targets (Vierros & Buonomo, 2017). While SDG 14 Target 1 relates to marine pollution in a general sense, most of the voluntary commitments addressed plastic pollution in the ocean. The commitments were made by local community organizations, NGOs, governments, the private sector, scientists, and others. While uncoordinated, they represented a growing sense of urgency about addressing the issue.

An analysis of 170 voluntary commitments related to marine plastics made during, or directly after, the 2017 UN Ocean Conference, demonstrated this trend. The data for this component of the analysis was downloaded from the Secretariat's registry (UN, n.d.), and used to discern the entities involved in making plastic pollution-related commitments, as well as the breadth of these commitments.

Most of the entities making commitments were governments, followed closely by NGOs. These entity types were responsible for most of the commitments, although the private sector, partnerships, civil society, the UN, academia, the scientific community, IGOs, and others also submitted commitments (Figure 1).

The types of actions included in the commitments were diverse, addressing public awareness, along with various downstream and midstream activities directed at reducing plastic pollution, as demonstrated in Figure 2.

By far the biggest category of actions was that of public awareness, education, and communication. Many of these actions were undertaken by NGOs, but other entities also participated. The commitments included activities such as public awareness campaigns and materials, advocacy for addressing plastic pollution, youth initiatives, pledges to reduce plastic pollution, workshops, events, and contests. The large number of these commitments demonstrates that building public awareness and education about the impacts of plastic pollution in the marine environment was a key aim of the commitment-holders.

The second largest category was plastic waste management, which included a large number of actions, such as: improving the management of plastic waste; addressing sources of plastic waste; improving recycling and circular economy; repurposing plastic waste into, for example, textiles; reducing intentional microplastics at the source; reducing discarded fishing gear; reducing product packaging; phasing out virgin plastics; utilizing end of life plastics; putting in place port reception facilities; and undertaking measures to reduce consumption.

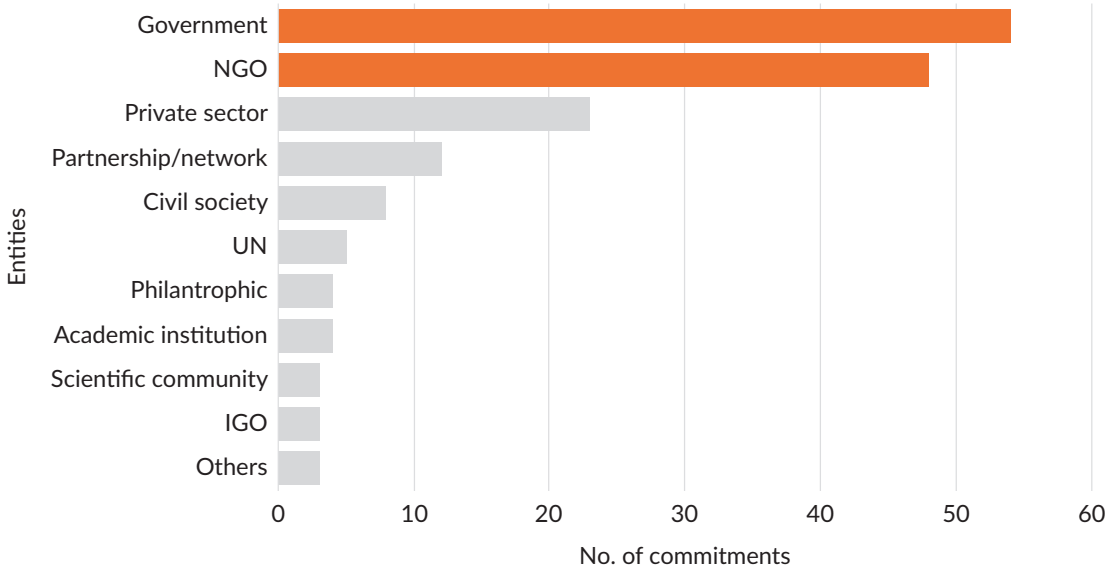


Figure 1. Number of commitments made by different entities. Notes: Governments and NGOs made the largest number of commitments; this figure is based on the data from the UN Registry of Voluntary Commitments (n.d.).

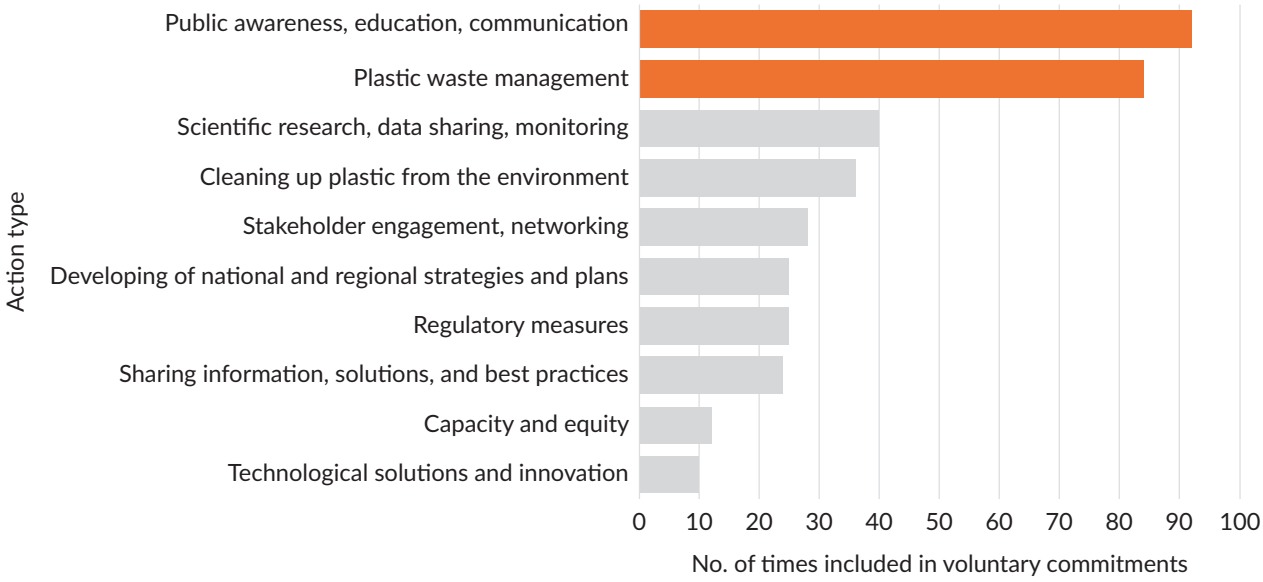


Figure 2. Types of actions included in voluntary commitments by category. Notes: Actions related to public awareness, education, and communication, as well as to plastic waste management, were the most common; this figure is based on the data from the UN Registry of Voluntary Commitments (n.d.).

The third largest category was that of scientific research, data sharing, and monitoring. This category included commitments by academia and the scientific community, but also NGOs, governments, and partnerships. Many of these commitments focused on the assessment and monitoring of plastics, including microplastics, in the marine environment, as well as their impacts on marine animals and human health. The category also included citizen science initiatives, such as documenting the amount of plastic collected from beaches, often undertaken in conjunction with beach cleanup events. In fact, beach cleanups and efforts to clean up plastics at sea (either by divers or automated systems on ships) were the fourth largest category of action.

The fifth most common category was related to stakeholder engagement and networking, including national and international cooperation amongst diverse actors. Several partnerships to address plastic pollution were proposed. Relatedly, actions on sharing information, solutions, and best practices (the eighth largest category) reflected a desire to learn from others undertaking similar work, and to start piecing together more global solutions.

The sixth most common category of commitments related to the development of national strategies and action plans on addressing plastic pollution in the marine environment, with some regional intergovernmental organizations also registering commitments towards regional strategies. The development of regulatory measures was the seventh most common category and included actions such as bans on certain types of single-use plastics and intentional microplastics (e.g., microbeads in cosmetics). These were generally government-registered commitments. While some governments stopped short of outright bans, they still registered efforts to significantly reduce single-use plastics, including through consultations.

Building capacity for improved plastic waste management in developing countries, both human and institutional capacity, received a few commitments and some monetary pledges. As an equity measure,

three commitments focused on community livelihoods and equity such as payment for the collection of plastic litter.

Finally, several private sector entities made commitments that focused on research, development, and innovation towards technological solutions for removing plastics from the marine environment, or for removing microplastics from wastewater.

These voluntary commitments indicate the breadth of actions contemplated in 2017, prior to the UN Environment Assembly (UNEA) resolution that led to the negotiations of a new treaty on plastic pollution. Many of these same, or similar, categories of actions are now under negotiation for incorporation in the draft treaty text (see Section 4). The voluntary commitments thus provide the experience an international treaty to address plastic pollution can build upon, both in negotiation and in eventually moving towards implementation.

The voluntary commitments were largely led by governments and NGOs. However, the inclusivity of the voluntary commitments provided a mechanism that empowered different stakeholders to participate and commit to reducing plastic pollution. The voluntary commitments provided a sense that everyone could do something to help solve the problem, and with the combined NGOs and civil society commitments (a number that was larger than the government commitments), the influence of grassroots action was evident. The relatively high number of private sector commitments was also notable, and included repurposing plastic litter into textiles and shoes; replacing plastic bottles with reusable bottles in hotels; and research, development, and innovation for cleaning up plastics. It is likely that the private sector felt more able to provide tangible solutions to plastic pollution than to other SDG 14 targets, such as those related to marine conservation and management.

While most voluntary commitment-holders have not reported on their progress over time (Gjerde & Vierros, 2021), those who have provided updates often claim considerable achievements. For example, in December 2017, six months after the first UN Ocean Conference, UN Environment announced that the Clean Seas Programme, a partnership aimed at raising awareness of plastic pollution and marine litter, and one of the first registered voluntary commitments, had generated thousands of pledges from individuals and NGOs to reduce pollution. Additionally, 40 governments had submitted pledges, and many were moving towards reducing or banning certain types of single-use plastics (UN, 2017). By 2023, the programme website indicated that 69 countries had joined the campaign, representing 76% of the world's coastline (Clean Seas, n.d.). This initiative has recently transitioned to continue under the umbrella of UNEP's Global Partnership on Plastic Pollution and Marine Litter, which has over 630 member organizations, and established communities of practice, regional nodes, and a digital platform for knowledge sharing and collaboration (Global Partnership on Marine Litter, n.d.).

The positioning of the plastic pollution problem within the SDGs also highlighted a growing understanding that plastic pollution in the marine environment was not purely an environmental problem that could be solved in the realm of SDG 14, or even SDGs 14 and 15 collectively. Instead, addressing it would require intersectoral cooperation, nationally and internationally, including between those implementing other SDGs. A 2017 analysis demonstrates that the SDG 14 voluntary commitments are particularly closely linked with climate action (SDG 13) and sustainable consumption and production (SDG 12; Vierros & Buonomo, 2017).

Addressing plastic pollution will additionally require consideration of SDG 3 on "good health and well-being," SDG 8 on "decent work and economic growth," and SDG 10 on "reduced inequalities." On the national level, nascent blue economies are one vehicle through which countries implement SDG 14 (World Economic Forum & Friends of Ocean Action, 2022), and where intersectoral cooperation can help address the plastic pollution issue. Many blue economy sectors, such as tourism and fisheries, depend on healthy ocean environments and may suffer economic losses from plastic pollution on beaches and the marine environment. Internationally, the plastic pollution treaty negotiations (see Section 4) may benefit from considering the SDGs framework in connecting upstream, midstream, and downstream actions, from production to equity.

3. Linking Local Action to Global Policy

While global commitments such as the SDGs provide an impetus for managing plastic pollution, they could not be implemented without local and national initiatives (Löhr et al., 2017). Due to global differences in the origin of plastic pollution, solutions are only effective in local contexts and under local conditions. As highlighted in Section 2, grassroots action is an important component of SDG 14 voluntary commitments, and in building momentum towards addressing plastic pollution on a global scale. The examples described in this section offer lessons about the diversity of local initiatives, stakeholders, and results, as well as the impacts of plastic pollution locally and nationally. They provide solutions and lessons that might be considered in a global context as a plastic pollution treaty is being negotiated.

Several initiatives highlight the creative ways in which local projects involve local volunteers, including youth, through a combination of education, beach cleanups, monitoring, data analysis, and advocacy for better policies. For example, several local initiatives have been undertaken in the Brazilian context. The Ecosurf project, created in 2000, and located on the north coast of São Paulo, Brazil, empowers surfers and volunteers to monitor and research pollution on beaches and undertake beach cleanups. This project was responsible for removing more than 40 tons of trash on Brazilian beaches. While local, the project also makes linkages to the implementation of several SDGs in a cross-cutting way, including SDGs 3, 6, 11, 12, 13, 14, and 17 (Ecosurf, n.d.).

The Mares sem Plástico (in English: seas without plastic) project was created in 2019 by a professor from the Federal University of Paraíba, Brazil to fight marine litter through educational activities. The project is composed of teachers, collaborators, and students, and aligns environmental education and monitoring with better regional management of marine litter. Environmental activities are undertaken with students from public schools in João Pessoa, Paraíba, corresponding with the themes taught throughout the year. Monitoring activities occur in almost 13 km of the coast. Additionally, the project sells products that contribute to the reduction of single-use plastics, such as eco bags (Queiroga, 2023).

Also in Brazil, the Blue Keepers initiative is a network of companies and stakeholders aiming to mobilise resources to combat ocean pollution. Placed under the UN Global Compact umbrella, Blue Keepers projects aim to collect and analyse data on plastic pollution on the coast of Brazil, particularly in high-risk areas for plastic waste, and use these results to develop local strategies and actions (Pacto Global Rede Brasil, n.d.).

In Fiji, the Pacific Ocean Litter Youth Project is a group of youths seeking to collect, through beach cleanups, and categorise marine litter, especially plastic pollution. The group uses science and art to catalyse behavioural

change for consumers and producers, with the aim of informing policy. Of note is their use of art and "artivism" to engage youth and raise awareness (Kumar, 2023).

Ocean cleanup efforts, while local, can have a large cumulative impact. For example, in 2020, a total of 23 UN Ocean Conference voluntary commitments reported the weight of litter they had removed from beaches since 2017, which collectively added up to a total of 2,100 tonnes. These local efforts also contributed to awareness raising, education, and citizen science, and served as an entry point for the general public, including youth, to engage with ocean issues (Vierros, 2021).

Cleaning up transboundary marine litter from beaches can be extremely costly for low-income countries and SIDS. For example, a beach clean-up effort on the remote Aldabra Atoll, a UNESCO World Heritage site, in Seychelles removed 25 tonnes of marine litter at a total cost of $224,537, or approximately $8,900 for each ton of litter. The amount of litter removed, mostly fishing gear and flip flops, was only a fraction of the total estimated 538 tonnes that was present on the Atoll's beaches at that time, with harmful impacts on a variety of marine life at this otherwise pristine location (Burt et al., 2020).

SIDS are particularly vulnerable because they often lack adequate facilities for disposing of or recycling the plastic items that flood their beaches (Burt et al., 2020) as well as their plastic waste (Samson, 2023). Dirty beaches, in turn, impact tourism and fisheries, and place cleanup costs on coastal communities, while bringing additional risks from flooding, toxins, and hazardous chemicals (Dauvergne, 2023; Mittempergher et al., 2022; Samson, 2023). The International Union for Conservation of Nature estimated that the economic impact of plastic pollution on tourism and fisheries sectors in Antigua and Barbuda, Grenada, and Saint Lucia in 2019 was considerable. For example, the losses for Antigua and Barbuda's fisheries sector were estimated at $1,428,980 or 9.2% of revenue, and the beach cleanup costs that would allow for the tourism sector to operate were estimated between $4,762.590 and $13,936.860, or between 88.4% and 258.6% of the 2019 waste management budget (Mittempergher et al., 2022). The reports concluded that plastic pollution has serious economic impacts in reducing national GDPs by up to an estimated $7 billion globally in 2017.

Local recycling solutions are being implemented on some islands. For example, Waste Recyclers (Fiji) Pte Limited, a locally-led organization, has been providing sustainable recycling services in Fiji for almost 30 years. Their aim is to reduce the number of recyclables being burnt, buried, or dumped in landfills. Most of their recycled products are plastic, and their work contains a social equity element that utilizes a network of informal waste pickers, village-based communities, and marginalized groups, providing them with economic opportunities that allow them to support their households. The organization also works with resorts and hotels to provide recycling services (Fiji Hotel and Tourism Association, 2021), as well as with the Pacific Ocean Litter Youth Project, the Fiji youth project described in this section, to collect recyclables (Kumar, 2023).

Despite some local solutions, the costs of cleaning up the plastic tide are considerable, and the examples from the Caribbean and Seychelles highlight the need for international funding for countries, particularly low-income countries that can ill afford such amounts, and are at the downstream of the global flow of marine plastic litter. Equity considerations in the global costs of plastic pollution are one reason for the formation of a coalition of downstream underdeveloped countries in the negotiations for the plastic pollution treaty (see Section 4).

National action plans on plastics or marine litter can be powerful tools for aligning actions across sectors and levels of government, as well as responding to national, regional, and global commitments, such as SDG 14. The development of such action plans was a commonly registered voluntary commitment at the 2017 UN Ocean Conference. Experiences from the development of the Belize Marine Litter Action Plan highlighted several lessons, including the importance of (a) stakeholder mapping and inclusive engagement; (b) communication that is consistent, dynamic, and sustained; (c) science in addressing data gaps and creating an objective common ground; and (d) enablers and champions across sectors (Monsanto et al., 2023). These lessons are transferable to other countries and may also be useful in the context of international treaty negotiations.

