Knowledge Co-Creation in Climate and Marine Governance

Edited by
EVA JULIA LOHSE,
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Preface

This book is the result of two international workshops, funded by the DAAD under its programme "Hochschuldialoge mit Südeuropa", which allowed us to continue and expand our ongoing research and teaching cooperation between the Universities of Bayreuth, Turin, Tromsø and Bari (Sede di Taranto). We would like to thank the DAAD again for funding this kind of endeavours which do not always fall within the conventional platforms of academic exchange in law and which allowed us to include manifold trans- and interdisciplinary perspectives from economy, political and social sciences, communication sciences, education, marine biology and geology, bio-chemistry, environmental engineering, as well as practical work in sustainable development.

We would also thank the many undergraduate, graduate and doctoral students from our universities who were willing to step out of their way to contribute to our workshops – with posters, presentations, ideas, comments, knowledge, co-created projects, and sometimes critical voices. We have all learned a lot. A special thank-you also goes to the teachers involved in the project in coordination with the Scuola Secondaria Di Primo Grado. G. Simoni – Medicina (Bologna), the Asfour Initiative (*Dana Ahmed*), the Gesso Stura Natural Park in Cuneo, the Ionian Dolphin Conservation Project in Taranto and *Marcelle Dabbah*'s expertise for adding practical insights and learning experiences. Our gratitude extends to *Annamaria Bonomo* for hosting the Autumn School in 2024 and to *Laura Vita* for developing the content of the workshop materials. Our workshops would not have been the same without you.

We are also grateful to the UN Ocean Decade for the endorsement of the Autumn School in Bari/Taranto as a Decade Activity and for the Library Open Access Funds UiT The Arctic University of Norway, which funded the open-access publications of Chapters 1, 3, 5 and 7.

Finally, we would like to extend our thanks to the student and research assistants at the Chair of Public Law III at the University of Bayreuth, especially, *Luis Bördlein, Richard Gänzle, Melina Lang, David Kuhlmann, Irina Lawrenz, and Paul Schafmeister* for the many hours spent in preparing and organising the workshops and in editing this book.

Bayreuth, Buenos Aires, Tromsø

Eva Julia Lohse, Violeta Radovich, Margherita Paola Poto

Contents

Chapter 1

Introduction: Co-creation as a Legal Methodological Approach for Inclusive Climate and Marine Governance

Eva Julia Lohse, Margherita Paola Poto and Violeta S. Radovich[1]

Abstract: This chapter analyses co-creation as a legal methodological approach for marine governance, reflecting on some of the research milestones reached in the last decade of collaborative research between the co-authors. It delineates two evolutionary paths: the transformation of the concept of participation into co-creation, and the shift towards a focus on climate law within environmental law research and education, emphasising its relevance to contemporary sustainability challenges. The first path examines the evolution of participation from a procedural right to a comprehensive technique that ensures inclusivity throughout all stages of knowledge development. This exploration highlights the extended scope of decision-making (starting from knowledge co-creation) and underscores the integral role of participation at every phase, including the foundational stages of research and education. Such an innovative approach has led to the integration of participation into the fabric of research and educational methodologies. The second path shows how co-creation is currently being applied to respond to sustainability challenges connected to climate change, the paramount environmental challenge of our era. In this sense, the chapter positions climate law as a specific branch of environmental law, focusing on addressing the sustainability challenges connected to marine governance. In detailing these paths, the chapter sets the stage for a deeper discussion on the development of participation as a key component of legal methodology that also considers knowledge formation. Elaborating on the transition from knowledge co-production to co-creation, it views knowledge formation as a collective, collaborative, and creative endeavour. Insights and practical applications of these instances from recent projects are also discussed. Finally, it provides an overview of the book's structure and a summary of each chapter, framing climate law and participation as foundational elements of the research underpinning this work.

