CHAPTER I

Introduction – Mapping Co-Production of Knowledge

Margherita Paola Poto / Eva J. Lohse / Omondi R. Owino[1]

I. Co-production of knowledge (CoPK) in research, education and practice: origins and state-of-the-art

1. Concept(s) in the current scholarship

Co-production of knowledge as such is not a legal term, and not yet a clearly defined, coherent legal concept. Still, this book offers an overview from a mostly legal perspective of how co-production of knowledge (hereinafter CoPK) is applied to research, practice, and education to tackle complex problems, such as climate governance, through an inclusive and participatory approach. CoPK reconfigures research foci from one that is inherently informed by traditional modes of scientific research to one that is informed by a collective and collaborative approach. It engenders 'a shift in the knowledge system – from a one-way "push" of scientific information to a two-way collaborative process of knowledge construction known as co-production'.[2] The scholarship has highlighted the unique CoPK characteristics that make it an innovative approach when compared to traditional approaches to research.[3] In particular, CoPK is characterized as 'the process of producing usable, or actionable science through collaboration between scientists and those who use science to make policy management decisions'.[4] Its goal is to bring together different knowledge constellations and knowledge bearers to develop a holistic comprehension of a complex problem like climate change. To this end, CoPK reconfigures the traditional top-down unidirectional approach to scientific research. Coproduced knowledge becomes 'more reflexive and affects at the deepest level what

1 *Poto* and *Lohse* equally contributed to the design, drafting and supervision of all the sections of this chapter. *Owino* provided final reflections and conclusions in sections I 1. and 2.

2 *Vincent, Daly, Scannell, Leathes,* What can Climate Services Learn from Theory and Practice of Co-production? Climate Services 2018, p. 48–58.

3 *Gibbons*, The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies (Reprinted.) 1994; *Nowotny, Scott, Gibbons*, 'Mode 2' Revisited: The New Production of Knowledge. 2003, p. 179–194.

4 *Meadow, Ferguson, Guido, Horangic, Owen, & Wall,* Moving toward the Deliberate Coproduction of Climate Science Knowledge. Weather, Climate, and Society 2015, p. 179–191.

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shall count as good science'.[5] The circular relationships that emerge from the process of knowledge coproduction enhance reflexivity.

Increasingly, CoPK is gaining currency as a highly viable approach to producing usable and actionable knowledge in climate change research[6] and other areas of scientific inquiry. For instance, coproduced knowledge is instrumental in mainstreaming climate change adaptation measures into government policy. This is because knowledge bases relevant to climate change arise from local contexts and natural sciences. The intersection of these public and research domains possesses a high usability for stakeholders and government alike.[7]

2. The two faces of CoPK in law and legal research

Against the foregoing backdrop, CoPK is hereinafter primarily described as a methodological approach within the wide field of participatory research and education in the areas of climate and environmental law. CoPK is also referred to as a practice in the context of administrative, judicial and governmental decision-making. It is perceived to increase transparency, accountability, usability of research output, participation, and equity. The need to delve into the methodological dimension and empirical applications of CoPK is justified by two key arguments.

First, it is fundamental to consolidate and strengthen CoPK as a research practice in climate and environmental law studies to increase the uptake of participation and the durability of the proposed solutions. It has been demonstrated that utilizing CoPK tools substantially increases the likelihood that key knowledge, essential for problem-solving and meeting the stakeholders' needs, is effectively used to address systemic chal-

5 *Gibbons* (note 3) p. 179–194.

6 *Homsy, & Warner*, Climate Change and the Co-Production of Knowledge and Policy in Rural US Communities. Sociologia Ruralis, 2013; *Djenontin, & Meadow,* The Art of Co-production of Knowledge in Environmental Sciences and Management: Lessons from International Practice. Environmental management 2018, p. 885–903; *Hegger, Lamers, van Zeijl-Rozema, & Dieperink*, Conceptualising Joint Knowledge Production in Regional Climate Change Adaptation Projects: Success Conditions and Levers for Action. Environmental Science & Policy 2012, p. 52–6; *Kirchhoff, Carmen Lemos, & Dessai*, Actionable Knowledge for Environmental Decision Making: Broadening the Usability of Climate Science. Annual Review of Environment and Resources 2013, p. 393–414; *Lemos, & Morehouse*, The Co-Production of Science and Policy in Integrated Climate Assessments. Global Environmental Change 2005, p. 57–68; *Bremer & Meisch*, Co-production in Climate Change Research: Reviewing Different Perspectives. Wiley Interdisciplinary Reviews: Climate Change 2017, p. 482.