4. Towards a Global Treaty

While national and regional actions, such as the UN Ocean Conference's voluntary commitments, are an important step towards addressing plastic pollution in the ocean, they are a response that is too fragmented for a problem that is global in scale. The international plastic economy includes value chains that pass through multiple jurisdictions of countries, entering the shared waters of the ocean as plastic becomes pollution. A global problem requires a coordinated global-scale solution by multiple stakeholders, including a circular economy addressing the full life cycle of plastics (March et al., 2022). The UN Ocean Conference's voluntary commitments were so-called midstream and downstream measures relating to waste management, recycling, and cleanup. For a comprehensive approach, the production and distribution of plastics will also need to be considered.

There has not previously been an international treaty addressing plastic pollution—or land-based sources of marine pollution for that matter—in a comprehensive sense (Borrelle et al., 2017). The United Nations Convention on the Law of the Sea defines marine pollution in Part 1, Article 1. Part XII, Sections 4 and 5, incorporate international rules to prevent, reduce, and control pollution of the marine environment, providing a legal framework for the issue. However, the law was adopted before plastic pollution reached a crisis level, and is not specific enough to comprehensively address a problem that incorporates the land and sea, as well as production, trade, use, and disposal. Many regional seas treaties have protocols that address land-based sources of marine pollution, but they do not have global coverage. The London Convention and Protocol address the dumping of waste from ships, but the majority of plastic pollution, with the exception of fishing gear, originates from land-based sources. The adoption of SDG 14 (and particularly Target 1) and the 2017 UN Ocean conference provided a global venue for discussing the problem, and the timing of this discussion corresponded with a growing sense of urgency about the impacts of marine plastic pollution, mostly coming from public opinion.

The momentum generated by the June 2017 UN Ocean Conference was reflected at UNEA, and in December 2017, the third session of UNEA established an ad hoc open-ended expert group on marine litter and microplastics (UNEP, 2018). In May 2022, based on the report of the ad hoc open-ended expert group, the fifth session of UNEA adopted resolution 5/14 entitled "End Plastic Pollution: Towards an International Legally Binding Instrument." The instrument:

> Could include both binding and voluntary approaches, based on a comprehensive approach that addresses the full life cycle of plastic, taking into account, among other things, the principles of the

> Rio Declaration on Environment and Development, as well as national circumstances and capabilities. (UNEP, 2022, pp. 3–4)

Along with an ambition to complete the work by 2024, the paragraph puts forward a broad scope for the instrument, one which continues to be debated in the ongoing International Negotiating Committee (INC) negotiations.

The second UN Ocean Conference in June/July 2022 welcomed UNEA resolution 5/14 in the political declaration of the conference (UN, 2022a) and its final report (UN, 2022b). The development was hailed as one of the bright spots in the implementation of SDG 14, which was otherwise behind schedule. While plastic pollution was still a major focus at the second UN Ocean Conference, there was also an anticipation of the INC meetings to come.

The INC meetings have, thus far, only made slow progress, with the ambition of finalizing the international legally binding instrument by the end of 2024 looking increasingly uncertain. There are differences in opinion about the scope of the instrument, particularly whether the instrument should focus on the entire lifecycle of plastics including design, production, manufacturing, logistics, use, reuse, and end-of-life management as indicated in UNEA resolution 5/14 (UNEP, 2022), or whether it should mainly address midstream and downstream approaches such as waste management. The latter position has been advocated by petroleum-producing countries, such as the Gulf Cooperation Council, and the petrochemical industry. As a result, much of the discussion has focused on the chemistry of polymers and the impact on industry rather than on environmental concerns.

Also still under negotiation is the ambition of the international instrument, and whether its provisions will be voluntary, as in the Paris Agreement, or legally binding. Different coalitions have emerged from the negotiations: The High Ambition Coalition arguing for a strong legally binding treaty addressing the entire plastics lifecycle; the Gulf Cooperation Council, along with the partially overlapping "group of like-minded countries" arguing mainly for voluntary measures that would not impact production and would focus largely on mid- and downstream measures (Dreyer et al., 2024, p. 4); and, at the third INC, the "coalition of downstream, underdeveloped countries"—a group of countries whose development and national resources are being impacted by their geographic location which requires them to use national resources to address unwanted plastic pollution from across jurisdictions. This last coalition emphasizes the importance of equity and finance in an international instrument where downstream countries bear a disproportionate burden from plastic pollution.

The nature of the debate, and the stakeholders involved in it, has shifted from the discussions at the 2017 UN Ocean Conference and its voluntary commitments. This is due not only to the passage of time, but also to the differing natures of SDG 14 as a non-binding soft law instrument, and the plastic pollution INCs aimed at developing a legally binding hard law instrument. The initial progress at the UN Ocean Conference was driven by NGOs, civil society, and early adopter governments. The plastic pollution INCs also include governments whose economic development is closely tied to the production of plastics, and numerous industry lobbyists (Center for International Environmental Law, 2023). The NGOs and civil society groups are numerous at the INCs but participate as observers. Thus, there has been a shift in how and by whom the topic is addressed.

Despite these challenges, the momentum to address plastic pollution has also spilled over to processes related to trade and hazardous waste, broadening its reach beyond only the environmental realm. For example, in 2019, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was amended to include some plastics as hazardous wastes. Additionally, in 2020, the WTO launched an Informal Dialogue on Plastic Pollution and Sustainable Plastics Trade, bringing the issue into trade policy.

The scientific basis for addressing plastic pollution will also be strengthened by the UN Decade of Ocean Science for Sustainable Development (2021–2030, commonly referred to as the Ocean Decade), which was launched in 2021. The first of the 10 Ocean Decade challenges is to "understand and beat marine pollution" (Ocean Decade Network, n.d.). It is envisioned as an effort to understand and map pollutants and contaminants from land and sea to better understand their impacts, and develop solutions, potentially providing a global-scale scientific effort and an objective baseline.

5. Conclusion

The UN Ocean Conference and its voluntary commitments demonstrated how a soft law process, such as SDG 14, can build momentum towards the development of a legally binding treaty. The inclusivity of the conference provided space for grassroots and community-level actors along with high-level government participants. Furthermore, the conference provided a venue for discussing ocean issues holistically in an otherwise fragmented ocean governance landscape. The positioning of SDG 14 amongst other SDGs allowed the consideration of synergies and trade-offs within sustainable development sectors, for example, between ocean health, tourism, fisheries, and the sustainable production and consumption of plastics. These factors, and the timing of the conference coinciding with growing public awareness of the plastic pollution crisis, likely contributed to the move towards more coordinated and binding solutions. While the plastic pollution treaty negotiations evolve, consisting of forward momentum and backward slides, it is likely that a treaty will emerge over time. It is hoped that the treaty will provide global coordination towards a circular plastic economy, although its provisions and degree of implementation are still unknown at this stage. Future UN Ocean Conferences may similarly succeed in becoming a forum for new ideas and solutions.

SIDS, which championed the creation of SDG 14, have collectively become strong advocates for ocean health, as demonstrated during subsequent ocean-related negotiations, such as the new treaty on biodiversity beyond national jurisdiction, where the Pacific SIDS and the Caribbean Community took leading roles. SIDS are also advocating for a strong treaty for addressing marine pollution, and, as downstream recipients of unwanted plastic pollution, for support and technologies for low-income countries to deal with costly cleanups. Linking conservation with equity measures has emerged as an important recent trend in international environmental negotiations, including those focused on the ocean, climate change, and biodiversity.

For the plastic pollution treaty to be successful, it not only needs to set global limits to the production of new plastics while providing for a circular economy, but it will also need to build upon and learn lessons from local actions, such as those described in Section 3 of this article. How plastic pollution is addressed nationally and locally will always be context-specific. Sources of pollution and the problems caused may vary by location, as will the appropriate response measures to address them. Creative grassroots actions will remain a key component of responding to the crisis and will have the larger benefit of connecting people to their ocean environment in new ways.

Acknowledgments

We would like to thank the Nippon Foundation–University of Edinburgh Ocean Voices Programme for bringing together this team of authors. In addition, we thank Ms. Lucy Tomkins from the University of Edinburgh for her editorial assistance.

Conflict of Interests

The authors declare no conflict of interests.

Data Availability

The data used in this study is publicly available through the online registry of voluntary commitments from the UN Ocean Conference at https://sdgs.un.org/partnerships/action-networks/ocean-commitments

References

Amato-Lourenço, L. F., Carvalho-Oliveira, R., Júnior, G. R., dos Santos Galvão, L., Ando, R. A., & Mauad, T. (2021). Presence of airborne microplastics in human lung tissue. *Journal of Hazardous Materials*, *416*, Article 126124. https://doi.org/10.1016/j.jhazmat.2021.126124

Barboza, L. G. A., Vethaak, A. D., Lavorante, B. R., Lundebye, A. K., & Guilhermino, L. (2018). Marine microplastic debris: An emerging issue for food security, food safety and human health. *Marine Pollution Bulletin*, *133*, 336–348.

Borrelle, S. B., Rochman, C. M., Liboiron, M., Bond, A. L., Lusher, A., Bradshaw, H., & Provencher, J. F. (2017). Why we need an international agreement on marine plastic pollution. *Proceedings of the National Academy of Sciences*, *114*(38), 9994–9997.

Burt, A. J., Raguain, J., Sanchez, C., Brice, J., Fleischer-Dogley, F., Goldberg, R., Talma, S., Syposz, M., Mahony, J., Letori, S., Quanz, C., Ramkalawan, S., Francourt, C., Capricieuse, I., Antao, A., Belle, K., Zillhardt, T., Moumou, J., Roseline, M., . . . Turnbull, L. A. (2020). The costs of removing the unsanctioned import of marine plastic litter to small island states. *Scientific Reports*, *10*, Article 14458. https://doi.org/10.1038/s41598-020-71444-6

Center for International Environmental Law. (2023). *Fossil fuel and chemical industries registered more lobbyists at plastics treaty talks than 70 countries combined*. https://www.ciel.org/news/fossil-fuel-and-chemical-industries-at-inc-3

Chiba, S., Saito, H., Fletcher, R., Yogi, T., Kayo, M., Miyagi, S., Ogido, M., & Fujikura, K. (2018). Human footprint in the abyss: 30 year records of deep-sea plastic debris. *Marine Policy*, *96*, 204–212. https://doi.org/10.1016/j.marpol.2018.03.022

Clean Seas. (n.d.). *Homepage*. https://www.cleanseas.org

Custer, S., DiLorenzo, M., Masaki, T., Sethi, T., & Harutyunyan, A. (2018). *Listening to leaders 2018: Is development cooperation tuned-in or tone-deaf*. AidData. https://docs.aiddata.org/ad4/pdfs/Listening_To_Leaders_2018.pdf

Dauvergne, P. (2023). The necessity of justice for a fair, legitimate, and effective treaty on plastic pollution. *Marine Policy*, *155*, Article 105785. https://doi.org/10.1016/j.marpol.2023.105785

Dreyer, E., Hansen, T., Holmberg, K., Olsen, T., & Stripple, J. (2024). *Towards a global plastics treaty: Tracing the UN negotiations*. Lund University.

Ecosurf. (n.d.). *Principal*. https://ecosurf.org.br

Fiji Hotel and Tourism Association. (2021). *Waste Recyclers Fiji Limited (WRFL)—Recycling commitment and solution for the tourism sector*. https://fhta.com.fj/waste-recyclers-fiji-limited-wrfl-recycling-commitment-and-solution-for-the-tourism-sector

Gjerde, K. M., & Vierros, M. (2021). Achieving SDG 14: Time for a global ocean approach. In N. Kakar, V. Popovski, & N. A. Robinson (Eds.), *Fulfilling the sustainable development goals* (pp. 329–340). Routledge.

Geyer, R., Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. *Science Advances*, *3*(7), Article e1700782. https://doi.org/10.1126/sciadv.1700782

Global Partnership on Marine Litter. (n.d.). *Global partnership on marine litter and plastic pollution*. https://www.gpmarinelitter.org

Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., Narayan, R., & Law, K. L. (2015). Plastic waste inputs from land into the ocean. *Science*, *347*(6223), 768–771.

Kumar, S. (2023, August 8). Combating plastic pollution in Fiji through Artivism. *Pasifika Environews*. https://pasifika.news/2023/08/combating-plastic-pollution-in-fiji-through-artivism

Lee, K. H., Noh, J., & Khim, J. S. (2020). The blue economy and the United Nations' sustainable development goals: Challenges and opportunities. *Environment International*, *137*, Article 105528. https://doi.org/10.1016/j.envint.2020.105528

Löhr, A., Savelli, H., Beunen, R., Kalz, M., Ragas, A., & Van Belleghem, F. (2017). Solutions for global marine litter pollution. *Current Opinion in Environmental Sustainability*, *28*, 90–99. https://doi.org/10.1016/j.cosust.2017.08.009

March, A., Roberts, K. P., & Fletcher, S. (2022). A new treaty process offers hope to end plastic pollution. *Nature Reviews Earth & Environment*, *3*(11), 726–727.

Mittempergher, D., Raes, L., & Jain, A. (2022). *The economic impact of marine plastic pollution in Antigua and Barbuda: Impacts on the fisheries and tourism sectors, and the benefits of reducing mismanaged waste*. International Union for Conservation of Nature. https://www.iucn.org/resources/grey-literature/economic-impact-plastic-pollution-antigua-and-barbuda

Monsanto, M., Kohler, P., Binetti, U., Silburn, B., Russell, J., Corbin, C., Lyons, B., Birchenough, S., & Maes, T. (2023). A blue future: Developing a national marine litter action plan in SIDS—Lessons learnt in Belize. *ICES Journal of Marine Science*, *80*(8), 2171–2182. https://doi.org/10.1093/icesjms/fsac206

Ocean Decade Network. (n.d.). *10 challenges*. https://oceandecade.org/challenges

Pacto Global Rede Brasil. (n.d.). *Blue keepers*. https://www.pactoglobal.org.br/blue-keepers

Queiroga, A. (2023, January 12). Mares sem plástico: Projeto engaja a sociedade de forma inovadora para a preservação dos oceanos. *Impacta Nordeste*. https://impactanordeste.com.br/mares-sem-plastico-projeto-engaja-a-sociedade-de-forma-inovadora-para-a-preservacao-dos-oceanos

Quirk, G., & Hanich, Q. (2016). Ocean diplomacy: The Pacific island countries' campaign to the UN for an ocean sustainable development goal. *Asia-Pacific Journal of Ocean Law and Policy*, *1*(1), 68–95.

Samson, E. (2023). *Plastic pollution affecting Small Island Developing States (SIDS)*. Organisation for Economic Co-operation and Development. https://www.seariousbusiness.com/media/neosbztzkirzzokbk8mls92n2yerb7

Silva, A. L. P., Prata, J. C., Walker, T. R., Duarte, A. C., Ouyang, W., Barcelò, D., & Rocha-Santos, T. (2021). Increased plastic pollution due to Covid-19 pandemic: Challenges and recommendations. *Chemical Engineering Journal*, *405*, Article 126683.

Singh, G. G., Cisneros-Montemayor, A. M., Swartz, W., Cheung, W., Guy, J. A., Kenny, T. A., McOwen, C. J., Asch, R., Geffert, J. L., Wabnitz, C. C., Sumaila, R., Hanich, Q., & Ota, Y. (2018). A rapid assessment of co-benefits and trade-offs among Sustainable Development Goals. *Marine Policy*, *93*, 223–231. https://doi.org/10.1016/j.marpol.2017.05.030

Tessnow-von Wysocki, I., & Le Billon, P. (2019). Plastics at sea: Treaty design for a global solution to marine plastic pollution. *Environmental Science & Policy*, *100*, 94–104.

UN. (n.d.). *UN Ocean Conference*. https://sdgs.un.org/partnerships/action-networks/ocean-commitments

UN. (2017, December 6). *Building communities of ocean action on marine pollution* [Press release]. https://sustainabledevelopment.un.org/content/documents/17203Press_release_UNEA_side_event.pdf

UN. (2018). *The world is being "swamped" by harmful plastic waste says UN chief, marking Environment Day*. https://news.un.org/en/story/2018/06/1011351

UN. (2022a). *Our ocean, our future, our responsibility*. https://sdgs.un.org/sites/default/files/2022-06/UNOC_political_declaration_final.pdf

UN. (2022b). *Report of the 2022 United Nations Conference to support the implementation of Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development*. https://www.un.org/en/conferences/ocean2022/documentation

UNEP. (2018). *Marine litter and microplastics*. https://apps1.unep.org/resolutions/uploads/k1800210.english.pdf

UNEP. (2022). *End plastic pollution: Towards an international legally binding instrument*. https://wedocs.unep.org/bitstream/handle/20.500.11822/39812/OEWG_PP_1_INF_1_UNEA%20resolution.pdf

United Nations General Assembly. (2015). *Transforming our world: The 2030 agenda for sustainable development*. https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_70_1_E.pdf

United Nations General Assembly. (2016). *Modalities for the United Nations Conference to support the implementation of sustainable development goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development*. https://sdgs.un.org/documents/ares70303-modalities-united-nations-c-22034

Vierros, M. (2021). *Assessment of the impacts of the United Nations Ocean Conference voluntary commitments*. UN. https://sdgs.un.org/sites/default/files/2022-01/DESA-Oceans-VCs.pdf

Vierros, M., & Buonomo, R. (2017). *In-depth analysis of ocean conference voluntary commitments to support and monitor their implementation*. Division for Sustainable Development, Department of Economic and Social Affairs. https://sustainabledevelopment.un.org/content/documents/17193OCVC_in_depth_analysis.pdf

World Economic Forum. (2016). *The new plastics economy: Rethinking the future of plastics*. https://www.weforum.org/publications/the-new-plastics-economy-rethinking-the-future-of-plastics

World Economic Forum, & Friends of Ocean Action. (2022). *SDG 14 financing landscape scan: Tracking funds to realize sustainable outcomes for the ocean*. https://www3.weforum.org/docs/WEF_Tracking_Investment_in_and_Progress_Toward_SDG14.pdf

About the Authors

Marjo Vierros is the head of science-policy research at the Nippon Foundation–University of Edinburgh Ocean Voices Programme. She has worked internationally in ocean policy and marine biodiversity research for 30 years, including for UN agencies, research organisations, and NGOs on topics related to ocean protection and management, capacity building, and sustainable development. Her research interests include the study of ocean socio-ecological systems and the inclusion of multiple knowledge systems and values into ocean governance.