I. Introduction

This book builds upon many years of research developed around the concept of participation and effective participatory approaches to environmental decision-making.[2]

[1] *Acknowledgements: Eva Julia Lohse, Margherita Paola Poto, Violeta S. Radovich equally contributed to the design, drafting, editing and final revision of the chapter.*

[2] Participation in environmental decision making has been developed as a research theme for the past ten years by the authors. Six main milestones have been reached with: (1) DAAD Fachkonferenzenprogramm "Deutsch-italienische Dialoge" (2014/15, *Lohse/Poto*). The team established an interdisciplinary PhD-workshop and expert seminar regarding participatory rights in environmental decision-making processes, resulting in *Lohse/Poto* (eds.), Participatory Rights in the Environ-

We acknowledge and reflect on the past ten years of collaborative research,[3] during which we observed the evolutionary paths that have led us to discuss co-creation in climate and marine governance today. The first path traces the development of the concept of participation into co-creation. The second path shifts our focus to the realisation that contemporary research education in environmental law is predominantly oriented towards climate law and governance, even though it should not be separated from other areas of environmental protection according to an integrative approach to environmental law.

As for the first path we have observed and enhanced our understanding of participation, evolving from merely a procedural (human) right[4] to a comprehensive technique that ensures inclusivity at every stage of knowledge development, including its inception (knowledge co-production and co-creation)[5], through administrative decision-making and judicial processes.[6]

In this sense, we observe how extended the concept of decision-making is: from the inception of the decision to the procedural stage of taking a decision to the phase of court decisions. And participation is always there (or at least: should always be there). In the past years, we have started developing a methodology looking at participation in the very inceptive phase of the knowledge development process, that is to say, the research building and the educational phase. Research and education are two solid aspects of the same building blocks, and in all these years of exploration of

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mental Decision-Making Process and the Implementation of the Aarhus Convention: a Comparative Perspective, 2015; (2) DAAD Hochschuldialog mit Südeuropa (2016/17, *Lohse/Poto*). Building on the prior research funding, this project narrowed the scope and foci to best practices in the protection of water and participation of the public, see *Lohse/Poto* (eds.), Best practices for the protection of water by law. Focus on participatory instruments in environmental law and policies, 2017; (3) DFG 'SustaiNet – Sustainability through participation' (2019–2022, *Peters/Lohse/Poto*), resulting in the book *Peters/Lohse* (eds.), Sustainability through Participation? Perspectives from National, European and International Law, 2023; (4) CoPK strategic workshop at the University of Bayreuth, Centre of International Excellence Alexander von Humboldt resulting in *Lohse/Poto* (eds.), Co-Production of Knowledge in Climate Governance, 2023; (5) DAAD Hochschuldialog mit Südeuropa Workshop "An Innovative Partnership and Methods for Knowledge Co-Production in Water Governance. The case study of the Gesso Stura Natural Park" (2023/24, *Lohse/Poto/Parola*); (6) DAAD Autumn School "Protection of Rights of The Sea and on Sea: Adopting Co-Created Methods Of (Public) Participation" (2024, *Lohse/Poto/Bonomo*).

[3] *Poto*, Environmental Law and Governance: The Helicoidal Pathway of Participation a study of a nature-based model inspired by the Arctic, the Ocean, and Indigenous Views, 2022, 224.

[4] On this understanding see e. g. *Schwerdtfeger*, in: Peters/Lohse (eds.), Sustainability through Participation?, 2023, 291 ff.; *Du Plessis*, Potchefstroom Electronic Law Journal 2008, 170 (183); *Gross*, in: Kahl/Weller (eds.), Climate Change Litigation, 2021, 91 (para. 39); *Boyd*, The Environmental Rights Revolution, 2012, 190 f.

[5] *Poto/Lohse/Owino*, in: Lohse/Poto (eds.) Coproduction of knowledge in Climate Governance, 2023, 13 (27).

[6] *Poto* (fn. 3), 19; for a development of the concept of participation and its application to water see *Lohse/Poto* (eds.), Best practices for the protection of water by law. Focus on participatory instruments in environmental law and policies, 2017, as well as *Lohse/Poto* (eds.) Participatory Rights in the Environmental Decision-Making Process and the Implementation of the Aarhus Convention: a Comparative Perspective, 2015.

the multifaceted approaches to participation, we have realised that participation also shapes new approaches to research and education. We developed this understanding starting from the concept of knowledge co-production, then moving to knowledge co-creation both in the research realm and in the educational fields.