7 *Lemos, Kirchhoff, & Ramprasad*, Narrowing the Climate Information Usability Gap. Nature Climate Change 2012, p. 789–794.

lenges such as the ones posed by sustainability and climate governance.[8] A conceptual framework that identifies the steps and key principles of CoPK research and education practices is expected to provide effective tools to co-design sustainability interventions and actionable knowledge that advances climate and environmental decision-making.[9] While interdisciplinary researchers have identified key principles that support the adoption of a collaborative effort in environmental sciences research,[10] a standardized, replicable approach has not yet been investigated, adhered to, and/or mainstreamed by (environmental) law scholars. Moreover, those studying the field of CoPK struggle with a lack of empirical evidence to support the domain's principles.[11] Currently, there is limited general information on how to apply these principles to research efforts. Further, there is little peer-reviewed literature on the implementation of CoPK principles and ambiguous evaluation criteria on the processes and outcomes of collaborative and participatory research in law. Education and teaching are seen as seminal tools to encourage more co-productive techniques to be included in research and decision-making processes and at the same time, they are fields where to apply CoPK.

Second, as a response to the evidence gap, this book provides a mapping, collection, and reporting of CoPK practices in climate governance, relevant to decision-making processes in environmental law. CoPK can be facilitated by law if the law offers a framework for it. Whereas in private law contexts coproduction happens within informal relationships, e. g. between the parties to a contract, coproduction in contexts that – at least in legal orders which differentiate between private and public law – occur in the public law sphere typically need to be based on precise legal provisions. Over the course of the last decades, administrative bodies have developed more informal ways to include information in their decision-making procedures, such as round tables or questionnaires. Therefore, the second part of this book serves as a starting point for further research of these formal and informal ways of coproduction by providing a socio-legal and comparative perspective in some case studies: what kind of tools exist,

8 *Lemos, Arnott, Ardoin, Baja, Bednarek, Dewulf, Fieseler, Goodrich, Jagannathan, Klenk, Mach, Meadow, Meyer, Moss, Nichols, Sjostrom, Stults, Turnhout, Vaughan, Wong-Parodi, Wyborn*. To co-produce or not to co-produce. Nature Sustainability, 1(12), 2018, p. 722–724. *Armitage, Berkes, Dale, Kocho-Schellenberg, & Patton*, Co-management and the co-production of knowledge: Learning to adapt in Canada's Arctic. Global environmental change 2011, p. 995–1004.

9 *Kirchhoff, Carmen Lemos, & Dessai*, Actionable knowledge for environmental decision making: broadening the usability of climate science. Annual review of environment and resources 2013, p. 393–414.

10 *Lemos, and Morehouse*, The co-production of science and policy in integrated climate assessments. Global Environ. Change 2005, p. 57–68; *Djenontin, Meadow*, The art of co-production of knowledge in environmental sciences and management: lessons from international practice, Environmental Management 2018, p. 885–903.

11 *Hegger, & Dieperink*, Joint knowledge production for climate change adaptation: what is in it for science? Ecology and Society 2015.

how they are used, how effective they are, what kind of knowledge and knowledge-bearers do they in- and exclude, how knowledge is included into the decision-making process as prescribed by law, what happens if the provided knowledge is ignored, how administrative bodies enable CoPK, and, finally, what co-production mechanisms can be identified and categorized.

3. State-of-the-art research on CoPK in climate governance

Before discussing the theory and practice of CoPK, it is worth briefly recapping the state-of-the-art research on CoPK in climate governance. This synopsis provides details on the current knowledge gaps thus positioning our corpus of research within the literature review. According to the most recent and complete literature review on CoPK conducted so far,[12] the research, education, and practice of CoPK have two main dimensions.

The first dimension depicts CoPK as the deliberate collaboration between researchers and stakeholders and is therefore defined as *normative*, as it aims to elaborate the guidelines on how different actors should define and co-produce relevant knowledge. The normative dimension of co-production is mainly found in CoPK research practices and appears prominently in three disciplinary traditions: public administration, science and technology studies, and sustainability science.[13] *Bremer* and *Meisch*[14] observe how *Ostrom* and colleagues first used the term co-production in the 1970s in its normative form, developing their reflections on the need to create inclusive approaches for the administration of the commons.[15] In particular, *Ostrom* and her research group at Indiana University found in CoPK the solution for common pool problems regarding the dynamics between public and private actors in the deliverance and administration of public services.[16] In this regard, the origins of CoPK have strong ties to citizen involvement

12 *Bremer, & Meisch*, Co-production in climate change research: reviewing different perspectives. Wiley Interdisciplinary Reviews: Climate Change 2017, p. 482.