Gemma Nelson is a Samoan lawyer with experience in public policy, international law, and legal advice in public and international sectors. As a Nippon Foundation–University of Edinburgh Ocean Voices Programme fellow in 2022–2023, she worked on topics related to the role of Pacific island countries in multilateral processes. She is currently an advisor to the Permanent Mission of Tuvalu to the UN.

Mariana Caldeira is a biologist from Brazil and a PhD candidate at the University of Edinburgh. Her research examines the conditions underpinning equitable and sustainable ocean governance, particularly focusing on pluralism in participation in the international agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction. As a fellow at the Nippon Foundation–University of Edinburgh Ocean Voices Programme, she investigated the role of traditional knowledge in multilateral ocean processes.

Andrei Polejack is the research and innovation director at the National Institute for Ocean Research in Brazil. He is also a member of the Advisory Group of the Nippon Foundation–University of Edinburgh Ocean Voices Programme. He holds a PhD in maritime affairs from the World Maritime University Sasakawa Global Ocean Institute, Sweden. His research interests include ocean science diplomacy, and particularly seeking to understand the role of science and scientists in international ocean affairs.

Júlia Schütz Veiga is a PhD candidate at NOVA School of Law, Portugal. Her thesis investigates the intersection between international property law and the transfer of marine technology. Julia is a visiting fellow at the Nippon Foundation–University of Edinburgh Ocean Voices Programme and has collaborated with the NOVA IPSI Knowledge Centre, the NOVA School of Law, and the Centro de Estudos em Direito do Mar.

Alumita Talei Sekinairai is a 2022–2023 fellow of the Nippon Foundation–University of Edinburgh Ocean Voices Programme and a Young Pacific Leaders alumni. She represents Fiji in multilateral environmental processes covering oceans, climate, and SIDS. Her research interests include issues related to traditional knowledge, ecosystem-based management, and international ocean governance. A Fijian national, she holds an Master of Science degree in maritime affairs from the World Maritime University, Sweden.

Ocean and Society
2024 • Volume 1 • Article 8678
https://doi.org/10.17645/oas.8678

cogitatio

ARTICLE

Open Access Journal

Bringing the Ocean to the Stage: Performing Coastal Values and Marine Management

Emma McKinley [1], Erika Hughes [2], Stephenie Georgia [3], Cressida Bowyer [4], Kathryn Fradera [5], Alison Fairbrass [6], and Jonathan Potts [7]

[1] School of Earth and Environmental Sciences, Cardiff University, UK
[2] School of Film, Media and Creative Technologies, Univerity of Portsmouth, UK
[3] Shetland Arts, UK
[4] Revolution Plastics Institute, University of Portsmouth, UK
[5] University of the Highland and Islands Shetland and School of Law, University of Glasgow, UK
[6] Institute for Sustainable Resources, University College London, UK
[7] School of the Environment and Life Sciences, University of Portsmouth, UK

Correspondence: Emma McKinley (mckinleye1@cardiff.ac.uk)

Submitted: 14 May 2024 **Accepted:** 11 September 2024 **Published:** 21 October 2024

Issue: This article is part of the issue "The Outliers: Stories of Success in Implementing Sustainable Development Goal 14" edited by Sarah Lothian (University of Wollongong) and Bianca Haas (University of Wollongong), fully open access at https://doi.org/10.17645/oas.i402

Abstract

Recent years have witnessed a seemingly constant call for improved understanding of human–ocean relationships, resulting in a "boom" of marine social science research, sometimes framed through the lens of ocean literacy. Defined as having an understanding of your influence on the ocean, and its influence on you, ocean literacy has gained traction in recent years as a way of better understanding the complexities of human–ocean relationships. However, despite this interest in the human dimensions of the ocean, coasts and seas, and a corresponding increase in broader marine social sciences research, qualitative and arts-based research approaches continue to remain on the periphery of ocean research. This article explores the role of two ocean research "outliers," intersecting arts-based practice and marine social sciences through the lens of interconnected performances designed to explore the diverse values held by communities about their marine and coastal environment. Undertaken as part of the Diverse Marine Values project, the performances brought together ocean scientists, coastal and marine managers, and community members to create original performance pieces in Lerwick, Shetland, Scotland, and Portsmouth, England. Drawing heavily on applied theatre practice and scholarship, these distinct but interrelated performances utilised elements of forum theatre, devised theatre, and storytelling to address marine issues important to each respective community, with a view to understanding and fostering ocean literacy. In each location, the performance work illustrated ways in which theatre can serve as not only a tool for science communication, but also a research method to explore a range of ocean literacy dimensions. The performances helped the research team, comprised jointly of specialist theatre practitioners and experts in ocean literacy, coastal management, and plastics pollution

to reshape data collection and stakeholder engagement. This collaborative theatre-making process led to deeper conversations and embedded engagement within each coastal community. It also led to a fundamental reshaping of the questions and approaches that the marine managers and scientists asked of the communities in question. The article presents a discussion of the challenges of bridging these related, but often distant, disciplines, and highlights the role of arts-based research practice in broader ocean literacy research and discourse.

Keywords

human–ocean relationships; marine social science; ocean connection; ocean literacy; performance; science-art collaboration; social values; theatre

1. Introduction

As efforts to navigate the challenges facing the global ocean continue to intensify, recent years have seen a growing emphasis on understanding human–ocean relationships as being central to the development of effective solutions to address the challenges (Bennett, 2019; Claudet, 2021; McKinley et al., 2020). As research into human–ocean relationships has continued to gain momentum, developing processes of understanding the diverse values attributed to marine and coastal environments has been the focus of much research effort. Over the last two decades, a range of concepts and frameworks have been put forward, with those dominated by economics largely underpinning our understandings of values and decision-making. The concepts of ecosystem services (Millennium Ecosystem Assessment, 2005; Watson et al., 2019) and natural capital (Terama et al., 2016) are two such examples of concepts grounded in ecological understanding and monitoring of marine systems and their economic value that have underpinned marine and coastal decision-making (Collins, 2022). While these concepts have arguably provided a common language to support sustainable ocean management, the dominance of economic values frequently associated with these concepts has increasingly been recognised as a limitation of these concepts (McKinley et al., 2019). In recent years, however, there has been a growing recognition that a broader assessment of the diverse and multiple ways in which society values the ocean, coast, and seas, and indeed nature more widely, is urgently required (Díaz et al., 2015; Kenter, 2018; McKinley et al., 2019; Pascual et al., 2023). Delivering this requires more meaningful engagement with diverse audiences, adopting innovative and multiple methods of understanding connections between people, ocean, and place, and recognising and integrating a broad range of ways of knowing and valuing the marine environment. The emphasis on ocean-human relationships has been echoed and further cemented within international policy drivers, including within the UN Sustainable Development Goals (UN, 2015), as well as the UN Decade of Ocean Science for Sustainability 2021–2030 (hereafter the Ocean Decade).

Launched in January 2021, the Ocean Decade's ten challenges include the ambition to "restore the relationship between society and the ocean" by 2030, positioning the concept of ocean literacy as a key mechanism for driving the transformation and restoration required (Glithero et al., 2024; IOC, 2018). At its simplest, ocean literacy is defined as having an understanding of your influence on the ocean and its influence on you (Cava et al., 2005). Developed in the early 2000s in the USA by marine educators who recognised a lack of ocean science within the national curriculum, the concept has been grounded in seven key principles since its inception (Payne & Marrero, 2022). Increasingly recognised as a framework for

supporting public engagement in ocean issues (Kelly et al., 2021), in the last five years, ocean literacy has undergone something of a conceptual evolution, moving away from its formal education and knowledge deficit origins to a concept that is more comprehensive and inclusive of the multiple facets of human–ocean relationships. Numerous scholars have suggested an expansion of the dimensions of ocean literacy (Kopke et al., 2019), including C. Brennan et al. (2019) who suggested ocean literacy as a concept of six dimensions—namely, knowledge, communication, behaviour, awareness, attitudes, and activism; while Fauville et al. (2024) have recently proposed a seven dimension framework of ocean literacy, combining a number of aspects proposed by other authors in the dimension of "ocean connectedness" (Nuojua et al., 2022). This article draws from the ocean literacy framework presented by McKinley et al. (2023) who proposed ten dimensions, including the new dimensions of "emoceans" (i.e., emotional connections to and with the ocean), access and experience, trust and transparency, and adaptive capacity (see Figure 1). The concept of ocean literacy, even in its evolved form, is not without limitations or criticisms, with a number of scholars raising concerns regarding its Western, knowledge deficit roots (MacNeil et al., 2021; McKinley et al., 2023; Shellock et al., 2024). Nevertheless, the concept of ocean literacy has captured the imagination and momentum of global ocean policy discourse (IOC-UNESCO, 2024)—and the recent momentum gained around the concept offers the opportunity for further shifts in ocean discourse and change towards vital improvements in inclusivity. The framework of ocean literacy provides a valuable lens for exploring relationships between people and their ocean and coastal spaces (McKinley et al., 2023)—with ocean literacy research increasingly calling for, and indeed embracing, different ways of understanding the diversity of values and human–ocean connections (McRuer et al., in press).

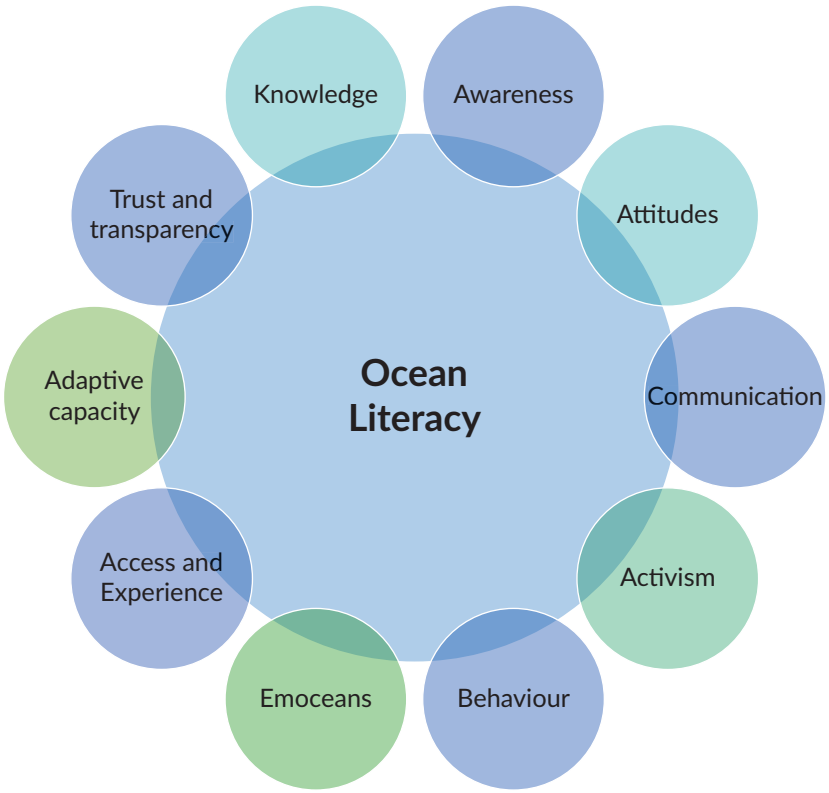


Figure 1. Ten dimensions of ocean literacy (McKinley et al., 2023).

The novel contribution of this article is that it adopts a transdisciplinary approach that is grounded in both applied theatre practice and qualitative methodologies, bridging the space among marine social science, arts-based research, and UK coastal communities. Broader marine social science research has its foundations in traditional social science disciplines (McKinley et al., 2022; Spalding & McKinley, in press); however, recent years have seen growing calls for improved transdisciplinarity within ocean research, including recognizing the role of arts and humanities scholarship and practice within ocean research. With a growing awareness of the need for improved equity and inclusivity in both ocean research and practice (Bennett, 2022), participatory methodologies are increasingly championed as best practice approaches (Popova et al., 2023) that both increase capacity for reflexive engagement and the range of stakeholders, worldviews, and knowledges involved. The emerging field of ocean literacy research (McRuer et al., in press) is beginning to echo this evolution of ocean research, with ocean literacy no longer seen as a process of passive knowledge development but one of societal action and empowerment through fostering of ocean connections (Glithero et al., 2024). However, despite repeated calls for improved societal engagement with the ocean, embracing diverse knowledge and value types in a way that centers inclusivity, equity and accessibility within ocean literacy has proven challenging with limited progress to date (Worm et al., 2021).

Socially engaged theatre scholarship and practice offer an opportunity for the ocean research community to be more inclusive and innovative in terms of how they consider human–ocean relationships. This includes, for example, drawing on participatory social sciences methods that are discursive, such as collective intelligence (McCauley et al., 2019), and championing approaches from the creative arts, including the empatheatre methodology, which has been utilised through the One Ocean Hub Collective (Erwin et al., 2022), as an integral part of the ocean research toolkit. Of course, it must be noted that participatory methodologies should not be considered a panacea within social science research, and like all other approaches, they are not without their limitations (e.g., lack of meaningful empowerment of communities, unintended reinforcement of unequal power dynamics between researchers and communities, feelings of participants not being listened to; see Cooke & Kothari, 2001; Eriksson & Stage, 2023; Neef, 2003). However, their potential value in achieving more socially equitable ocean research, and in turn ocean governance, should not be underestimated—as Erwin et al. (2022, p. 385) note, such approaches have the potential to "reject epistemological hierarchies and the problematic view that different knowledge systems are incommensurable." Furthermore, even utilising methods like Boal's Theatre of the Oppressed as epistemological thought experiments can help scholars to explore how participatory approaches might promote a reflexive understanding of complex socio-ecological problems (Neilson & Castro, 2016). With the notion of moving away from 'the usual suspects' of marine social science research, this article explores the use of different applied theatre practices as a way of understanding ocean literacy within different communities. In this way, we highlight the importance of diversifying the methods and approaches currently used to understand the complexities of human–ocean relationships, recognizing that one size does not fit all (Jefferson et al., 2021). The article presents key findings relating to the use of theatre practice as a way of evaluating community ocean literacy, and in particular, explores how these approaches can elicit previously unconsidered layers within the different dimensions of ocean literacy. Finally, the article presents a series of recommendations for the future use of theatre, and arts-based research methods more broadly, within marine social research.

2. Methodological Approach

This study combined methodologies from the social sciences and arts-based research. The activities and interventions in the two case study areas, introduced in the next section, were guided by applied theatre practices, while the analysis drew heavily on social science analytical approaches.

2.1. Introduction to the Diverse Marine Values Project and Case Study Sites

Conducted through the Diverse Marine Values project, as part of the UKRI-funded Sustainable Management of UK Marine Resources (SMMR) programme, this study sought to evaluate the role of theatre practice as a method of understanding and evaluating the diverse values held by different communities towards the marine environment. The research was carried out in two case study locations representing two geographically, socially, economically, and culturally different communities in the UK (Figure 2). The first is the Shetland test site, which is the most northerly region within the United Kingdom, forming an archipelago of over 100 islands, of which sixteen are inhabited. The population of just over 22,000 is dispersed across the islands, with over two-thirds of jobs directly or indirectly dependent on the marine environment. The management of Shetland's marine resources has been locally prioritised, and local decision-making has been championed by the local council and marine sectors such as fisheries. Historically Shetland's economy was based on fishing and knitwear, with aquaculture and oil and gas emerging as a key sector in the 1980s. The emergence of renewable energy in the form of wave, tide, and offshore wind raises opportunities for further economic transition for the region, with the potential to impact local industries and cultural heritage.