As for the second path, we have been tracing the evolution of environmental decision-making in the context of climate change,[7] the paramount environmental challenge of our times.[8] Climate is the urgent environmental issue of our times[9] and specifically in this book, we will focus on climate governance connected to water and marine areas. In this evolutionary observation and also for the purpose of this book, we describe the relationship between environmental law and climate law as a genus-to-species relationship, contextualised in terms of time and priority. Environmental law (*genus*) is the corpus of laws whose primary objective is the protection of the environment and therefore deals with the regulation of environmental issues. Climate law (*species*) tackles a major environmental issue of our times – climate change –, focusing on mitigation and adaptation strategies (priority).[10] In this sense, climate law contains all the elements of environmental law, in particular, the elements of time (climate change is the environmental issue of our time) and priority (the specific environmental issue of climate change). Nevertheless, climate change relates to the established areas of environmental law: biodiversity, nature conservation, air quality, water quality etc. and cannot and should not be treated apart. Knowledge co-creation is a good connector as it demands us to consider various aspects and approaches in the decision-making process. Climate law and participation are therefore the two key starting points of the research at the foundation of this book.

In section II., we detail how we developed our understanding of participation as a crucial component of a legal methodology that also considers the formation of knowledge. We discuss our progression from the concept of knowledge co-production (as participation applied in research) to the concept of knowledge co-creation, a term that captures our view of knowledge formation as a collective, collaborative, and creative endeavour (subsection 1.).[11] We then briefly analyse how, in our latest project, we have applied these insights to marine governance and the protection of the sea (subsections 2. and 3.). This leads to a conclusion on our understanding of "co-production" and "co-creation" as legal concepts (subsection 4.) that are already

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[7] *Harrison*, Journal of Environmental Law 2024, 413; *Mayembe/Simpson/Rumble/et al.*, Science of The Total Environment 869 (2023), Apr 15;869:161850.

[8] *Lohse/Poto* 2023 (fn. 2); see also *Poto*, in: Peters/Lohse (eds.), Sustainability Through Participation?, 2023, 491.

[9] For a full overview of climate law reports see the official UN website: https://www.un.org/en/climatechange/reports (8.10.2024); in legal doctrine see *Fletcher/Ripple/Newsome/et al.*, PNAS nexus 4 (2024), 106; *Carlarne*, Stan. Envtl. LJ. 2022, 125; *Ruhl*, Envtl. L. 2010, 363.

[10] For a more detailed analysis of this relationship, see *Poto/Enyew*, in: Bugge (ed.), Klimarettsbok, 2021, 155.

[11] A key study on the role of knowledge co-creation in transformative research on sustainability is the paper by *Jacobi/Llanque/Mukhovi/et al.*, Environmental Science & Policy 129 (2022), 107–115.

inherent in some legal texts and relate to a specific understanding of good decision-making processes. Section III. details on the structure of the book and a brief summary of each chapter illustrating the abstract definitions found in our co-productive process.

Just a note on terminology: our book is titled "co-creation in marine governance", but throughout the book authors will also speak about ocean, maritime or sea governance. Partly, this is due to the referral to various legal instruments, which use different vocabulary, partly, this is due to the fact that we speak about specific marine environments, like the Mediterranean Sea, or the Pacific Ocean. We understand "marine" to be the umbrella, catch-all term, with "maritime" being rather attached to human-made environments.

II. Evolutionary steps of participation in legal approaches to climate law: from co-production to co-creation

1. COPROKNET – a network on "Co-Production of Knowledge"

The concept of knowledge co-production was initially applied by COPROKNET,[12] our network of researchers established in 2022 and involving researchers from Germany, Norway, Italy, Canada, Kenya, Argentina, and Brazil.

In the COPROKNET project, our research findings concluded that knowledge co-production, as the new frontier of defining participation within legal research,[13] needed further clarification in its definition and practical applications, even though it had the potential of offering a transformative perspective on research, practice, and education and addressing complex issues like climate governance through inclusive and participatory methods.[14] In our understanding, and by applying a critical decolonising lens to our research,[15] knowledge co-production could contribute to shifting the conventional research focus based on analytical, top-down and extractive approaches to knowledge[16] making room for a collective and collaborative approach,[17] characterised by a knowledge base (at the intersection of science, law and indigenous knowledge) through the collaboration between scientists, community members and policymakers.[18] Through our research findings, co-production of knowledge helped reconfigure the conventional top-down approach to scientific research, fostering a reflexive process that deeply influences the work of knowledge holders and researchers. Co-pro-

[12] See more on this network and the research results in: *Lohse/Poto* 2023 (fn. 2), 13 (19–22).