13 Chapter V.

14 *Ibid 13*.

15 *Ostrom E.*, Crossing the great divide: co-production, synergy, and development. World Dev 1996, p. 1073–1087.

16 *Ostrom E.*, Scales, polycentricity, and incentives: designing complexity to govern complexity. In: *Guruswamy, McNeely,* (Eds.), Protection of Global Biodiversity: Converging Strategies, 1998, p. 149–167; *Ostrom, E., Ostrom, V.,* Public economy organization and service delivery. Workshop in Political Theory and Policy Analysis, 1977, p. 1–53; *Ostrom, V., Ostrom, E.,* A theory for institutional analysis of common pool problems. Managing the Commons, p. 157–172; *Ostrom, V., Ostrom, E.*, Public goods and public choices. Workshop in Political Theory and Policy Analysis, 1977, p. 1–42; *Ostrom, E., Whitaker*. Does local community control of police make a difference? Some preliminary findings. Am. J. Polit. Sci., 1973, p. 48–76; *Ostrom, E., Baugh, Guarasci, Parks, Whitaker*, Community Organization and the Provision of Police Services. Sage, Beverly Hills, CA, 1973; *Ostrom E., Parks, Whitaker, Percy*,

in complex governance matters through participatory mechanisms. As will be observed in Chapter V of this book, the original trait of CoPK is to enable participation and collaboration in the governance of the commons, between private and public actors, when inputs and efforts of multiple individuals are needed to achieve common objectives.[17] This analysis brings into question the demarcation of public-private boundaries and demonstrates that citizens are not merely passive clients of services provided by government agencies.[18]

Building and attaining equity for all parties, especially citizens, is at the core of the normative dimension of a CoPK framework. As a branch of administrative law, climate law requires a participatory approach aiming to attain equitable outcomes for all parties. Administrative law and thus climate law's focus on equity justifies and substantiates the use of CoPK in climate change law and governance research and practice.

Climate change is a classical wicked problem.[19] A wicked problem refers to a 'class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing'.[20] Singular disciplinary standpoints are therefore ill-suited for the research of climate change-related challenges as vindicated by the observation that 'there are no experts on these problems, nor can there be'.[21] Additionally, knowledge produced in silos is bedevilled by a lack of transferability, it meets possible resistance by affected groups, facing implementation bottlenecks and unclear and/or absence of ownership.

Equity in the context of CoPK refers to ensuring that space is provided for all knowledge systems and knowledge holders in the research process to not overlook insights.[22]

The public service production process: a framework for analyzing police services. Policy Stud. 1978, p. 381–389. *Ostrom, E., Parks, Percy, Whitaker*, Evaluating police organization. Public Prod. Rev., 1979, p. 3–27. *Ostrom, E.,* Formulating the elements of institutional analysis. Workshop in Political Theory and Policy Analysis, 1985.

17 *Ostrom E.*, Polycentric systems: Multilevel governance involving a diversity of organizations. In: *Brousseau*, *Dedeurwaerdere, Jouvet, Willinger*, Global environmental commons: Analytical and political challenges in building governance mechanisms, 2012, p. 105–125.

18 Chapter V.

19 *Incropera*, Climate Change: A Wicked Problem: Complexity and Uncertainty at the Intersection of Science, Economics, Politics and Human Behavior, 2016; *Meadow, Ferguson, Guido, Horangic, Owen, & Wall*, Moving toward the Deliberate Coproduction of Climate Science Knowledge. Weather, Climate, and Society 2015, p.179–191; *Rittel & Webber*, Dilemmas in a General Theory of Planning. Policy Science 1973, p. 155–169.

20 *Churchman*, Wicked Problems. Management Science 1967, p. 141–142.

21 *Ludwig*, The Era of Management is Over. Ecosystems, 2001, p. 758–764.

22 *Yua, Raymond-Yakoubian, Aluaq, and Behe,* A framework for co-production of knowledge in the context of Arctic research. Ecology and Society 2022, p. 34.