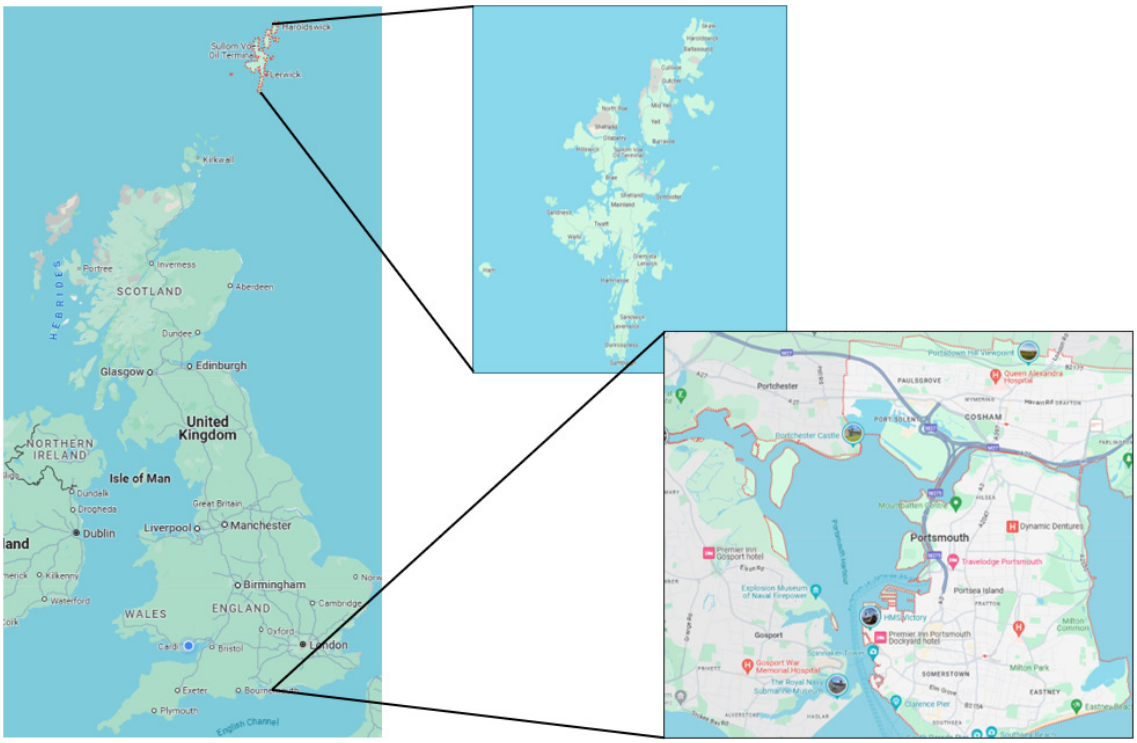


Figure 2. Location of the two case study sites, Shetland (top right) and Portsmouth (bottom right), with the boundaries of Portsmouth indicated by the dotted red line.

The second location included in this study is the port city of Portsmouth on the central south coast of England. Portsmouth is the UK's only island city; 75% of Portsmouth's 208,000 residents reside on Portsea Island, which is the second most densely populated area outside London. The city's storied maritime history goes back centuries, and HMB Portsmouth is home to the Royal Navy's largest class of aircraft carriers. A range of industries are present in the region, including operating as a naval city, hosting Portsmouth International Port, with connections for freight and transport to the Isle of Wight, Channel Islands, and the Continent, and developing its cruise liner market. As an island city, Portsmouth is vulnerable to flooding and sea level rise with risk to residences and important historical and cultural features. The themes explored here have included issues relating to climate change, coastal development and management, peoples' connections to the sea, and maritime heritage.

2.2. Theatre Methods and Their Role in Ocean Issues

This project utilised theatre and drama practices that might alternately be referred to underneath the broad umbrella terms of "applied theatre" or "socially engaged theatre." Such practices position the act of making performance as a cultural exercise that can alternately reflect existing community values, strengthen community ties, and serve as important political and cultural interventions (Hepplewhite, 2020; Shaughnessy, 2012). In the Diverse Marine Values project, the researchers served as theatre facilitators who created bespoke drama workshops for each community setting that lasted from a few hours to a few days. The participants were not professional performers, but rather community members who represented local expertise and brought first-hand lived experience from their communities into the process of co-creation. Furthermore, while much theatre-making is traditionally focused on creating a product, i.e., a performance that would typically be open to the public, the techniques utilised in this project were inherently process based. In addition, the workshops focused on affording participants the opportunity to share values through collaboration, co-creation, and physical, embodied engagement with one another.

The workshops in Shetland were created in collaboration with ten young participants aged 13–17 from Shetland Youth Theatre, a part of Shetland Arts, an independent charitable trust that is a major arts agency in the region. Taking place over the course of one week in April 2023, the Shetland Youth Theatre workshops ran from 10 am to 4 pm daily. The research team utilised devising theatre techniques (Oddey, 1996) that did not involve a prewritten script, but rather drew on other cultural artefacts including music, images, and poetry, as starting inspiration. At the onset the team chose to not use a preexisting script. Rather, they decided to focus on creating an improvisational scaffold in which every rehearsal and performance would be open to new actions and insights from the young performers and their audiences. Although the sharing of work at the end of the week ended up being a fully realised performance entitled *The Ripple Effect*, the priority was on creating drama workshops that afforded young participants an opportunity to explore and discuss their personal relationships to their coastal environment and community. While the workshop content was planned in advance by the research team, co-creation with participants was an essential component of the project, so it was not uncommon for content to change significantly based on input from the members of Shetland Youth Theatre. Workshop exercises invited participants to use their voices and bodies to tell the stories of their community; these stories in turn became catalysts for in-depth conversations around ocean literacy and the future of the Shetland coast. In the final performance, the young performers also invited community members in the audience to share their own stories of the coast, then created improvised stage pictures illustrating these coastal connections.

For the Portsmouth case study site, the research team created a bespoke forum theatre play, *Community Consultation*, which was initially workshopped at Cardiff University and later performed twice for students and colleagues studying and teaching a range of postgraduate courses at the University of Portsmouth. Forum theatre has been successfully used in health sciences, community engagement settings, as a tool for development, and in environmental justice (Olvera-Hernández, Martin-Ortega, et al., 2023; Olvera-Hernández, Mesa-Jurado, et al., 2023; Sullivan & Lloyd, 2006; Walsh et al., 2023). Performances typically begin with a short dramatic scene that presents a problem, but not a solution—rather, audience members are understood as "spect-actors" (Boal, 1973) who participate in a range of activities that can include asking direct questions to the characters in the play, offering potential courses of action to solve the problem at hand, and even joining the actors onstage to perform potential solutions themselves. *Community Consultation* was based on a real situation: the 2021 dropping of boulders by Greenpeace in the Offshore Brighton Marine Protected Area. The performance was set in the imaginary English coastal city of Worthingtonshire, at a hypothetical public consultation meeting led by a new-in-post civil servant representing "EnglandNature" (loosely based on Natural England and NatureScot). Scripted roles included a fisherman representing a local fishers organisation, an environmental activist, and a representative from a wind energy company. These roles were performed by the research team who, in several cases, were experts in the same areas as their characters. The audience took on the role of community members attending the consultation. The scene was stopped by the facilitator once the civil servant lost control of the meeting; at this point, the audience was invited to interact with the performance through both direct questioning via a technique called "hot seating" (Burton & O'Toole, 2005) and by joining the actors onstage to take on the role of one of the aforementioned characters. Following the aforementioned interactions by volunteers from the audience, the performance ended with a conversation between the facilitator, actors from the research team, and the audience as a whole.

The workshops in both test sites included activities that invited participants to identify existing connections and commonalities within their communities. For example, in one activity, "Come Be My Neighbour," participants move around the room whilst declaring statements that are true about themselves (for example: "I love swimming in the ocean, even when it is cold!"), then others in the room move to be near the person who made the statement if it is also true for them. A subsequent embodied activity deepened this new knowledge of common experience: Shetland participants created a scene about being on the shore and swimming in the sea, which shed light on what these youth associate with a visit to the coastline. Another activity involved a volunteer (from either the workshop group or, during the performance, the audience) telling a story about their relationship to the sea while participants behind the storyteller created shapes with their bodies to illustrate the story. It is important to note that while the performances in Shetland and Portsmouth were facilitated by a researcher serving as an emcee, and performed utilizing a scaffolding or plan that functioned as something of a "set list," none of the roles in either performance were scripted in a manner that required memorization of lines. The performances themselves were entirely codesigned by the actors and improvised within a structure that arose from our workshop activities. This allowed the participants to enact roles and explore relationships that were of direct relevance to them. While there may have been risks that individual biases and stereotyping of certain personalities may have been staged by the participants, the point of these processes was not to illustrate all values and relationships, but to focus on the ones of most interest and importance to the communities with which we collaborated.

In both Portsmouth and Shetland, participants were asked to provide feedback and commentary about their experience at the end of each workshop session or performance on blank postcards. These formed the basis of the data collection for this study, and also contributed to the iterative development of subsequent workshops in both test sites. Participants were free to respond however they liked, so the data captured included written, open-ended text and drawn responses. In Shetland, postcards were collected on each of the five days in April 2023, while in Portsmouth, feedback was collected at the end of each performance held in February and November 2023.

2.3. Data Analysis

Standard qualitative data analysis processes were used to analyse the various data collected through the theatre workshops, specifically focusing on the feedback postcards collected from participants. For the purposes of this article, analysis has focused on these feedback postcards due to the focus on the theatre process and its value in understanding ocean literacy in diverse audiences—a future paper will explore the performances themselves alongside the autoethnographic notes taken during the sessions.

Using NVivo 12 data analysis software, and adopting the ten ocean literacy dimensions proposed by McKinley et al. (2023) as an initial thematic framework, the data collected through the feedback postcards and the reflective summaries developed by the facilitation team was analysed using a standard thematic coding process (Braun & Clarke, 2006). Initially, an a priori coding framework was developed to identify evidence of the ten ocean literacy dimensions highlighted through the two theatre experiences, with additional indicative emergent coding carried out to identify new themes. The thematic framework and emergent themes are provided in Table 1 of the Supplementary File.

3. Key Findings and Discussion

As outlined above, thematic coding was undertaken to analyse the feedback outputs from the theatre practice activities in both Shetland and Portsmouth, with a total of 103 postcards (50 from Shetland Youth Theatre and 53 from Portsmouth MSc students). While the concept of ocean literacy and its ten dimensions were used as an initial framework for analysis, additional themes were identified through the emergent coding of the data. It should also be noted that not all ten dimensions of ocean literacy outlined by McKinley et al. (2023) were represented in the feedback data collected, although they were represented in the performances themselves. The next sections discuss the key findings (summarized in Table 1), identifying common themes across the two performance experiences, highlighting divergences and similarities, and feeding into the development of key recommendations for theatre as a method for understanding and fostering ocean literacy. Where appropriate the number of references relating to each theme is included with quotations also included.

3.1. Theatre as a Method for Exploring Ocean Literacy Dimensions

The analysis found several ocean literacy dimensions represented in the feedback comments, highlighting the opportunity for theatre-based practice research as a tool to explore ocean literacy in previously under-engaged communities.

Table 1. Summary of key themes.

Theme	Sub-themes discussed
Theatre as a method for exploring ocean literacy dimensions	Knowledge
	Awareness
	Emoceans
	Access and experience
Delivering equitable and inclusive ocean literacy through relationship-building	Building community and relationship
	Fostering of innovative and novel learning experiences
	Creation of safe spaces

The most frequently identified themes related to various aspects of the dimensions of *knowledge and awareness*, with 54 references identified in the participant feedback. Crucially, in this study, we have adopted the expanded definition of what knowledge can mean in the evolved ocean literacy concept suggested by McKinley et al. (2023). In addition to ocean science knowledge, the expanded definition of knowledge calls for the inclusion of Indigenous, traditional, and local knowledges, but also suggests that ocean knowledge should include having an understanding of broader topics relating to the ocean—including, but not limited to, ocean governance processes, ocean-related career opportunities, and related training programmes (McKinley et al., 2023). With this in mind, we have noted not only the development and expression of participants' knowledge of their local ocean or coastal space, but also their views on knowledge development and learning processes, and how these were supported through theatre practice. For example, the role of theatre in supporting learning through creative practice was referenced 20 times, with one participant from Shetland stating they "loved working with all the different techniques," while others (8) highlighted the importance of sharing and of storytelling as a form of knowledge and learning, as well as providing a method of understanding human–ocean relationships. One Shetland participant stated this clearly, commenting that they "loved writing our stories. I enjoyed the two hours that we got to speak about social issues [on the islands]. It was really powerful and we all connected."

Through the creative processes afforded by theatre practice in both communities, participants felt that theatre allowed them to learn from experiences and were given the space to develop transdisciplinary skills and knowledge (20). In Portsmouth, theatre practice allowed masters level students to learn by stepping into the (improvised) roles of a range of stakeholders within the marine decision-making environment and experiencing the challenges that come with environmental and marine management, diversifying from a curriculum largely dominated by traditional, banking-style pedagogy with an emphasis on marine science topics. Feedback from participants highlighted that the theatre practice allowed them to develop knowledge about various stakeholder perspectives with one stating that "it was a fun way to learn about the different perspectives which different stakeholders hold," with participants feeling that the "engaging scenario" was "entertaining," while "the session was insightful [and] gave…more understanding of the aims and reasons for conservation." Others commented that "the session was very educational and informative" and that it "played out a real life scenario of management issues and how it could be solved."

In terms of knowledge development and process, gamification of ocean conservation and governance scenarios is becoming increasingly commonplace as a capacity-building tool, particularly as we continue to

recognise the need for innovative approaches to considering multiple perspectives, ocean users, and how these relate to trade-offs and decision-making (Abspoel et al., 2021). Previous studies have found that role-playing style games can foster feelings of empathy and understanding, while also demonstrating real-world ocean issues and problem-solving needs (Koenigstein et al., 2020)—echoing the findings of this study—and are increasingly being used as a tool to promote ocean-friendly behaviours and engender ocean literacy (Veronica & Calvano, 2020). In addition to the increasing use of gamification, adopting theatre practice in ocean teaching provides students with an opportunity to role-play and test different skills necessary for future ocean careers. As we continue to work towards a new generation of transdisciplinary ocean science, there is an opportunity to explore how theatre practice can support activities of this nature, drawing out a greater sense of connection, and generating new types of knowledge and skills (Erwin et al., 2022). This would directly respond to the expanded definition of knowledge within the ocean literacy framework, including knowledge of ocean governance processes as well as more traditional forms of ocean knowledge. This will be a crucial aspect of ongoing ocean education to ensure it fosters a next generation of ocean professionals with the transdisciplinary knowledge, skill, and confidence to undertake the roles expected of them (Gardner, 2021). Theatre lends itself to the development of listening skills via the use of role play to support understanding of diverse perspectives and values, which is an essential competency for working on often contentious issues (e.g., MPA designation, offshore wind development, fisheries management), management of groups, understanding different ways of feeding back and more. Finally in relation to the dimension of knowledge, the theme of challenging existing learning spaces and practice was highlighted by some, with one participant commenting that it was "great to be involved in something different to PowerPoint and lectures," while another indicated that the theatre practice created a safe space for not knowing the answer, and for "pushing beyond" what would be allowed in a real-life consultation, thereby learning by doing without "offending anyone."

Topics relating to the expression of "emoceans" and connection were mentioned 31 times by 26 individuals. In particular, there was a specific focus on theatre practice offering positive learning spaces and overall enjoyment within the co-creation process. While the two theatre experiences adopted quite different theatre approaches, in both test sites the facilitation of positive spaces that engendered enjoyment and fun was highlighted in a range of ways. In the forum theatre work in Portsmouth, participants stated that they found "the interactivity [through theatre practice] with people in the industry interesting and fun to engage with" with others indicating that it was "great fun" and a "fantastic opportunity…in a safe setting." In Shetland, youth participants made similar comments, with one stating:

> I really enjoyed today because it was so interesting and exciting talking about Shetland and Shetland's history. I love…folk stories so it was really cool to talk about that. I have a lot of stories that I really like sharing so I had a lot of fun today.

Examples of other comments made relating to this theme are presented in Figure 3.

The feedback from the Shetland theatre experience also identified the dimension of *access and experience*, with one Shetland stating that they enjoyed "talking about their experiences of the ocean" and expressing a desire to move the activity outside and "go down to the Knab [a local coastal path] to get ideas" as part of the co-design and theatre devising techniques.