[13] *Soneryd/Sundqvist*, Science and Democracy. A Science and Technology Studies Approach, 2023, 108–123.

[14] *Lohse/Poto/Owino* (fn. 5), 13 (19).

[15] *Poto* (fn. 3), 185; *Smith*, Decolonizing methodologies: Research and indigenous peoples, 2021, 25.

[16] *Klenk/Fiume/Meehan/et al.*, Climate Change 2017, 475.

[17] *Latulippe/Klenk*, Current Opinion in Environmental Sustainability 42 (2020), 7.

[18] *Adelle/Pereira/Görgens/et al.*, Science and Public Policy 2020, 56.

duction of knowledge can also be utilised in order to surmount barriers between disciplines by dialogue and critical assessment, i. e. as regards 'sustainability sciences', thereby creating a collaborative learning process by being confronted with 'otherness'[19] This newly acquired knowledge can be the base for decision-making by administrative bodies and policy makers, ideally also by the legislator and courts. The problem often faced by these legal or political actors is that although the legal narrative is that decisions are based on the 'best' science available, for them as non-experts it is often difficult to discern what the 'best' scientific solution could be. Using methods of co-production can help to create an effective science-policy-interface that is truly transdisciplinary.[20] This again would have effects on interpretation or implementation of legal norms, i. e. in administrative law, which require scientific knowledge to be interpreted or concretizes correctly, as is often the case in environmental, climate change or sustainability law (see Chapter 3). Those co-production methods can be formal, even required by law, or informal, for example developed by civil initiatives.

Overall, we concluded that knowledge co-production could be followed in its dynamic development and progress from a tool in climate governance to a broader application in co-creation projects, emphasising its role in enhancing participatory research and decision-making in climate law.

2. Knowledge co-creation in the Ocean Incubator Network: the first prototype of co-creation applied to ocean literacy

We pursued our studies, research and education of knowledge co-production in subsequent years, influenced by the objectives of Agenda 2030[21] and inspired by the vision of the UN Ocean Decade for Sustainable Development ("The science we need for the Ocean we want"),[22] of co-designing ocean-knowledge-based solutions to climate challenges.[23] We re-envisioned knowledge co-production through the lens of creation, applying it specifically to ocean science and therefore suggesting collaborative and effective solutions to the complex sustainability challenges[24] connected to marine governance. Consequently, participation in climate governance evolved into co-creation within marine governance. In this context, and within the realm of ocean literacy, we rephrased our approach as knowledge co-creation, emphasising the importance of collaborative efforts across various disciplines, integrating both

[19] *Fernandes/Philippi Jr.*, in: Frodemann/Klein/Pacheco (eds.), The Oxford Handbook of Interdisciplinarity, 2017, 371 (379).

[20] *Baker*, in: Frodemann/Klein/Pacheco (eds.), The Oxford Handbook of Interdisciplinarity, 2017, 88 (97). Similar *Weimer/de Ruijter*, in: Weimer/Ruijter (eds.), Regulating Risks in the European Unions: The Co-production of Expert and Executive Power, 2017, 1 (5 f.).

[21] Official website: https://sdgs.un.org/2030agenda (8.10.2024).

[22] Official website: https://oceandecade.org/ (8.10.2024).

[23] https://oceandecade.org/news/vision-2030-ocean-decade-launches-new-global-ambition-setting-process/ (8.10.2024).