For this reason, a significant strand of research on climate change research promotes the coproduction of ecological knowledge between Indigenous peoples and scientists, using Indigenous approaches to address the socio-economic and environmental problems posed by the sustainability challenges. Among the most remarkable initiatives that respond to the normative dimension of CoPK, researchers have elaborated a set of guidelines for considering traditional and Indigenous knowledge sets in climate change research.[23] To facilitate respectful and mutually beneficial research relationships, many Indigenous communities are codifying research protocols and formalizing structures of accountability.[24] This book maps some of the CoPK principles and codes adopted in Indigenous contexts, clarifying the theory and providing an analysis of best practices.[25]

The second dimension is referred to as the descriptive area of CoPK.[26] This area is called descriptive because it is the space that studies, interprets, and describes the changing relationships between science, society, and nature. It is critical to note that the descriptive area does not necessarily intervene or seek to change existing dynamics. In this book, we have adopted the term 'descriptive' as it closely aligns with the co-production idiom for interpreting the shifting relationships between science, society, and nature – including on the subject of climate change – rather than intervening to actively change these relationships.[27]

4. Intersection of the normative and the descriptive dimension

Furthermore, it can be observed that the two dimensions, normative and descriptive, often intersect. Often, the descriptive dimension serves as a knowledge base to elaborate a prescriptive approach and subsequentially results in the elaboration of protocols and guidelines which is especially helpful to legal scholars with limited experience with this research approach.

An example where it is possible to observe the interaction between the normative and the descriptive dimension of CoPK comes is found Chapter IV.[28] This chapter details

23 *Chief, Chischilly, Cochran, Durglo, Hardison, Hostler,* & *Wotkins*, Guidelines for considering traditional knowledges in climate change initiatives, 2015.

24 Chapter III.

25 *Ibid* 25.

26 *Bremer & Meisch,* Co-production in climate change research: reviewing different perspectives. Wiley Interdisciplinary Reviews: Climate Change 2017, e482.

27 Among the authors involved in the study of the descriptive area see *Miller*, & *Jasanoff*, States of knowledge: the co-production of science and social order, Routledge, London, 2004; *Jasanoff, Wynne*, Science and decision-making. In: *Rayner, Malone*, eds. Human Choice and Climate Change: The Societal Framework, 1998, p. 1–87; *Wynne*, SSK's identity parade: signing up, off-and-on. Soc Stud Sci 1996, p. 357–391; *Latour*, We Have Never Been Modern, 1993.

28 See Chapter IV.

a pilot project on the development of a framework for CoPK in emotional and environmental education. In this chapter, the authors analyse the steps that led to the co-creation of educational materials on emotional and ecological education. This novel approach toward a co-created learning toolkit was developed by a legal scholar, an expert in global health, and an illustrator, in collaboration with researchers and teachers, with the aim to raise awareness of the importance of emotional education and nurturing multiple talents.

As elaborated in the book chapter,[29] in the process of co-creating the educational materials, three stages were followed: 1) Literature review on the state of the art of emotional education; 2) Evidence review and teachers' consultation; 3) Co-production of activities and book content. The methods used at each stage allowed for the integration of scientific literature with teachers' knowledge and expertise. A variety of consultation methods were offered to groups of teachers to enable them to participate in the way manner that they felt was most appropriate. A semi-structured topic guide was used, consisting of broad open-ended questions relating to participatory task-based activities using information and resources. The result was a book, with a tripartite target audience: children (an illustrated story constitutes the incipit of the book); researchers and teachers. This study offers an example of how the descriptive and normative dimensions of CoPK can be intertwined. The creation of 'Follow Your Heart' required a collaborative approach between researchers, educators and children, and thus can offer guidelines to enhance inclusive education at the policy and practice policy levels. Further, this CoPK approach could be studied for the institutionalization of best practices through working with schools focusing on emotional and ecological education.

In the next section, the original project idea, which inspired this book, will be read in the context of climate and environmental law research.