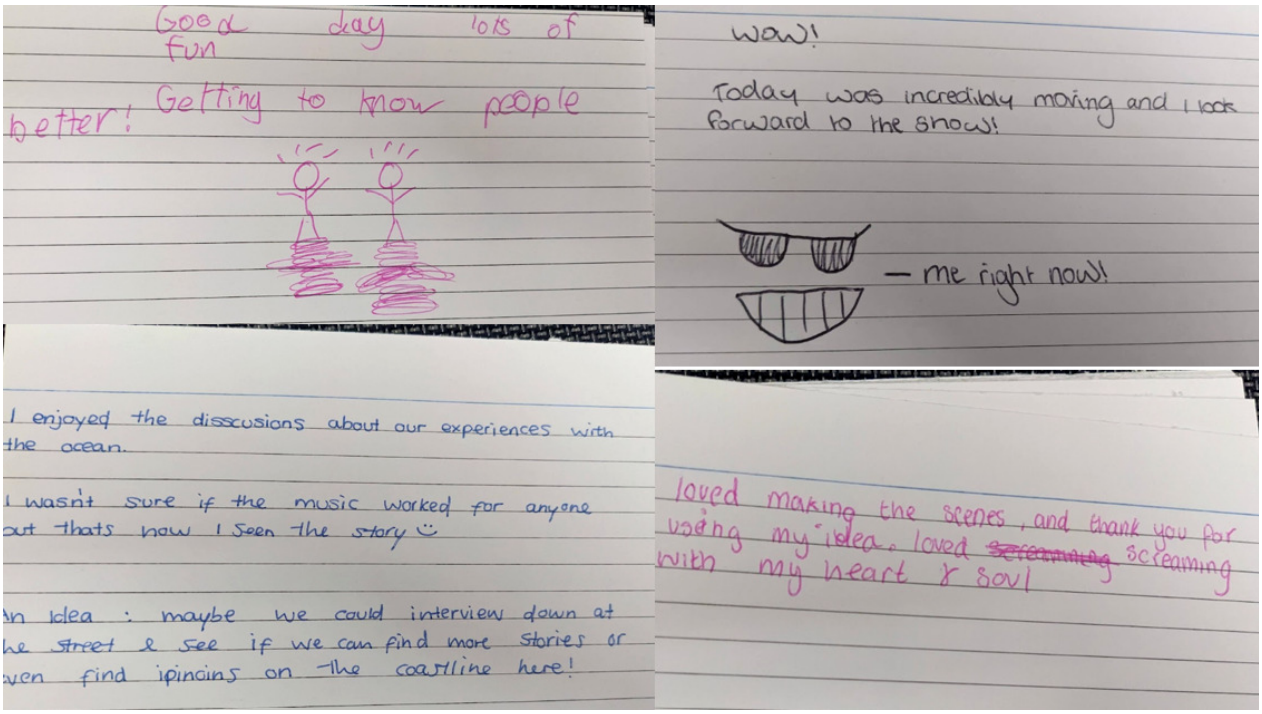


Figure 3. Example of the feedback postcards from theatre participants.

3.2. Delivering Equitable and Inclusive Ocean Literacy Through Relationship-Building

In addition to the ocean literacy dimensions, analysis of the data highlighted a number of emergent themes. One dominant theme was that of the role of theatre practice as a way of building community and relationships (14 references) in that it facilitates equitable and inclusive engagement in ocean issues, as well as the building of skills and knowledge. Participants commented that they "loved working as a team…and how everything contrasted" and that they "enjoyed the feeling of community" afforded by the theatre processes used. While the acknowledgement that more effort is required to support equity and inclusivity might not be considered particularly novel when thinking about community engagement, realizing this in practice continues to be a challenge.

A particular strength of theatre practice is that it can encourage disruption and diminishing of existing power dynamics that can be inherent within more traditional community engagement practices. Indeed, "theatre and performance can speak to critical socio-political and ecological contexts in imaginative ways, particularly in light of climate and environmental inequalities and injustices" (Woynarski, 2020, p. 4). In the case of both Shetland and Portsmouth, utilising co-creative theatre practice allowed a shifting of the balance of power so that participants and session leaders contributed equally, building community in a way that destabilised the status quo. Feedback from both groups reflected this, with one of the Shetland participants explicitly expressing gratitude, commenting "thank you for using my idea" in response to their suggestion being used to change the direction of the process, and one of the session facilitators commenting that it was "wonderful to hand over control and agency to the young people…and to follow their motivation." In terms of disrupting the expected power dynamics within the groups, the Spatial Justice concept of Lawscapes is useful here in helping to understand the importance of considering power within decision-making and engagement practices more generally. Where some people, practices, or ways of thinking are allowed to take up more space, they

act as "tilts," exhibiting a greater force on the wider group. These tilts can become naturalised into just the way things are and act as atmospherics hanging over the process (Philippopoulos-Mihalopoulos, 2015; Sarat, 1990). Moreover, theatre practice facilitates a more intimate and connected learning environment, breaking down language barriers and creating common understanding to allow natural change and flexibility within the process to happen. This requires vulnerability and openness on the part of both the theatre facilitators as well as the participants. This rebalancing of power achieved through this form of theatre work supports the building of trust and encourages active listening as a central part of the process which can be a vital part of ensuring meaningful community engagement in ocean issues.

Finally, as we continue to hear calls for inclusion and equitable space for diverse values and voices, drawing from the arts through theatre practice creates a space and platform for those who may have been excluded from ocean spaces in the past (Erwin et al., 2022). For example, theatre has long been seen as a particularly welcoming space to amplify narratives from youth (Hammond, 2013) and specifically LGBTQIA+ youth (Halverson, 2007). Recent scholarship has indicated how such practices can serve as resistance against oppressive paradigms that would silence these voices (Santiago-Jirau, 2021). The project in Shetland included queer, transgender, and nonbinary youth participants who foregrounded their experiences of non-heteronormativity in conversations about their relationship to their coastal community—conversations and insights that would most likely not have been captured through other methods, such as those from traditional social sciences. Furthermore, literary scholars have explored how ocean topics can offer queer and feminist spaces of fluidity (Huggan & Marland, 2023; Jue, 2020). The youth engagement with the Shetland performance was one marked by multiple fluidities: the inherent fluidities of the ocean and adolescence, as well as the added discovery of identity with the group discussing gender identity and sexuality in relation to their experiences of their community and coastal spaces. *The Ripple Effect* invited these young people to claim space as community members and coastal stewards and offered them an explicit opportunity to make their voices heard. Indeed, "our voices must be heard" was devised by the young actors as their closing refrain in their performance.

4. Concluding Comments and Recommendations

Recent years have seen increasing calls for improved transdisciplinary knowledge and skills as central to successfully addressing ocean challenges (IOC, 2018; IOC-UNESCO, 2024). However, ocean education remains dominated by natural science, despite efforts from the continually growing marine social science community. In addition to social science disciplines, here we call for improved integration and collaboration with the arts and humanities disciplines to deliver true transdisciplinarity for the ocean. This article explores the notion of outliers in an ocean context from a range of perspectives. Challenging recognised resistance to arts-based approaches in decision-making and policy, this study embraced the use of creative practice and arts-based research methods, historically not considered an integral component of the ocean research methodologies, to explore diverse values and relationships held by two different communities and their local ocean. This work is particularly timely, given recurrent calls for broadening and diversifying the definition of what constitutes ocean research. It is of note, for example, that during the UN Ocean Decade conference held in Barcelona in April 2024, several speakers and sessions specifically championed the need to embrace not only multiple and diverse knowledge and values types but also the need to expand the ways in which we seek to assess, evaluate and understand human–ocean relationships, all of which is reflected in the Barcelona Statement published following the conference (IOC-UNESCO, 2024). Secondly, the article

focuses on communities that are often on the edge of the ocean and coastal discourse (young people, members of the LGBTQ+ community)—including those who may be geographically proximate to the ocean but are perhaps outliers in their own communities. Ocean research and practice has long been plagued by its reputation as one of the least diverse sectors and communities (IOC-UNESCO, 2020), and while there have been, and continue to be, excellent efforts to address this, there are communities that remain excluded from ocean spaces and discussions (Bennett, 2022; Worm et al., 2021). This study clearly illustrates the capacity for theatre practice to allow the ocean research community to expand what is meant by inclusive ocean connections and ocean literacy, actively reflect on efforts to facilitate inclusive ocean literacy to date, and consider how we ensure everyone is considered equally within the ocean decade.

Despite an apparent turning of the tide in terms of perceptions of arts-based research within ocean science (R. E. Brennan, 2018), misconceptions of the validity and rigour inherent within arts-based research, a legacy within science of focusing on facts and outcomes or outputs, rather than process, and a common view of the role of arts solely as a communication and engagement tool remain persistent challenges to arts-based research being fully embraced by the ocean science community (Barone & Eisner, 2011). However, as stated by Franke et al. (2023), to truly deliver the change within and restoration of human–ocean relationships to deliver the goals of the Ocean Decade, and indeed the change needed to address the challenges facing the global ocean and the communities which depend on it, there is a clear need to move beyond the usual suspects and approaches.

The two case studies explored here provide quite different examples of how theatre practice can and should be considered a valuable component of broader ocean literacy research. The findings of this study clearly illustrate the role of theatre approaches as an effective mechanism of assessing existing levels of ocean literacy across a range of dimensions, capturing aspects and layers that have received limited attention to date. In doing so, these processes encourage a deepening and grounding our understanding of ocean literacy in a diverse range of human–ocean relationships, as well as a tool through which new types of ocean-relevant knowledge can be generated and taught. Theatre, like other arts approaches, offers opportunities to express relationships and values that draw on all senses and highlight common stories, symbols, and complex narratives in a way that gives voice and space to those who may have been unheard and deepens understandings (Barone & Eisner, 2011). Furthermore, through inviting participants to engage not only verbally and aurally but also with their whole bodies, socially engaged theatre practices open space for researchers to learn more about embodied and experiential knowledge held within communities that might otherwise not be captured as successfully via traditional research methodologies. Embodied practices like applied theatre have the potential to both highlight and challenge the one-sidedness of anthropocentrism in environmental values held and management decisions made, as "performance may highlight the interconnectedness of humans and the more-than-human world by theorising, revealing and critiquing ecological relationships" (Woynarski, 2015, p. 4). In these ways, engaging in applied theatre practices can contribute significantly to our understandings of the affective and empathetic dimensions of ocean literacy (Blythe et al., 2021).

As ocean research continues to respond to increasing calls to move away from business-as-usual approaches and seeks to create new ways of thinking about how to engage communities in ways that are inclusive, equitable, and accessible (Strand et al., 2022), it is timely to consider how theatre and arts-based practice can offer new ideas and solutions to the longstanding, pervasive, wicked problems facing the ocean on a range of scales (Jung et al., 2022).

Based on these two case studies, recommendations for facilitating a shift of arts-based research from an outlier to a core component of ocean research are set out below:

- Echoing calls from other scholars, transdisciplinary thinking to address the challenges facing the ocean will be strengthened through the inclusion of artists, both researchers and practitioners. As has been said about other areas of research that focus on the human component of the ocean, theatre should be considered a potential research tool to support meaningful co-design with communities. Crucially, this must happen during project design and be integrated effectively into project implementation to avoid the tendency to view theatre as a way of communicating project outputs.
- Theatre practice requires time and energy to develop trusting and open relationships between researchers and community participants. It is vital to ensure adequate time and resources are built into project budgets and designs to support the creation of space to deliver meaningful theatre practice.
- To answer the challenge above of operationalising theatre practice within the ocean decision-making sphere, capacity building and learning from where theatre practice has been used effectively to support decision-making and negotiations are needed (Erwin et al., 2022).

While this study clearly illustrates the value and potential of adopting arts-based methods in the context of ocean research, further effort is required to ensure that arts-based research is considered valid and valuable, if not integral, to truly understanding diverse expressions of ocean literacy, and within ocean research more generally. Crucial to this will be identifying pathways for operationalising arts-based methods within the ocean decision-making space as well as advocating for improved funding and collaboration opportunities.

Acknowledgments

The authors would like to extend their heartfelt gratitude to Sheltand Arts, and specifically the members of Shetland Youth Theatre, for their co-creation and performance of *The Ripple Effect*. The authors would also like to thank the students of the University of Portsmouth who participated in the development and performance of *Community Consultation*. We would finally like to thank the reviewers for their constructive feedback on earlier versions of the manuscript.

Funding

This work was supported by the UKRI's Natural Environment Research Council and Economic and Social Research Council under grant number NE/V017497/1 (Integrating Diverse Values into Marine Management).

Conflict of Interests

The authors declare no conflict of interests.

Data Availability

Data is available from the authors on request.

Supplementary Material

Supplementary material for this article is available online in the format provided by the author (unedited).

References

Abspoel, L., Mayer, I., Keijser, X., Warmelink, H., Fairgrieve, R., Ripken, M., Abramic, A., Kannen, A., Cormier, R., & Kidd, S. (2021). Communicating maritime spatial planning: the MSP challenge approach. *Marine Policy*, *132*, Article 103486. https://doi.org/10.1016/j.marpol.2019.02.057

Barone, T., & Eisner, E. W. (2011). *Arts based research*. Sage.

Bennett, N. J. (2019). Marine social science for the peopled seas. *Coastal Management*, *47*(2), 244–252.

Bennett, N. J. (2022). Mainstreaming equity and justice in the ocean. *Frontiers in Marine Science*, *9*, Article 873572. https://doi.org/10.3389/fmars.2022.873572

Blythe, J., Baird, J., Bennett, N., Dale, G., Nash, K. L., Pickering, G., & Wabnitz, C. C. (2021). Fostering ocean empathy through future scenarios. *People and Nature*, *3*(6), 1284–1296.

Boal, A. (1973). *Theatre of the oppressed*. Pluto.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101.

Brennan, C., Ashley, M., & Molloy, O. (2019). A system dynamics approach to increasing ocean literacy. *Frontiers in Marine Science*, *6*, Article 360. https://doi.org/10.3389/fmars.2019.00360

Brennan, R. E. (2018). Re-storying marine conservation: Integrating art and science to explore and articulate ideas, visions and expressions of marine space. *Ocean & Coastal Management*, *162*, 110–126.

Burton, B., & O'Toole, J. (2005). Enhanced forum theatre: Where Boal's theatre of the oppressed meets process drama in the classroom. *NJ: Drama Australia Journal*, *29*(2), 49–57.

Cava, F., Schoedinger, S., Strang, C., & Tuddenham, P. (2005). *Science content and standards for ocean literacy: A report on ocean literacy*. Consortium for Ocean Science Exploration and Engagement.

Claudet, J. (2021). The seven domains of action for a sustainable ocean. *Cell*, *184*(6), 1426–1429.

Collins, K. (2022). Co-production of knowledge as production of space: How we all give meaning to the sea. In S. Gomez & V. Kopsel (Eds.), *Transdisciplinary marine research: Bridging science and society* (Chapter 3). Routledge.

Cooke, B., & Kothari, U. (Eds.). (2001). *Participation: The new tyranny?* Zed books.

Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., Larigauderie, A., Adhikari, J. R., Arico, S., Báldi, A., & Bartuska, A. (2015). The IPBES conceptual framework—Connecting nature and people. *Current Opinion in Environmental Sustainability*, *14*, 1–16.

Eriksson, B., & Stage, C. (2023). How participatory are we really? The pitfalls and potentials of participatory research practices. *Conjunctions*, *10*(1), 1–14.

Erwin, K., Pereira, T., McGarry, D., & Coppen, N. (2022). Lalela uLwandle: An experiment in plural governance discussions. In D. O'Kane, J. Hills, & R. Boswell (Eds.), *The Palgrave handbook of blue heritage* (pp. 383–409). Springer.

Fauville, G., Voşki, A., Mado, M., Bailenson, J. N., & Lantz-Andersson, A. (2024). Underwater virtual reality for marine education and ocean literacy: Technological and psychological potentials. *Environmental Education Research*. Advance online publication. https://doi.org/10.1080/13504622.2024.2326446

Franke, A., Peters, K., Hinkel, J., Hornidge, A. K., Schlüter, A., Zielinski, O., Wiltshire, K. H., Jacob, U., Krause, G., & Hillebrand, H. (2023). Making the UN Ocean Decade work? The potential for, and challenges of, transdisciplinary research and real-world laboratories for building towards ocean solutions. *People and Nature*, *5*(1), 21–33.

Gardner, C. J. (2021). Not teaching what we practice: Undergraduate conservation training at UK universities lacks interdisciplinarity. *Environmental Conservation*, *48*(1), 65–70.

Glithero, L. D., Bridge, N., Hart, N., Mann-Lang, J., McPhie, R., Paul, K., Peebler, A., Wiener, C., Yen, C., Kelly, R.,

McRuer, J., Hodgins, D., & Curtin, F. (2024). *Ocean Decade Vision 2030 White Papers—Challenge 10: Restoring society's relationship with the ocean*. IOC-UNESCO. https://doi.org/10.25607/ekwn-wh61

Halverson, E. R. (2007). Chapter eight: Listening to the voices of queer youth: The dramaturgical process as identity exploration. *Counterpoints*, *310*, 153–175.

Hammond, N. (2013). Introducing forum theatre to elicit and advocate children's views. *Educational Psychology in Practice*, *29*(1), 1–18.

Hepplewhite, K. (2020). *The applied theatre artist: Responsivity and expertise in practice*. Springer.

Huggan, G., & Marland, P. (2023). Queer blue sea: Sexuality and the aquatic uncanny in Philip Hoare's transatlantic eco-narratives. *ISLE: Interdisciplinary Studies in Literature and Environment*, *30*(1), 25–49.

IOC. (2018). *Revised roadmap for the UN Decade of Ocean Science for Sustainable Development*.

IOC-UNESCO. (2020). *Global ocean science report 2020: Charting capacity for ocean sustainability*. UNESCO Publishing.

IOC-UNESCO. (2024). *2024 Ocean Decade Conference: The Barcelona statement*. https://oceanexpert.org/document/34098

Jefferson, R., McKinley, E., Griffin, H., Nimmo, A., & Fletcher, S. (2021). Public perceptions of the ocean: Lessons for marine conservation from a global research review. *Frontiers in Marine Science*, *8*, Article 1705. https://doi.org/10.3389/fmars.2021.711245

Jue, M. (2020). *Wild blue media: Thinking through seawater*. Duke University Press.