[24] The UN Ocean Decade identifies ten challenges, that can be found here: https://oceandecade.org/challenges/ (8.10.2024)

academic and non-academic knowledge systems.[25] Building on the work developed by *Jacobi et al.*,[26] we structured our analysis and understanding of co-creation in marine knowledge around two main components: (1) a subjective component; and (2) an objective component. In observing the process of co-creation, we observed its multi-actor dimension requiring the active participation of a diverse group of actors, including policymakers, researchers, and community leaders.[27] The effectiveness of this component relies on robust institutional design and proactive public leadership to facilitate co-creation.[28] Such a model is built on the foundational concept of polycentric governance,[29] which posits that, in addition to leaders seen as facilitators of the process, a diverse array of key actors emerges as knowledge translators, learners and teachers, and experts in developing educational and learning methodologies.[30] This approach emphasises a dynamic and interactive approach to governance (including climate), where facilitation and adaptability become central to navigating and managing complex governance landscapes. Moreover, it underscores a commitment to trans-disciplinarity, where participants collaborate to forge new understandings and solutions to complex transboundary challenges.[31]

Transdisciplinarity is the other cornerstone of the co-creation approach, where knowledge from different disciplines and sectors is integrated to address complex, interconnected challenges. This process unfolds through a "spiral of co-creation," consisting of five stages.[32] The first stage is the (1) articulation of the problem and objectives: Systems knowledge helps stakeholders understand the complexities of ocean sustainability by visualizing interactions within the ocean system. The second implies the (2) integration of natural and social sciences. Systems thinking bridges different scientific disciplines, facilitating a shared understanding and collaborative research.[33] The third requires the (3) incorporation of non-academic knowledge: Indigenous and local community knowledge is integrated, valuing diverse perspectives and enhancing the holistic understanding of ocean systems. The fourth leverages (4) social learning and reflection, adopting the techniques of continuous feedback and reflection processes that allow participants to refine their strategies and understandings based on

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[25] See *Poto/Vita* (eds.), The Ocean Incubator Network Learning Toolkit, 2025, and more in details on co-creation *Poto/Vita/Peftiyev/et. al.*, in: Poto/Vita (eds.), The Ocean Incubator Network Learning Toolkit, 2025, 131–168.

[26] *Jacobi/Llanque/Mukhovi/et al.* (fn. 11), 108.

[27] *Andersen/Hauggaard-Nielsen/Budde Christensen/et al.*, in: Andersen/Budde Christensen/Hulgaard (eds.) Interdisciplinary Perspectives on Socioecological Challenges, 2023, 321–353.

[28] *Poto/Vita/Peftiyev/et al.* (fn. 25), 131.

[29] *Hofstad/Vedeld*, JEPP 23, 4 (2021), 496–509; *Ostrom*, in: Guruswamy/McNeely (eds.), Protection of Global Biodiversity: Converging Strategies, 1998, 149. For a systematic literature review on polycentric governance see *Poto/Vita/Peftiyev/et al.* (fn. 25), 131.

[30] *Panieri/Poto/Murray* (eds.), Emotional and Ecological Literacy for a More Sustainable Society, 2024.

[31] *Poto/Kuhn/Tsiouvalas/et. al.*, Human Ecology 2022, 125.

[32] *Jacobi/et al.* (fn. 11), 107–115; *Poto/Vita/Peftiyev/et al.* (fn. 25), 131.

[33] *Poto/Murray*, Envtl. Policy and Law 53 (2022), 35–48.

collective insights. Finally, the fifth stage foresees the (5) initiation of collective action, where leverage points for effective interventions are identified and systemic change and adaptive management in ocean sustainability efforts are promoted.

Within the Ocean Incubator Network project, we applied this analytical framework to the team dynamics and a prototypical co-creation system that we called Living Laboratory,[34] where we implemented the two key elements (subjective and objective components of co-creation) in realising the vision of ocean literacy.

From the project's outset, we ensured inclusive participation across all stages – from co-creating the project proposal to conducting monthly meetings and culminating in the final Living Laboratory event focused on dissemination and maintenance. The project's polycentric governance structure had leaders acting as coordinators, developers, and facilitators, which helped integrate diverse perspectives and smoothly advance through project phases.[35] Team members took on dynamic roles as knowledge translators, learners, and facilitators, actively participating in every project phase, from conception and planning to testing the Living Laboratory prototype, creating activities, and consolidating research findings in co-authored chapters.