II. Getting things started: The Strategic Workshop on CoPK in climate governance at the University of Bayreuth and Centre of International Excellence Alexander von Humboldt

This volume is the project result of a collaboration between the research group coordinated by *Eva Julia Lohse* at the University of Bayreuth, and the Centre of International Excellence Alexander von Humboldt and *Margherita Paola Poto*, as well as scholars

29 Chapter IV.

from Norway, Italy, Canada, Kenya, Argentina, and Brazil.[30] The organization of a two-day workshop at the University of Bayreuth in May 2022 resulted in the establishment of a network of scholars (CoProknet) and the consolidation of the research presented in this book. Our preliminary assumption in the elaboration of the state-of-the-art on CoPK was that climate change requires solutions from multilevel and polycentric perspectives.[31] Conscientious of the critical considerations that accompany the growing interest in CoPK approaches to find integrated solutions to the climate crisis, we decided to explore its applications in the fields of law and social sciences.[32] Building on previously consolidated research on environmental participation and governance,[33] our central assertion was that CoPK could successfully counter the perceived lack of effectiveness of the participatory rules in administrative decision-making processes outlined in many national, regional, and international legal documents. Such provisions are often based on uni-directional decision-making, unilateral knowledge transfer processes, and access rights limited to the procedural realm. In contrast, according to our preliminary observation, further strengthened by the research mapped in this book, CoPK integrates bottom-up perspectives of different knowledge bearers. Our project moved forward from the consideration that an integrated, systematic, and implementable definition of an approach to CoPK was missing in legal research.[34]

The aim of the workshop was, therefore, to address the research gap by setting a common framework for CoPK in climate governance, relevant for legal scholars and prac-

30 See *www.humboldt-centre.uni-bayreuth.de/en/fellows-and-grantees/recently-selected-strategic-scientific-workshops/index.html,* last access 27 December 2023.

31 For a full bibliography on the subject matter see *Poto*, Sustainability Through Participation: Critical Reflections on the Epistemic Adequacy of the Western Legal Approach to Square the Circle and Grant a Common Future for All, in: *Peters, Lohse* (eds) Sustainability Through Participation? Legal Perspectives, Brill, 2022, in press.

32 *Christie*, "Commission on the Future Delivery of Public Services". Report, APS Group Scotland, UK, 2011; *Thornton, & Scheer*, Collaborative engagement of local and traditional knowledge and science in marine environments: a review. Ecology and Society 2012; *Latulippe, Klenk,* Making room and moving over: knowledge co-production, Indigenous knowledge sovereignty and the politics of global environmental change decision-making, Current Opinion in Environmental Sustainability 2020, p. 7–14.

33 In particular, the CoPK workshop and research on CoPK as a necessary step forward in the search for effective participation built on three main projects: (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; (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; (3) DFG 'SustaiNet – Sustainability through participation' (2019–2022, *Peters/Lohse/Poto*).

34 *Norström et al.*, Principles for knowledge co-production in sustainability research. Nature sustainability 2020, p. 182–190.

titioners, through the mapping and evaluation of existing climate-smart practices from a multilevel and polycentric perspective (primary scientific objective). The academic portion of the workshop, reflected in the structure of this book, had both theoretical and practical components. Drawing from the conceptual framework of the participatory rights in international environmental decision-making (the Århus Convention, and the Escazú Agreement) as well as national (constitutional) provisions on participatory rights in environmental law, the workshop connected the tenets of effective participation with best practices of CoPK. Focus was placed on selected local, traditional, and Indigenous communities, affected by climate change (Germany: Bavarian Forest/Steigerwald/Upper Franconia; Arctic Region: Sápmi; Kenya: Maasai, Ogiek, Endorois, Tana River County, and the northern frontier; Brazil: Mato Grosso). The complex problems from climate change, which impact communities all over the world, were assessed as comparable. It was therefore deemed legitimate to use a comparative approach to find similarities and to develop a common framework of CoPK. The long-term aim of the workshop's inclusive research and learning experience was to consolidate our international network and develop training and capacity-building materials (i. e. database, outreach activities, tailored courses) for researchers as well as representatives of communities on the climate-smart practices of CoPK (long-term objectives).

To address the lack of a systematic and implementable definition, the participants proposed the following research question: How can legal researchers, legislators, policymakers, and communities systematically and effectively define and develop ways to engage with CoPK in environmental decision-making?

The participants inductively approached the research question and the task of describing and defining CoPK from different interconnected angles including water governance, climate change, alternative justice, agricultural and nature conservation law, and biodiversity. Questions that structured the panels of the workshop as well as the subsequent contributions in this book were the following:

1. How do legal research and community-based observations in the field of climate and environmental law regard/disregard CoPK? Are there examples/best practices drawn from water governance, where CoPK led to effective and implementable solutions to the ecological challenges that we are currently facing (environmental threats and population displacement stress)?
2. How does CoPK produce usable knowledge for climate-vulnerable Indigenous communities?
3. How does CoPK combine scientific and traditional knowledge for adaptation and mitigation of climate change?