Jung, J., Gupa, D., Hash, C., Thoms, J., Owens, D., Threlfall, J., & Juniper, S.K. (2022). Doubling down on wicked problems: Ocean artscience collaborations for a sustainable future. *Frontiers in Marine Science*, *9*, Article 873990. https://doi.org/10.3389/fmars.2022.873990

Kelly, R., Evans, K., Alexander, K., Bettiol, S., Corney, S., Cullen-Knox, C., Cvitanovic, C., de Salas, K., Emad, G. R., Fullbrook, L., & Garcia, C. (2021). Connecting to the oceans: Supporting ocean literacy and public engagement. *Reviews in Fish Biology and Fisheries*, *32*, 123–143.

Kenter, J. O. (2018). IPBES: Don't throw out the baby whilst keeping the bathwater; put people's values central, not nature's contributions. *Ecosystem Services*, *33*, 40–43.

Koenigstein, S., Hentschel, L. H., Heel, L. C., & Drinkorn, C. (2020). A game-based education approach for sustainable ocean development. *ICES Journal of Marine Science*, *77*(5), 1629–1638.

Kopke, K., Black, J., & Dozier, A. (2019). Stepping out of the ivory tower for ocean literacy. *Frontiers in Marine Science*, *6*, https://doi.org/10.3389/fmars.2019.00060

MacNeil, S., Hoover, C., Ostertag, J., Yumagulova, L., & Glithero, L. D. (2021). Coming to terms with ocean literacy. *Canadian Journal of Environmental Education*, *24*(1), 233–252.

McCauley, V., McHugh, P., Davison, K., & Domegan, C. (2019). Collective intelligence for advancing ocean literacy. *Environmental Education Research*, *25*(2), 280–291. https://doi.org/10.1080/13504622.2018.1553234

McKinley, E., Burdon, D., & Shellock, R. J. (2023). The evolution of ocean literacy: A new framework for the United Nations Ocean Decade and beyond. *Marine Pollution Bulletin*, *186*, Article 114467. https://doi.org/10.1016/j.marpolbul.2022.114467

McKinley, E., Kelly, R., Mackay, M., Shellock, R., Cvitanovic, C., & van Putten, I. (2022). Development and expansion in the marine social sciences: Insights from the global community. *Iscience*, *25*(8). https://doi.org/10.1016/j.isci.2022.104735

McKinley, E., Acott, T., & Yates, K. L. (2020). Marine social sciences: Looking towards a sustainable future. *Environmental Science & Policy*, *108*, 85-92. https://doi.org/10.1016/j.envsci.2020.03.015

McKinley, E., Pagès, J. F., Wyles, K. J., & Beaumont, N. (2019). Ecosystem services: A bridge or barrier for

UK marine stakeholders? *Ecosystem Services*, *37*, Article 100922. https://doi.org/10.1016/j.ecoser.2019.100922

McRuer, J., McKinley, E., Glithero, D., & Paiz-Domingo, M. (in press). Ocean literacy research community: Co-identifying gaps and priorities to advance the UN Ocean Decade. *Frontiers in Marine Science*.

Millennium Ecosystem Assessment. (2005). *Ecosystems and human well-being: Synthesis*. Island Press.

Neef, A. (2003). Participatory approaches under scrutiny: Will they have a future? *Quarterly Journal of International Agriculture*, *42*(4), 493–502.

Neilson, A. L., & Castro, I. (2016). Reflexive research and education for sustainable development with coastal fishing communities in the Azores islands: A theatre for questions. In P. Castro, U. Azeiteiro, P. Bacelar-Nicolau, W. Leal Filho, & A. Azul (Eds.), *Biodiversity and education for sustainable development*. Springer. https://doi.org/10.1007/978-3-319-32318-3_13

Nuojua, S., Pahl, S., & Thompson, R. (2022). Ocean connectedness and consumer responses to single-use packaging. *Journal of Environmental Psychology*, *81*, Article 101814. https://doi.org/10.1016/j.jenvp.2022.101814

Oddey. (1996). *Devising theatre: A practical and theoretical handbook*. Routledge.

Olvera-Hernández, S., Martin-Ortega, J.,Mesa-Jurado, M. A., Novo, P., Holmes, G., Borchi, A., & Walsh, A. (2023). Can theatre be used in environmental governance? The view of environmental professionals in Mexico. *Environmental Science & Policy*, *149*, Article 103559. https://doi.org/10.1016/j.envsci.2023.103559

Olvera-Hernández, S., Mesa-Jurado, M. A., Novo, P., Martin-Ortega, J., Walsh, A., Holmes, G., & Borchi, A. (2023). Forum theatre as a mechanism to explore representation of local people's values in environmental governance: A case of study from Chiapas, Mexico. *People and Nature*, *5*, 119–133.

Pascual, U., Balvanera, P., Anderson, C. B., Chaplin-Kramer, R., Christie, M., González-Jiménez, D., Martin, A., Raymond, C. M., Termansen, M., Vatn, A., Athayde, S., Baptiste, B., Barton, D. N., Jacobs, S., Kelemen, E., Kumar, R., Lazos, E., Mwampamba, T. H., Nakangu, B., . . . Zent, E. (2023). Diverse values of nature for sustainability. *Nature*, *620*, Article 7975. https://doi.org/10.1038/s41586-023-06406-9

Payne, D. L., & Marrero, M. E. (2022). Ocean literacy: The essential principles and fundamental concepts of ocean sciences for learners of all ages. *Mediterr Mar Sci*, *23*(2), 270–276.

Philippopoulos-Mihalopoulos, A. (2015). *Spatial justice: Body, lawscape, atmosphere*. Routledge.

Popova, E., Aksenov, Y., Amoudry, L. O., Becker, A., Bricheno, L., Brown, J. M., Clare, M. A., Evans, A., Evans, C., Fowell, S. E., Jevrejeva, S., Jacobs, Z., Jones, D. O. B., Hibbert, A., O'Hara, F., McKinley, E., Payo-Payo, M., Pearce, C. R., Taylor, S. F. W., Sams, C., & Yool, A. (2023). Socio-oceanography: An opportunity to integrate marine social and natural sciences. *Frontiers in Marine Science*, *10*. https://doi.org/10.3389/fmars.2023.1209356

Santiago-Jirau, A. (2021). Queering applied theatre. In L. S. Brenner, C. Ceraso, & E. D. Cruz (Eds.), *Applied theatre with youth* (pp. 138–142). Routledge.

Sarat, A. (1990). "The law is all over": Power, resistance, and the legal consciousness of the welfare poor. *Yale Journal of Law and the Humanities*, *2*, 343–379. https://openyls.law.yale.edu/handle/20.500.13051/7423

Shaughnessy, N. (2012). *Applying performance: Live art, socially engaged theatre and affective practice*. Palgrave Macmillan.

Shellock, R. J., Fullbrook, L., McKinley, E., Cvitanovic, C., Kelly, R., & Martin, V. (2024). The nature and use of ocean literacy in achieving sustainable ocean futures: A systematic map. *Ocean & Coastal Management*, *257*, Article 107325. https://doi.org/10.1016/j.ocecoaman.2024.107325

Spalding, A., & McKinley, E. (in press). The state of marine social science: Yesterday, today, and into the future. *Annual Reviews in Marine Science*.

Strand, M., Rivers, N., & Snow, B. (2022). Reimagining ocean stewardship: Arts-based methods to 'hear'and

'see'Indigenous and local knowledge in ocean management. *Frontiers in Marine Science*, *9*, Article 886632. https://doi.org/10.3389/fmars.2022.886632

Sullivan, J., & Lloyd, R. S. (2006). The forum theatre of Augusto Boal: A dramatic model for dialogue and community-based environmental science. *Local Environment*, *11*(6), 627–646.

Terama, E., Milligan, B., Jiménez-Aybar, R., Mace, G. M., & Ekins, P. (2016). Accounting for the environment as an economic asset: Global progress and realizing the 2030 Agenda for Sustainable Development. *Sustainability Science*, *11*, 945–950.

UN. (2015). *Transforming our world: The 2030 agenda for sustainable development*.

Veronica, R., & Calvano, G. (2020). Promoting sustainable behavior using serious games: Seadventure for ocean literacy. *IEEE Access*, *8*, 196931–196939.

Walsh, A., Olvera-Hernández, S., Mesa-Jurado, M. A., Borchi, A., Novo, P., Martin-Ortega, J., & Holmes, G. (2023). Valuing trans-disciplinarity: Forum theatre in Tabasco and Chiapas, Mexico. *Research in Drama Education: The Journal of Applied Theatre and Performance*, *28*(2), 311–329.

Watson, R. T., Baste, I. A., Larigauderie, A., Leadley, P., Pascual, U., Baptiste, B., Demissew, S., Dziba, L., Erpul, G., Fazel, A. M., Fischer, M., Hernández, A. M., Karki, M., Mathur, V., Pataridze, T., Pinto, I. S., Stenseke, M., Török, K., & Vilá, B. (2019). *The global assessment report on biodiversity and ecosystem services. Summary for policymakers.* IPBES Secretariat.

Worm, B., Elliff, C., Fonseca, J. G., Gell, F. R., Serra-Gonçalves, C., Helder, N. K., Murray, K., Peckham, H., Prelovec, L., & Sink, K. (2021). Making ocean literacy inclusive and accessible. *Ethics in Science and Environmental Politics*, *21*, 1–9.

Woynarski, L. (2015). *Towards an ecological performance aesthetic for the bio-urban: A non-anthropocentric theory* [Unpublished PhD thesis]. Royal Central School of Speech and Drama, University of London.

Woynarski, L. (2020). *Ecodramaturgies: Theatre, performance and climate change*. Palgrave Macmillan.

About the Authors

Emma McKinley is a senior research fellow at Cardiff University. Her research focuses on understanding the complex relationships between society and the sea, taking account of diverse values held by different communities, and how insights can support effective ocean governance.

Erika Hughes is a professor of theatre for social change at the University of Portsmouth. Her work as a director of live and digital performance has been seen on stages and screens throughout Europe, North America, and Asia.

Stephenie Georgia is a theatre practitioner based in the Shetland Isles. She is the founder of community interest company ALICE Theatre Project, director for Shetland Youth Theatre, and a lecturer in Drama for Shetland Arts Development Agency. She graduated from the University of the Highlands and Islands in 2022 with an MA in art and social practice. Her work specialises in delivering socially engaged theatre projects with an emphasis on influencing social change.

Cressida Bowyer (PhD) is an associate professor in arts and sustainability and the Deputy Director of the Revolution Plastics Institute at the University of Portsmouth. Bowyer's research focuses on employing arts-based participatory methods to tackle global health and sustainability challenges, such as plastic waste and air pollution.

Kathryn Fradera (PhD) is a research associate based within the School of Law at the University of Glasgow. She has an in-depth understanding of the importance of lawscapes for contextualising spatial decisions and her main area of research interest is in the application of spatial justice to land-use decision making, particularly at the coast. After 10 years of research and practice in marine regulation, Kat is currently researching flood adaptation and climate resilience through a spatial justice lens, investigating how to implement adaptation planning pathways.

Alison Fairbrass (PhD) is a research fellow at UCL specialising in natural capital, biodiversity monitoring, and environmental sustainability indicators.

Jonathan Potts is the course leader for the MSc Coastal and Marine Resource Management at the University of Portsmouth. His teaching is interdisciplinary and spans the science–policy–society interface. His current research is driven by national and global sustainable development agendas, emphasising transferable practices for global sustainability.

Ocean and Society
2024 • Volume 1 • Article 9328
https://doi.org/10.17645/oas.9328

COMMENTARY

Open Access Journal

Building Successful International Summer Schools to Enhance the Capacity of Marine Early Career Researchers

Christopher Cvitanovic [1,2], Jessica Blythe [3], Ingrid van Putten [4,5,6], Lisa Maddison [5], Laurent Bopp [7], Stephanie Brodie [4], Elizabeth A. Fulton [2,4], Priscila F. M. Lopes [8,9], Gretta Pecl [10,5], Jerneja Penca [11], and U. Rashid Sumaila [12,13]

[1] School of Business, University of New South Wales Canberra, Australia
[2] Centre for Marine Science and Innovation, University of New South Wales, Australia
[3] Environmental Sustainability Research Centre, Brock University, Canada
[4] Commonwealth Scientific and Industrial Research Organisation, Australia
[5] Centre for Marine Socioecology, University of Tasmania, Australia
[6] Wageningen Economic Research, Wageningen University & Research, The Netherlands
[7] LMD/IPSL, CNRS, Ecole Normale Supérieure, Paris Sciences & Lettres University, France
[8] Department of Ecology, Federal University of Rio Grande do Norte, Brazil
[9] Research Institute of the University of Bucharest, University of Bucharest, Romania
[10] Institute for Marine and Antarctic Studies, University of Tasmania, Australia
[11] Mediterranean Institute for Environmental Studies, Science and Research Centre Koper, Slovenia
[12] Institute for the Oceans and Fisheries and the School of Public Policy and Global Affairs, University of British Columbia, Canada
[13] Department of Agricultural Economics and Rural Development, University of Pretoria, South Africa

Correspondence: Christopher Cvitanovic (c.cvitanovic@unsw.edu.au)

Submitted: 23 September 2024 **Accepted:** 1 October 2024 **Published:** 24 October 2024

Issue: This commentary is part of the issue "The Outliers: Stories of Success in Implementing Sustainable Development Goal 14" edited by Sarah Lothian (University of Wollongong) and Bianca Haas (University of Wollongong), fully open access at https://doi.org/10.17645/oas.i402

Abstract

The development of informal science learning programs is a key strategy for supplementing traditional training for early career researchers (ECR). Within the marine sector, there has been a proliferation of international summer schools (a form of informal science learning program) to support ECRs to develop the networks, skills, and attributes needed to tackle ocean sustainability challenges and support the attainment of the Sustainable Development Goals (e.g., collaboration across disciplines, policy engagement, etc.). Yet, there exists very little evidence on the impact generated by such informal science learning programs or the design strategies that can confer their success. This commentary seeks to address this knowledge gap by considering the successful biennial Climate and Ecosystems (ClimEco) marine summer school series that has run since 2008. Specifically, we draw on the perspectives of lecturers and organisers, in combination with a survey of ClimEco participants (n = 38 ECRs) to understand the drivers and motivations of ECRs to attend summer schools, the types of outcomes and impacts that summer schools can have for marine ECRs, and the

key factors that led to the successful attainment of these impacts, outcomes, and benefits. In doing so, we develop guidance that would enable global summer school convenors to effectively support the next generation of marine researchers to advance ocean sustainability.

Keywords

early career researchers; informal science learning programs; interdisciplinary; ocean sustainability; postgraduate; SDG 14; transdisciplinary

1. Introduction

The UN Decade of Ocean Science for Sustainable Development (2021–2030) calls for the science we need for the ocean we want, particularly to achieve the SDGs. This initiative underscores the importance of cultivating a new generation of scientists capable of addressing the complex and interconnected challenges facing marine social-ecological systems. Scientists must, among other things, have the ability to work across disciplinary boundaries (Kelly et al., 2019; Sumaila, 2024), build trusted relationships to engage with policy and practice (Cvitanovic et al., 2016, 2021; Evans & Cvitanovic, 2018), and collaborate with a wide range of non-academic actors and knowledge systems (Penca et al., 2024). This is evident in the global growing demand for diverse, equitable, interdisciplinary, and transdisciplinary research and researchers (e.g., Pennino et al., 2021), which is also increasingly used as a key metric of career success by funding agencies, academic institutions, and selection committees for prestigious awards (de Vos et al., 2023). Consequently, there is an urgent need to build the capacity of early career researchers (ECRs) to meet these evolving expectations and ensure the development of marine scientists equipped to tackle the pressing issues of the 21st century (Brodie et al., 2022; Hildebrand, 2019; Shellock et al., 2023).

Traditional academic training programs, such as those for Masters and PhD degrees, often fall short of equipping ECRs with the full suite of skills necessary to address the complex challenges of contemporary marine science (Andrews et al., 2020). They typically emphasize the norms and methodologies of a singular scientific discipline (although we do note the emergence of a range of postgraduate programs that aim to reverse this trend), which may limit researchers' ability to work across various fields and collaborate effectively beyond their area of expertise. Moreover, traditional postgraduate science curricula frequently overlook the development of essential "soft skills"—such as communication, teamwork, and stakeholder engagement—that are critical for undertaking research needed in modern times.

Informal science learning programs (ISLPs), developed outside of core training and degree programs, can fill this early career training and development gap. Participation is voluntary and they are structured towards achieving desired skills and/or attributes (e.g., Moskel et al., 2021). In the context of marine education, international summer schools have emerged as key ISLPs to support ECR's skills development (e.g., Aguilar-Manjarrez & de Viçose, 2018; Singh et al., 2024). However, little scholarship exists on marine summer schools, particularly in terms of best practices for program development to ensure lasting and enduring outcomes and impacts for participants (Penca, 2021).

In this Commentary, we seek to fill this gap, using the long-standing Integrated Marine Biosphere Research (IMBeR) ClimEco summer school series as a case study. Specifically, we draw on the perspectives of a group of

ClimEco lecturers and organisers (the authors), combined with a survey of ClimEco participants (n = 38 ECRs), to understand the drivers and motivations of ECRs to attend summer schools, the types of outcomes and impacts that summer schools can generate for marine ECRs, and the key factors that led to attaining these benefits. In doing so, we aim to provide guidance for convenors of other global summer schools to help them design effective programs that build the capacity of ECRs to advance ocean sustainability.