In our team, we also embraced the objective component of co-creation by integrating transdisciplinarity throughout all project development stages. This comprehensive approach included a broad spectrum of knowledge systems: a) academic disciplines, b) non-academic disciplines, and c) experiential knowledge.

a) Academic Disciplines: We leveraged expertise from various fields such as marine geosciences, law education, global health, political sciences, gender studies, and ecolinguistics. This interdisciplinary academic collaboration deepened our understanding and enhanced our approach to addressing the complex issues involved.[36]

b) Non-Academic Disciplines: With the contributions from Indigenous scholars, our project incorporated perspectives rooted in Arctic Indigenous knowledge, drawing specifically on the works of *Harald Gaski* and collaborating with *Aila Biret Henriksen Selfors*.[37] Additionally, we organized follow-up ocean literacy activities with the Indigenous peoples of Aldeia Maraka'nà in Rio de Janeiro.[38] During these sessions, our team members, alongside Indigenous experts, conducted a workshop where Indigenous knowledge and one of the co-created activities from the Living Laboratory were shared with children, elders, researchers, and other community members.[39] This approach ensured that Indigenous and local insights were central to

[34] *Poto/Vita/Brown/et al.*, The Ocean Incubator Network (OIN) Living Laboratory and Ocean Literacy Toolkit, Septentrio Reports (1) 2024, https://doi.org/10.7557/7.7606.

[35] *Poto/Vita/Brown/et. al.* (fn. 34).

[36] *Poto/Vita/Peftiyev/et al* (fn. 25).

[37] *Gaski*, Scandinavian Studies 2019, 259–268.

[38] *Montaña Mónoga/Parola/Poto/et al.*, ECO_CARE Multisensory and Experimental Workshop 2024 "We are the Ocean, and the Ocean is us. A Living Laboratory to learn from each other and learn from the ocean". Septentrio Reports (1) 2024, https://doi.org/10.7557/7.7828.

[39] *Montaña Mónoga/Parola/Poto/et. al* (fn. 38).

our methodology, enriching it with depth and context beyond traditional academic boundaries.

c) Experiential Knowledge: Our project actively engaged experiential knowledge through reflective practices and outreach educational activities. Notably, the workshop held in June 2024 at Aldeia Maraka'nà in Rio de Janeiro and the activities involving the foraminifera box with the local school Goyavier in Colombia provided immersive and enlightening hands-on learning experiences.

This extensive involvement ensured that all team members were contributors, co-learners, and co-creators, truly embodying co-creation principles throughout the project lifecycle. This approach cultivated a collaborative environment where knowledge was not only shared but generated collectively, resulting in a comprehensive and integrated outcome that reflected the diverse inputs and expertise of all participants.

The extensive experience gained during the Ocean Incubator Network project has been instrumental in laying the groundwork for the development of an Autumn School (see further in subsection 3.). The Autumn School treasured the teaching gathered in the previous projects, focusing on the protection of the sea, human rights at sea, and living by the sea. The insights and knowledge accumulated throughout the project have enabled us to create a robust foundation and compile comprehensive educational and research materials tailored for this specialized program.

3. Knowledge co-creation for public participation: the DAAD workshop "An innovative partnership: co-production and water governance (2023) and the DAAD Autumn School on ocean governance (2024)"

The workshop based at the Gesso and Stura nature park in Cuneo, Italy, aimed to explore interdisciplinary, novel methods for legal and political water governance in the age of climate crisis. It investigated how co-production of knowledge can be used in environmental decision-making processes so as to reach better decisions based on a broader knowledge base, increase acceptance of protection measures by the public, enhance knowledge with the local communities about the protection of water sources and improve management of areas hit by severe droughts to guarantee access to water for communities. In this context, CoPK can successfully counter the perceived lack of effectiveness of unilateral participatory rules in administrative and international decision-making. The workshop connected the narrative of effective participation with best practices of CoPK from selected local communities. This showed that taking classic formal and informal, consensual and decisive participatory instruments[40] as a starting point the involvement of knowledge within the local communities and expert knowledge bottom-up can foster better water quality, awareness of the

[40] For the difference, see e. g. *van Deth*, in: Pohl/Massing (eds.), Mehr Partizipation – mehr Demokratie?, 2014, 11 (13); *Burgi*, ZG 2015, 34 (38); *Waechter*, VVDStRL 72 (2013), 499 (529 ff.); *Brennecke*, VerwArch 2015, 34 (36).