2. The Short History of ClimEco

The IMBER (see Hofmann et al., 2015 for a history of the project) first organised the biennial Climate and Ecosystems ("ClimEco") summer schools for marine ECRs when its focus shifted to include human dimensions. The location of the summer school changes every year, bringing into collaboration a local co-organiser and bringing opportunities to ECRs in regions which can struggle to access events due to, for example, limited funding. The first ClimEco summer school was held in 2008 in Ankara, Turkey, and the most recent in Koper, Slovenia in 2023. Over this 16-year period, six ClimEco summer schools have been held in six countries (one was held online during the Covid-19 pandemic).

Each ClimEco summer school focuses on a topic relating to global change and human and ocean systems (van Putten et al., 2021). The topic is chosen by the organiser and convenor, who also co-ordinates the development of the program. Disciplinary experts are invited to lecture relevant sections. Altogether, 40 lecturers volunteered (some more than once) about 10 days each for each event. The ClimEco summer schools were attended by 445 ECRs from 68 countries (Figure 1 shows the last five summer schools—for which full data was available).

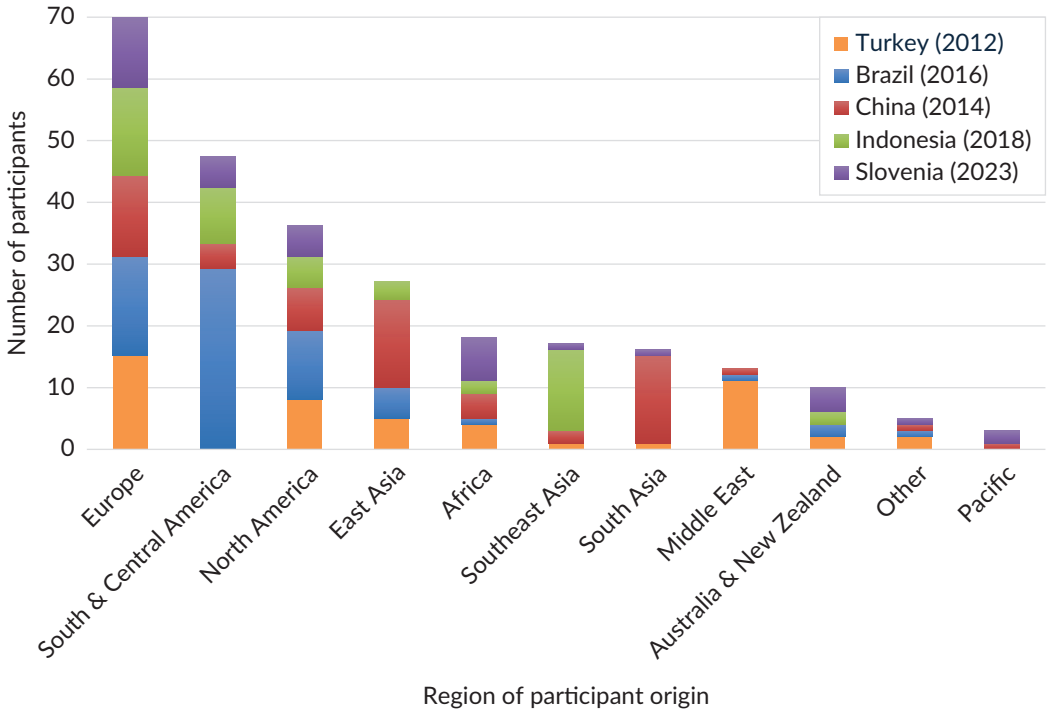


Figure 1. The summer school participants by region according to the location and year, across the last five in-person ClimEco summer schools for which data was available (held in Turkey, Brazil, China, Indonesia, and Slovenia).

The geographic, disciplinary, and gender distribution of attendees is intentionally balanced. Nevertheless, work remains to be done because the attendees from the Pacific are significantly unrepresented (Figure 1). The organiser (in collaboration with the local co-organisers) undertakes administrative and logistical tasks, including promotion, communication with applicants, budget management, and fundraising (sponsorship for specific summer school events and travel support).

3. Why Do ECRs Attend International Summer Schools?

As described in the introduction (Section 1), ISLPs (in this case summer schools) are designed to provide structured learning towards a specific goal and outcome. It is therefore important to first understand what motivates ECRs to attend international summer schools, as this has implications for their design, and thus the guidance suggested later in this commentary.

The 38 survey participants mentioned 81 motivations to attend which could be grouped into seven main themes (Figure 2): one did not respond, and the remainder provided between one to four motivations. Thematic analysis of the responses indicated that most attend summer schools to "network" (n = 22). However, the purpose of networking varied. Some aimed to network with their peers or find potential collaborators, some to network with people from other cultures/countries, others simply to increase their network, and some specifically wanted to network with lecturers.

The next most mentioned motivation to attend ClimEco was to increase skills and expand horizons (n = 17), or interest in a particular topic (most common were climate change, social science research methods, science communication and engagement, environmental justice, and sustainability; n = 17). Many wanted to gain interdisciplinary skills (n = 11). Others had personal drivers for attending, such as scouting for career opportunities and building their reputations. Some were attracted by the lecturers or wanted to visit the place where the summer school was held.

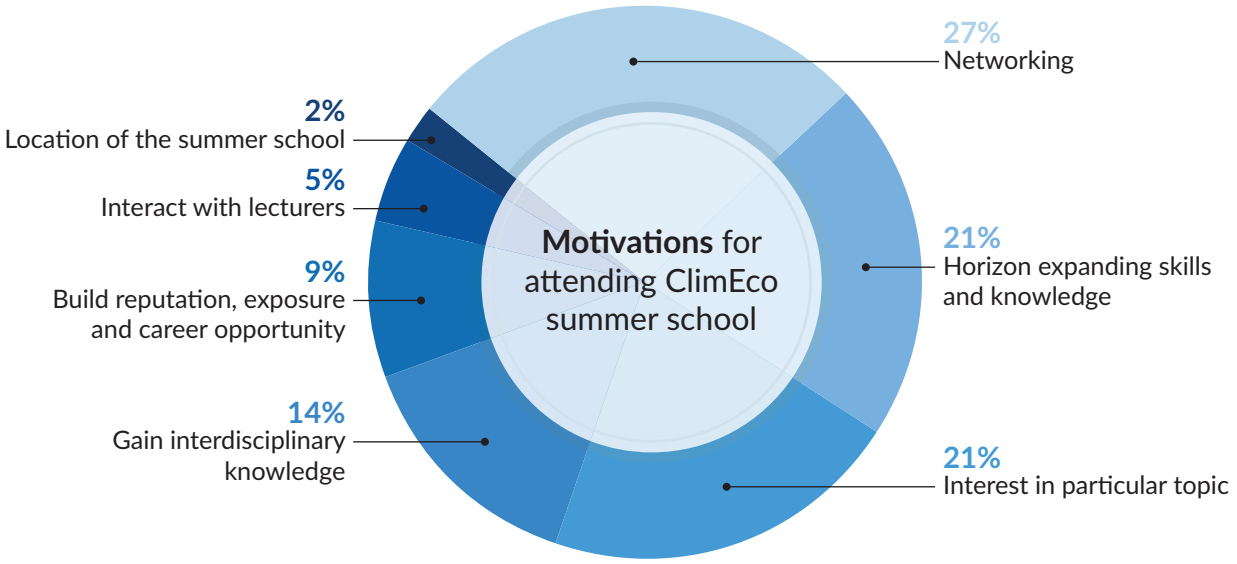


Figure 2. Motivations of participants for attending ClimEco summer schools.

4. What Benefits Occurred as a Result of Attending ClimEco?

4.1. Benefits Derived From Attending a ClimEco Summer School

Networking was the most frequently reported benefit of attending ClimEco (based on $n = 33$ that completed this question of the survey, Figure 3). Participants developed both personal and professional connections, with one noting, "I'm still in touch with some of my fellow participants, we have a WhatsApp group where we exchange useful information about events or opportunities." Another mentioned the importance of building "connections with other senior academics I would've been too shy to try and create in another setting [e.g., a conference]."

The second most reported benefit was learning ($n = 30$). Participants mentioned learning about marine social science ($n = 6$), new places and cultures ($n = 4$), ecosystem modelling ($n = 3$), interdisciplinary marine science ($n = 3$), knowledge mobilization ($n = 3$), careers paths ($n = 1$), climate research ($n = 1$), oceanography ($n = 1$), and academic publishing ($n = 1$), among other topics.

The remaining benefits were split across three themes. Six respondents identified an increased appreciation for equity, diversity, and inclusion in marine research. For example, one participant noted that the summer school allowed them to "accept and understand the differences in cultural habits and thought processes from researchers of different latitudes," while another stated that they gained an "increased awareness of challenges faced by minorities in academia and fieldwork." Six respondents identified an increased appreciation for equity, diversity, and inclusion in marine research as a benefit. For example, one participant shared "I was able to take a break from the stress of my program." Finally, six participants valued the opportunity to share their research and receive receive feedback from their peers and lecturers on their research during the poster session.

Although networking was a motivation to attend for many participants, it was an unexpected benefit for some ($n = 12$) who responded that they had not anticipated its value. One shared, "7 years later I still lean on

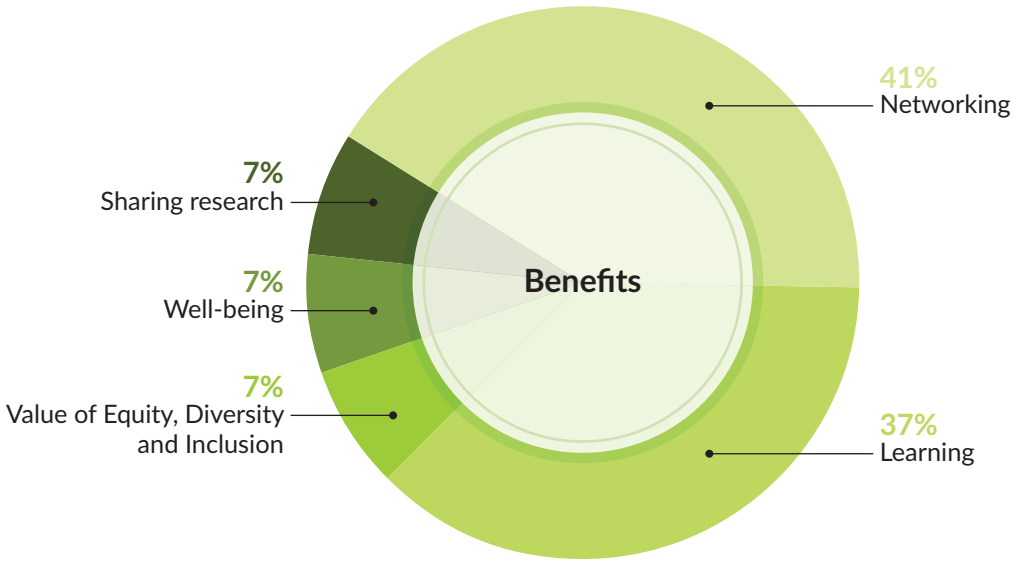


Figure 3. Summary of the benefits derived from attending the ClimEco summer school.

and work with the network I met at this summer school. As an ECR, I was rather naive about the importance of networking [before the summer school]." The next unexpected benefit was the relaxed atmosphere (n = 7). One respondent noted: "My experience of academic [sic] was very rigid…but ClimEco was an extremely warm and welcoming environment that opened my eyes to alternative ways of working in this field." Another indicated that the atmosphere made it "easy to have informal talks and ask questions." Four participants also expressed surprise at how much they learned at the school.

Career opportunities were the most significant outcome of participating in ClimEco, with 16 respondents citing benefits such as heightened job awareness, academic visits, roles on marine science committees, and opportunities for conference presentations. Additionally, some secured postdoctoral, PhD, or Masters positions as a result of attending. The second most common outcome was joint academic publications (n = 7). Eleven survey respondents reported no outcomes as yet.

Summer school participants created an early-career networking platform to build on the connections and collaborations outlined above by establishing the Interdisciplinary Marine Early Career Network (IMECaN), designed to extend the goals of the summer schools. It provides a sustainable platform for early-career marine researchers to foster collaborations, receive training in areas not typically covered by formal education, and access leadership opportunities—particularly for researchers from developing nations. Interdisciplinary Marine Early Career Network now includes members from 103 countries and delivers impactful events and research outputs.

5. Benefits From a Lecturer's Perspective

The lecturers, particularly those who attended multiple summer schools (i.e., the authors), also felt they personally benefited from the experience. We were variously motivated by desires to help expand capacity, give back to the field, and gain exposure to new fields and cultures (and typically a combination of these and more). These desires were often exceeded, noting that we personally benefitted from the exposure to the breadth of disciplines covered in the summer schools (due to the convention that the lecturers attend all lectures as much as possible). We also built new collaborations across disciplines and the lecturer network. Seeing alumni leading impactful research and accessing capability became more straightforward as summer schools, and courses inspired by them, grew in number.

6. How to Build Effective International Interdisciplinary Summer Schools

Attending ClimEco summer schools has led to a range of outcomes and impacts for participants, making ClimEco an example of a successful ISLP, a "bright spot." As highlighted throughout the literature (e.g., Cvitanovic & Hobday, 2018; Karcher et al., 2022), the study of such bright spots can provide important lessons that can be replicated in other contexts (i.e., other summer schools and ISLPs). In this section, we draw from survey respondents, and our own experiences and knowledge as lecturers, to provide guidance for organisers of other marine-focused ISLPs. In doing so, we note that a range of approaches to building successful summer school are likely applicable depending on the topic, goals, and context beyond those outlined here.

The guidelines (presented in the following sections) follow three temporal stages: planning and preparation; implementation; and post-summer school. The overall success of a summer school starts at least 12 months

earlier, and the time and effort involved in planning and preparation should not be underestimated. The success is very much linked to the people involved. Lecturers should not be selected solely on their international standing, but rather for their reputation as collaborative, understanding, passionate (for people and education), and engaging individuals (noting that, in the case of ClimEco, convenors and lecturers worked on a voluntary basis). Lecturer characteristics significantly impact the learning environment. Finally, by design and following the best practices in the field (de Vos et al., 2023), ClimEco intentionally sought to consider and support diversity and equity across all aspects, including actively seeking opportunities for ECRs from the Global South and creating avenues to support their participation through sponsorship, visa applications, and other logistical support.

6.1. Planning a Summer School

The following are considerations to guide the planning of summer schools:

- Have a dedicated organiser: The organiser is the primary point of contact. They have experience in organising events, excellent leadership, and interpersonal skills.
- Engage a convenor: The organiser invites a convenor to drive the event (someone well-regarded in their field, collegial, engaging, and enthusiastic). The convenor largely sets the tone of the summer school. They must commit to volunteering a significant amount of time.
- Choose an interesting and attractive location (and finalize size): Secure a venue early in the process with the help of a local academic who can also contribute to teaching. Ideally, the location is accessible and in a low-income country/region where (this type of) learning opportunity is typically less available. The capacity of the venue dictates the size of the summer school. We found just the right size to allow for both diversity and manageability was 60–65 students and 8–10 lecturers (the optimal ratio appears to be one lecturer to five to seven students).
- Secure facilities: An effective summer school requires a plenary room (preferably with movable tables and chairs), two to three separate rooms for group activities, space for coffee breaks and lunch, an indoor/outdoor area with sufficient wall space for a poster session, outdoor spaces, and a private room for prayer or other personal needs. Windows and natural sunlight are important. An assortment of accommodations (hotels, hostels, student housing, and local homes willing to take in students) close to the venue or with easy transport is ideal.
- Secure funding: Lack of funding limits ECRs, particularly from low-income countries, from attending international events. Even though a registration fee can be charged (see below) to cover costs, the organiser, convenor, and lecturers should apply for grants (e.g., philanthropic organisations, NGOs, and government agencies) for travel support for participants. A central collection point should be set up to receive registration fees, book, and pay for sponsored participants' travel and accommodation, and to pay various vendors and suppliers (e.g., hotels and caterers).
- Choose the topic and draft the program: The organiser and convenor select the topic and draft a preliminary program. Eight days may be the optimal length although some attendees recommended 10–14 days with some free days midway. Balance theoretical and practical sessions, consider trade-offs between depth and breadth of topics, and include at least 50% interactive activities. Ideally, interactive activities foster small group participation, with attendees learning together, sharing skills, and having fun. Laughter and play is a key ingredient to learning.