exigencies of the local waterways and of the scientific understanding of complex linkages in aquatic eco-systems. The examples involved co-produced education and community-based science, knowledge exchange and empowerment of indigenous communities, and nature conservation and restauration projects, e. g. re-irrigation of wetlands in Germany, by mixed water-bodies. Legal frameworks and their underlying conceptualization often overlook or even exclude fundamental dimensions of key branches of knowledge beyond the discretionary powers of the decision-makers, such as indigenous, traditional and local ecological knowledge or knowledge of those too young, less informed or too remote to be included in formal participation procedures. In order to make use of those various aspects of knowledge for policymaking and regulation on the national, regional and international levels, it is important to describe the process of "co-production" and critically reflect on the existing and emerging instruments that allow – within the respective legal frameworks – for CoPK.[41]

Building on the initial foundations of knowledge co-creation, hosted by the University of Bari Sede di Taranto, we embarked on a journey to deepen our understanding of co-creation as a key element for effective marine governance, focusing on a trans-thematic approach.[42] The focus of investigation of co-creation in marine governance was developed along the three main thematic areas: protection of sea rights, protection of human rights at sea and living by the sea. This endeavour materialized through an Autumn school program, designed to blend experiential learning with scientific research, and culminating in transdisciplinary projects co-created by the Autumn School participants from different academic backgrounds and levels of academic experience.

Step 1: Experiential Learning through Marine Observation

The first step in our approach was to provide students with a direct, immersive experience in the marine environment. Coordinated by expert marine biologists from the Jonian Dolphin Conservation in Taranto,[43] the project participants embarked on a day trip at sea to observe cetaceans in the Gulf of Taranto. This experiential learning component was crucial to allow the project participants to witness first-hand the complexities and wonders of marine ecosystems.[44] Such experience was not only engaging but also helped to foster a deep emotional connection to the subject matter, which is vital for long-term commitment and understanding of ocean-related challenges.[45]

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[41] A full report can be found at *Poto/Vita/Lohse/et. al*, Autumn School "Protection of The Sea: Adopting Co-Created Methods Of (Public) Participation", Septentrio reports (1) 2024, https://doi.org/10.7557/7.7859.

[42] See *Poto/Vita/Lohse/et. al* (fn. 41).

[43] Official website: https://www.joniandolphin.it/?lang=en (08.10.2024).

[44] On the importance of experiential learning for co-creation see *Tanaka/Dam/Kobayashi/et. al.*, Procedia Computer Science 2016, 146–156.

[45] *Poto/Panieri/Murray*, in: Panieri/Poto/Murray (eds.), Emotional and Ecological Literacy for a More Sustainable Society, 2024, 1–22.

Step 2: Building Scientific and Regulatory Knowledge

The second step focused on expanding the participants' scientific and regulatory knowledge base. This phase covered a broad spectrum of topics essential for comprehensive marine governance, including rights of nature and co-production of knowledge – including especially indigenous knowledge – from the ocean to the space, the EU regulatory framework on environmental law, marine geosciences on extreme environments and their need for protection, private law concerning nature rights, and international human rights law focusing on the rights of persons at sea, with a focus on climate change induced migration. Additionally, the program enriched this knowledge through the inclusion of visual facilitation techniques, which utilised visual language and design to enhance knowledge translation and retention.[46] This multidisciplinary approach ensured that students gained an understanding of the climate challenges and frameworks governing marine environments, equipping them with the necessary tools to approach marine issues from multiple perspectives.

Step 3: Transdisciplinary Projects and Solutions

In the final step, students were challenged to apply their newly acquired knowledge and insights to address specific issues aligned with Sustainable Development Goal (SDG) 14 (Life Below Water), alongside another interconnected SDGs (3, 5, 15, and 16).[47] This task required them to synthesize information across disciplines and propose an innovative co-created project that could address the task challenge.

Through this structured, three-step approach, the autumn school fostered a deeper understanding of the co-creation of knowledge in climate and marine governance and also demonstrated its essential role in addressing the complex, multifaceted sustainability challenges highlighted by the Agenda 2030.

By integrating experiential learning with a strong scientific foundation and transdisciplinary collaboration, the program empowered students to become active, informed participants in the ongoing efforts to safeguard our oceans and marine life.