- Select an inspiring team of lecturers with diverse disciplinary backgrounds: The organiser and convenor invite lecturers with the required expertise that are known for their collaboration and collegiality. The lecturing team must have diverse disciplines, nationalities, genders and career stages, and be available throughout the summer school (i.e., all lecturers are present at all times, even on days they are not teaching).
- Advertise and call for applicants: Develop a flyer and create a website (with location, topic, themes, lecturers, and local committee) at least eight months before the summer school. Promote the summer school, "Save the Date" (seven months), and call for applications (six months), via networks, mailing lists, and social media. The ClimEco application asked for name, email, gender, pronouns, career stage, institution, discipline, nationality, country of residence, CV, and 300-word motivation for wanting to attend.
- Select participants: Use a fair and transparent selection process. A ClimEco selection committee comprised of the organiser, convenor, and two to three lecturers, scored each application (3 = *highly suitable*, 2 = *suitable*, and 1 = *unsuitable*). The top candidates were selected, and any other candidates were discussed collectively (in order of their score). Diversity in gender, career stage, discipline, and country of residence was also taken into account.
- Finalise program: All lecturers contribute to finalising the program, based on their specific expertise and proposed innovative topics and formats. The program is published at least two weeks before the summer school.
- Provide information via a conference app: Information on arrival and departure logistics, accommodation options, program and infrastructure, and cultural information should be included. A conference app (e.g., Whova), where lecturers and participants can upload profiles and interact will be useful. The program, suggested reading material, and surveys (pre- and post-summer school), can be posted on the app.
- Set up registration: Online registration with payment of registration fees, acts as proof of attendance. If fees are required, they should be reasonable ensuring a no-cost balance.
- Embed local logistics: Local ECRs/students can be asked to assist with a local organisation (e.g., in lieu of registration fees) and can recommend facilities, source flip charts and poster boards, and assist with field trips (coordinating timing, transport, entrance fees, guides, catering, etc.).
- Book travel and accommodation: The organiser books travel and accommodation for the lecturers. Early booking will result in cheaper rates. The organiser pre-books rooms for participants in a range of accommodation options (differently priced). Participants then confirm and pay for their bookings. Participants staying close together, within walking distance of the venue, facilitate informal networking.

6.2. Implementing a Summer School

The following are considerations for running the summer school:

- The convenor sets the tone: In the opening address, the convenor should set a friendly, accessible, interactive, and welcoming tone and outline expectations (including equity, fairness, and justice principles). The convenor "opens" and "closes" each day. Learning people's names and addressing them by their names during discussions is important.

- Maximise the physical space: A diversity of "spaces" and constructions are needed (i.e., a U-shape lecture room and sufficiently large breakout rooms to allow people to move around). Flipcharts/whiteboards should also be available.
- Create a "safe space": Maximise learning and networking by making participants feel comfortable to engage and ask questions. Create a safe space to share research experiences (both positive and negative). Personal anecdotes help to normalise sharing without fear of judgment. Always account for different cultures and religions, for example, by providing a private prayer room.
- Balance lectures and workshops: Participant feedback recommends equal proportions of lectures and interactive activities each day. ClimEco held lectures in the morning and other activities after lunch (when "tiredness" is more likely to set in). Lectures provide the foundation theory for the day's theme. Interactive activities reinforce the morning's theoretical learnings, and/or provide practical skills for career development, such as: how to write a policy brief, how to write a winning grant application, how to write papers and choose a publisher, and how to build an online profile.
- Plan a range of networking events: Include several networking events throughout the summer school. For example, at the end of the first day, ClimEco would have an "ice-breaker" poster session in an informal setting with drinks and snacks and a more formal sit-down dinner on the final night.
- Ensure time for informal networking: Informal networking is important, e.g., morning and afternoon coffee breaks (30 minutes) and lunch (1–1.5 hours). Some evenings must be free to allow participants opportunities for self-organised fun. Physical activity during the lunch period also helped the afternoon mood and sharpened minds for the after-lunch sessions.
- Include a field trip: Intensive and immersive daily learning can be very tiring. ClimEco held a field trip midway through the summer schools for lecturers and participants, to a local tourist attraction or the beach (providing a break and a great opportunity for informal networking).

6.3. Following on From a Summer School

The following are considerations for what to do after the completion of the summer school:

- Support ongoing networking and dialogue between participants: Establish a mechanism for participants to continue their interactions after the summer school. Maintain an email list or set up a dedicated online space. ClimEco uses a WhatsApp group chat (on an opt-in basis) to achieve this.
- Create a community: Organisers can also facilitate ongoing network and learning opportunities through a dedicated ECR network (this, however, can be costly and time-consuming and requires ongoing support). The Interdisciplinary Marine Early Career Network was established by a group of past ClimEco participants and lecturers and has been highly successful.
- Gather feedback: Participant feedback is an important mechanism for improvement. Feedback immediately following the summer school focuses on understanding participants' experiences, while mid- to longer-term responses (6–12 months later) should consider outcomes and impacts. The latter can demonstrate "success," to help secure future funding for future summer schools.

7. Conclusions

In this commentary, we have reflected on the ClimEco Summer School series to generate guidance for organisers/convenors of global summer schools (and other ISLPs) to help them train the next generation of

marine researchers to successfully tackle the challenges posed by ocean sustainability. We posited that the success of such events depends on the *people* involved, which is a recurrent theme throughout the commentary (i.e., the main motivation for attending was networking, the main benefit derived related to networking and relationship building, and networking was an unexpected benefit for those not initially motivated by it). The key design principles rest largely on having a team of organisers, convenors, and lecturers who create a positive environment for networking while learning to work in an interdisciplinary way to solve the diversity of marine issues occurring this century.

Acknowledgments

We thank the survey participants for completing the survey. We also thank IMBeR for the opportunity to be involved in, learn from, and synthesize lessons from the ClimEco summer school series. Particular thanks to all the local hosts who provided the venues, and to the sponsors who supported ClimEco over the years by providing travel support for participants or who made a contribution to the ice-breakers or summer school dinners. Thanks also to all the lecturers who volunteered their time and support to participants over the years. P. Lopes thanks CNPq for a productivity grant (302365/2022–2) and the Romanian Ministry of Research, Innovation and Digitalization, within PNRR-III-C9–2022-I8 for a grant (760054—JUST4MPA). J. Penca reports support by the Slovenian Research Agency P5–0453. U. R. Sumaila thanks the Social Science and Humanities Research Council of Canada for its support of the Solving FCB Partnership hosted by the University of British Columbia.

Conflict of Interests

The authors declare no conflict of interests.

Data Availability

Data is not publicly available to protect participants, in accordance with research ethics approval. For further information or access to the data, please contact the lead author.

References

Aguilar-Manjarrez, J., & de Viçose, G. C. (2018, April). EcoAqua summer school on marine spatial planning. *FAO Aquaculture Newsletter*, 24. https://openknowledge.fao.org/server/api/core/bitstreams/e6aed392-6665-4721-9fcb-17a7073789f1/content

Andrews, E. J., Harper, S., Cashion, T., Palacios-Abrantes, J., Blythe, J., Daly, J., Eger, S., Hoover, C., Talloni-Alvarez, N., Teh, L., Bennet, N., Epstein, G., Knott, C., Newell, S., & Whitney, C. K. (2020). Supporting early career researchers: Insights from interdisciplinary marine scientists. *ICES Journal of Marine Science*, *77*(2), 476–485. https://doi.org/10.1093/icesjms/fsz247

Brodie, S., Addey, C. I., Cvitanovic, C., Dias, B. S., Frainer, A., García-Morales, S., Jiang, S., Kaikkonen, L., Lopez, J., Mathesius, S., & Ortega-Cisneros, K. (2022). Editorial: Solving complex ocean challenges through interdisciplinary research: Advances from early career marine scientists. *Frontiers in Marine Science*, *9*, Article 7.

Cvitanovic, C., & Hobday, A. J. (2018). Building optimism at the environmental science-policy-practice interface through the study of bright spots. *Nature Communications*, *9*, Article 3466. https://doi.org/10.1038/s41467-018-05977-w

Cvitanovic, C., McDonald, J., & Hobday, A. J. (2016). From science to action: Principles for undertaking environmental research that enables knowledge exchange and evidence-based decision-making. *Journal of Environmental Management*, *183*, 864–874.

Cvitanovic, C., Shellock, R. J., Mackay, M., van Putten, I. E., Karcher, D. B., Dickey-Collas, M., & Ballesteros, M. (2021). Strategies for building and managing "trust" to enable knowledge exchange at the interface of environmental science and policy. *Environmental Science & Policy*, *123*, 179–189.

de Vos, A., Cambronero-Solano, S., Mangubhai, S., Nefdt, L., Woodall, L. C., & Stefanoudis, P. V. (2023). Towards equity and justice in ocean sciences. *npj Ocean Sustainability*, *2*, Article 25. https://doi.org/10.1038/s44183-023-00028-4

Evans, M. C., & Cvitanovic, C. (2018). An introduction to achieving policy impact for early career researchers. *Palgrave Communications*, *4*(1), 1–12.

Karcher, D. B., Cvitanovic, C., van Putten, I. E., Colvin, R. M., Armitage, D., Aswani, S., Ballesteros, M., Ban, N. C., Barragán-Paladines, M. J., Bednarek, A., Bell, J. D., Brooks, C. M., Daw, T. M., Cruz-Modino, R., Francis, T. B., Fulton, E. A., Hobday, A. J., Holcer, D., Hudson, C., . . . Zhang, J. (2022). Lessons from bright-spots for advancing knowledge exchange at the interface of marine science and policy. *Journal of Environmental Management*, *314*, Article 114994. https://doi.org/10.1016/j.jenvman.2022.114994

Kelly, R., Mackay, M., Nash, K. L., Cvitanovic, C., Allison, E. H., Armitage, D., Bonn, A., Cooke, S. J., Frusher, S., Fulton, E. A., & Halpern, B. S. (2019). Ten tips for developing interdisciplinary socio-ecological researchers. *Socio-Ecological Practice Research*, *1*, 149–161.

Hildebrand, L. P. (2019). Educating the ocean leaders of today for the ocean of tomorrow. In *The future of ocean governance and capacity development: Essays in honor of Elisabeth Mann Borgese* (pp. 100–105). Brill.

Hofmann, E., Bundy, A., Drinkwater, K., Piola, A. R., Avril, B., Robinson, C., Murphy, E., Maddison, L., Svendsen, E., Hall, J., & Xu, Y. (2015). IMBER—Research for marine sustainability: Synthesis and the way forward. *Anthropocene*, *12*, 42–53. https://doi.org/10.1016/j.ancene.2015.12.002

Moskel, J. M., Shroyer, E. L., Rowe, S., Needham, M. D., & Arbic, B. K. (2021). The coastal ocean environment summer school in Ghana: Exploring the research capacity building potential of a higher education informal since learning program. *Journal of Higher Education Outreach and Engagement*, *25*(2), 187–214.

Penca, J. (2021). Capacity building for healthy seas: Summer school on sustainable blue economy in the Mediterranean. *International Journal of Euro-Mediterranean Studies*, *14*(1), 131–137.

Penca, J., Barbanti, A., Cvitanovic, C., Hamza-Chaffai, A., Elshazly, A., Jouffraym, J. B., Mejjad, N., & Mokos, M. (2024). Building competences for researchers working towards ocean sustainability. *Marine Policy*, *163*, Article 106132.

Pennino, M. G., Brodie, S., Frainer, A., Lopes, P. F., Lopez, J., Ortega-Cisneros, K., Selim, S., & Vaidianu, N. (2021). The missing layers: Integrating sociocultural values into marine spatial planning. *Frontiers in Marine Science*, *8*, Article 633198. https://doi.org/10.3389/fmars.2021.633198

Shellock, R. J., Cvitanovic, C., McKinnon, M. C., Mackay, M., van Putten, I. E., Blythe, J., Kelly, R., Tuohy, P., Maltby, K. M., Mynott, S., Simmonds, N., Bailey, M., Begossi, A., Crona, B., Fakoya, K. A., Ferreira, B. P., Ferrer, A. J. G., Frangroudes, K., Gobin, J. . . . Wisz, M. S. (2023). Building leaders for the UN Ocean Science Decade: A guide to supporting early career women researchers within academic marine research institutions. *ICES Journal of Marine Science*, *80*(1), 56–75. https://doi.org/10.1093/icesjms/fsac214

Singh, S., Sprintall, J., Capotondi, A., & Rodrigues, R. (2024). First international summer school on marine heatwaves. *Bulletin of the American Meteorological Society*, *105*(3), E742–E748. https://doi.org/10.1175/BAMS-D-23-0288.1

Sumaila, U. R. (2024). Reflections on breaking down silos in fisheries science. *Fisheries*, *49*(5), 207–210.

van Putten, I. E., Kelly, R., Cavanagh, R. D., Murphy, E. J., Breckwoldt, A., Brodie, S., Cvitanovic, C., Dickey-Collas, M., Maddison, L., Melbourne-Thomas, J., Arrizabalaga, H., Azetsu-Scott, K., Beckley, L. E., Bellerby, R., Constable, A. J., Cowie, G., Evans, K., Glaser, M., Hall, J., . . . Wolf-Gladrow, D. (2021). A decade

of incorporating social sciences in the integrated marine biosphere research project (IMBeR): much done, much to do? *Frontiers in Marine Science*, *8*, Article 662350. https://doi.org/10.3389/fmars.2021.662350

About the Authors

Christopher Cvitanovic is a transdisciplinary marine scientist at UNSW Canberra and Deputy Director of the UNSW Centre for Marine Science and Innovation. His research focuses on advancing the theory and practice of knowledge exchange at the interface of science and policy to support the governance of marine systems. He has almost 20 years of experience working at the interface of marine science, policy, and practice to enable evidence-informed decision-making, including 10 years of experience working for the Australian government, and then as a knowledge broker for CSIROs Climate Adaptation Flagship.

Jessica Blythe is an associate professor at Brock University in Canada with expertise in ocean equity, blue justice, adaptation to climate change, and transformations to sustainability. Her research is motivated by questions such as: How do diverse groups and communities experience and respond to environmental change? What explains their differential capacities for adaptation and transformation? What supports the transformations needed to achieve more equitable and sustainable societies? Her empirical work has been based in Malawi, Mozambique, Solomon Islands, Australia, and Canada.

Ingrid van Putten is a senior research scientist with Wageningen Economic Research at the Wageningen University & Research. She is an adjunct professor at the Centre for Marine Socioecology, University of Tasmania. Her research focuses on understanding resource users' behaviour and finding tractable ways to influence their behaviour and reduce risks in coupled marine social-ecological systems. She has over 170 peer-reviewed publications, including in top-tier journals.

Lisa Maddison is a freelance consultant specialising in interdisciplinary marine science project management and events coordination. She successfully managed Integrated Marine Biosphere Research (IMBeR), an international marine science initiative for over 16 years. She focuses on capacity building for students and early career researchers, particularly from the Global South.

Laurent Bopp is a CNRS research scientist at the Ecole Normale Superieure and Deputy Director of the Institut Pierre Simon Laplace (IPSL). His research focuses on climate change, impacts on marine ecosystems, and the global carbon cycle. He was the lead author of the last IPCC report and has co-authored more than 250 scientific publications.

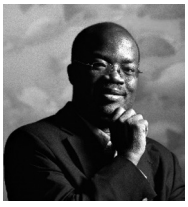
Stephanie Brodie is a marine ecologist with a wide-ranging interest in biogeography, fisheries, and climate change. Her expertise lies in utilising quantitative analyses and diverse data sets to tackle critical questions in marine conservation. Passionate about applied research, Stephanie is committed to understanding the impact of anthropogenic stressors, including plastic pollution, on the environment and the communities that rely on them. Her work aims to contribute to sustainable solutions for preserving marine biodiversity and supporting resilient coastal communities.

Elizabeth A. Fulton is CSIRO's research domain leader for integrated oceans stewardship and the blue economy. She is also the Deputy Director at the Centre of Marine Socioecology, a centre focusing on transdisciplinary, equitable, and sustainable solutions to the problems facing coasts and oceans. Beth has off more than 20 years of work developing various system modelling tools for looking at marine ecosystems, sustainability, and climate adaptation.

Priscila F. M. Lopes is an associate professor at the Federal University of Rio Grande do Norte (Brazil) with over 15 years of interdisciplinary research. She focuses on small-scale fisheries, socio-ecological resilience, and integrating fishing communities into fair conservation efforts. Her work explores how Local Ecological Knowledge can inform scientific conservation.

Gretta Pecl is a professor of marine ecology at the Institute for Marine and Antarctic Studies and director of the Centre for Marine Socioecology at UTAS. She was a lead author for the IPCC AR6 report, has extensive expertise on the impact of climate change on natural systems and on developing adaptation options for fisheries and aquaculture, and has a strong passion for science communication and engagement with the public.

Jerneja Penca is a senior research associate at the Science and Research Centre Koper, where she heads the Mediterranean Institute for Environmental Studies. Her work focuses on governance for sustainability at land and sea, transnational environmental law, and the science-policy interface. She currently serves as the lead author for the IPBES Transformative Change Assessment and MedECCC Water-Food-Energy Nexus Assessment.



U. Rashid Sumaila is a University Killam Professor and Canada Research Chair (Tier 1) in Interdisciplinary Ocean and Fisheries Economics at the University of British Columbia's Institute for the Oceans and Fisheries and the School of Public Policy and Global Affairs. He was also named an "extraordinary professor" by the University of Pretoria in 2024. His research focuses on bioeconomics, marine ecosystem valuation, and the analysis of global issues such as fisheries subsidies and climate change.

OCEAN AND SOCIETY

Ocean and Society is an innovative peer-reviewed open access journal focused on the societal interactions with marine and coastal environments.

As an interdisciplinary journal, Ocean and Society brings together relevant studies in the multiple areas of marine and maritime social sciences, promoting both theoretical and empirical studies whether these studies are done on a global, regional, or local level.

As an interdisciplinary journal, Ocean and Society brings together relevant studies in the multiple areas of marine and maritime social sciences, promoting both theoretical and empirical studies whether these studies are done on a global, regional, or local level.

cogitatio

www.cogitatiopress.com/oceanandsociety