It resulted in four co-created projects: "Olympics for the Ocean" (linking SDG 14 and 3 by developing a campaign for the (para-)Olympic games at Los Angeles that would involve the public general in protecting and restoring marine environments), "The (In)Visible Fisherwomen" (linking SDG 14 and 5 by developing a hands-on, community based initiative that could introduce tourists to the daily lives of fisherwomen, who are often overlooked and vested with less rights than their male colleagues and family members), "Tide-Turner" (linking SDG 14 and 15 by developing a marine protection management plan in order to avoid microplastics in the ocean)

[46] See *Poto/Vita/Lohse/et al.* (fn. 41).
[47] See *Poto/Vita/Lohse/et al.* (fn. 41).

and "Taras' Guardians" (linking SDG 14 and 16 by exploring social media as a tool to spread awareness and increase knowledge about marine ecosystems).[48]

Figure 1a)

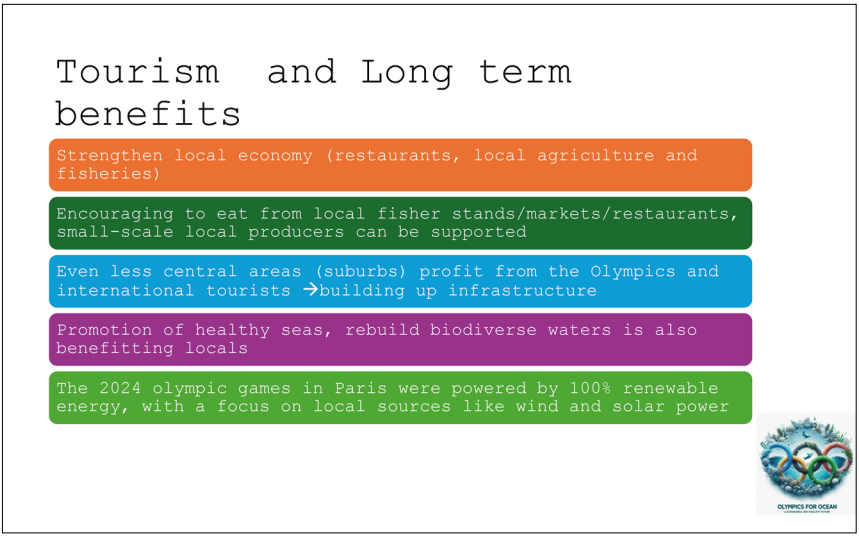

Figure 1b)

[48] Further information and a description of the projects can be found at: https://www.forne.uni-bayreuth.de/de/projekte/index.html.

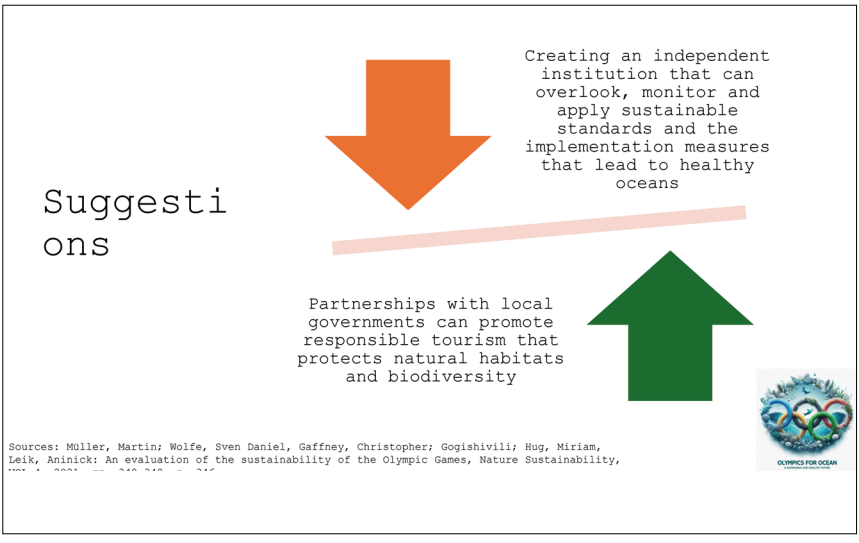

Figure 1c)

Figure 1a)–c): Student Project "Olympics for the Ocean" (excerpt of the final presentation): Sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans, connecting SDG 3: Ensure healthy lives and promote well-being for all at all ages and SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.