How to Mix Geology, Philosophy, and Sociology for Making Policy Recommendations: Lessons from a Transdisciplinary Collaboration towards Epistemic Justice in Climate Adaptation

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Abstract

This chapter describes and reflects on the challenges encountered in a transdisciplinary collaboration between researchers from geology, philosophy, sociology, and political consultancy. The collaboration sought to produce a policy recommendation, arguing for the integration of local knowledge for the advancement of epistemic justice in EU climate adaptation policies. Drawing on our experiences with the various disciplinary, theoretical, and practical challenges encountered during this process, we propose a series of concrete recommendations intended to support others seeking to engage in similar transdisciplinary collaborations aimed at policy recommendations. Finally, we reflect on the broader implications of our experiences and recommendations for sustainability research, as well as for our efforts to include local knowledge and achieve epistemic justice more specifically.

Keywords

Policymaking; Process indicator; Transdisciplinarity; Local knowledge

1. Introduction

This chapter contributes to the growing body of work on transdisciplinary sustainability research by showing how collaborators with different backgrounds, methods, interests, and values can channel their various expertises and experiences towards the production of an integrated, non-strictly academic output. We describe and reflect on a collaboration among researchers from geology, philosophy, sociology, and political consultancy to develop an EU policy recommendation that seeks to advance epistemic justice in climate adaptation efforts.

Climate adaptation is a principal concern in confronting the wide-ranging effects of climate change at the local, national, and global levels. Adaptation involves various responses to current and future climates in order to reduce exposure and vulnerability. To be successful, adaptation relies on two main considerations. First, adaptation requires state-of-the-art, evidence-based knowledge about climate and socio-ecological systems to ensure efficiency and feasibility. Second, adaptation calls for fair processes of planning and policymaking to ensure justice and actionability. Both considerations – knowledge and justice – are brought together in an increasingly recognised political goal, namely 'epistemic justice', which encompasses criteria, standards, or practices that seek to ensure fair and equal recognition, representation, and participation by diverse actors in processes of knowledge production.

Europe has been at the forefront in developing initiatives for climate adaptation, such as the adoption of the 'EU Strategy on Adaptation to Climate Change' in 2021. The EU Adaptation Strategy has several main objectives among which making adaptation faster as well as more systemic. Despite its significant merits, there are important tensions within the EU Adaptation Strategy that threaten its potential success. First, the goal of faster adaptation conflicts with the necessity of providing adequate space for engaging in the time-consuming tasks that foster justice in systemic changes. Such structural changes require the development and implementation of adaptation plans and actions at all levels of governance, but particularly at the local level. This demands concerted efforts and resources, particularly timewise, to enable deliberative, noncoercive processes of negotiation among various stakeholders. To formulate and implement policies that facilitate just local adaptation actions, it is crucial to adequately engage with the specificities of each locality, considering both their internal commonalities and heterogeneities as well as the potential frictions or synergies with other localities. Second, each EU member state is expected to create national climate plans that accommodate its own specific concerns and capabilities. The efficient implementation of national strategies and the accomplishment of resilient climate adaptation schemes strongly relies on the actionability of such plans, that is, how meaningful and compelling they are. Both the integration of local knowledge and the achievement of epistemic justice drastically improve the prospects of adaptation policies in terms of their actionability and likelihood of success.

In light of these concerns, we – the authors of this chapter – made a collaborative, transdisciplinary effort to develop a policy recommendation that underscored the crucial role of both local knowledge and epistemic justice in climate change adaptation [1]. Alongside our policy recommendation, we drafted an annotated prototype of a process indicator [2] and

proposed its implementation for the evaluation of epistemic justice, specifically for the degree to which locally available knowledges and practices are acknowledged, reinforced, and integrated into local and national policies. To develop this policy recommendation in an informed and convincing manner, however, we needed to draw from multiple types of disciplinary knowledge and engage in transdisciplinary collaboration with policy actors and researchers from Social Sciences and Humanities (SSH) and Science, Technology, Engineering, and Mathematics (STEM) fields. In addition to relying on our own backgrounds in SSH, namely Science and Technology Studies (STS) and Philosophy of Science, respectively, we sought out collaboration with two prominent researchers in the Earth Sciences working at the National Institute of Geophysics and Volcanology in Rome (Silvia Peppoloni and Giuseppe Di Capua) as well as a political consultant and lobbyist (Federico Lampis) with close-up experience in policymaking at the EU level. Underpinning our selection of different disciplinary expertises and professional experiences was the idea that each researcher would provide a different yet complementary perspective on key terms, such as 'knowledge', 'localness', or 'justice', and that the perspective of the policy consultant would guide us in transforming our academic knowledge into a clear, concrete, and actionable policy recommendation.

This collaboration was not supposed to produce new knowledge but a policy recommendation for EU policy officers. As such, it did not require primary research, and therefore did not involve the mixing of disciplinary methods or modes of analysis found in conventional interdisciplinary collaborations. Instead, our collaboration consisted of a transdisciplinary exercise that transcended purely academic, disciplinary ambitions to produce a practical tool and policy recommendation for EU funding officers. Our varied backgrounds and areas of expertise required not only the integration of different perspectives on contentious concepts such as 'justice' and 'knowledge', but also direction on how these might be achieved or assessed in practice. This process involved a number of challenges at the level of theorisation, conceptualisation, and implementation.

Efforts to integrate Earth sciences with policymaking are not new. Initiatives such as the Intergovernmental Panel on Climate Change and the EU Adaptation Strategy exemplify attempts to translate scientific expertise into actionable guidance. Also, substantial SSH scholarship has analysed and critiqued these endeavours, including work on the role of traditional and indigenous knowledges in climate adaptation [3, 4]. However, these forms of science-for-policymaking, in order to be legitimate, tend to operate at large institutional scales, relying on intricate, bureaucratic procedures that remain only partially flexible in order to achieve a broad consensus and gain eventual general support. Our project represents a different, and comparatively underexplored, mode of integration, namely an output-driven collaboration, aimed at producing a concrete policy recommendation and a prototype tool undergirding the recommendation through iterative work within a small but committed group of academic researchers together with a policy consultant. In this sense, while the broader ambition of mixing diverse knowledge domains with policymaking is not new, the methodological configuration and scale at which we operated introduced an unorthodox form of transdisciplinary practice.

The chapter is structured as follows. In the next section, we discuss the challenges of mixing approaches from SSH as well as STEM disciplines and directing these towards the development of a concrete policy recommendation. In the subsequent section, we draw on this experience to propose practical guidance for others seeking to engage in similar transdisciplinary collaborations aimed at producing policy-relevant outputs. Finally, we reflect on the implications of our collaborative experience for sustainability research more broadly, as well as for efforts to foster epistemic justice specifically.

2. Challenges of mixing geology, philosophy, and sociology in making policy recommendations

Here, we reflect on the challenges encountered, which, for the sake of clarity, have been divided into four separate parts. Although presented as separate, these challenges bleed into each other throughout the process, sometimes emerging with more intensity than at other times. This section reflects our experiences as SSH scholars who led this collaborative project in terms of applying for funding, organising and leading meetings, writing up the policy recommendation, and engaging in post-publication dissemination. This model is somewhat unusual in STEM-SSH collaborations, as the former tends to be the dominant rather than subordinate partner. In our case, however, this allowed us to put the goal of epistemic justice front and centre.

Another unusual, perhaps even exceptional, aspect of our collaboration is that all the researchers already had an affinity for interdisciplinarity. Although a philosopher of science, Hernán has an academic and professional background in geology. Listed in the title of this chapter as a sociologist for the sake of simplicity, Chris is actually an STS researcher (itself an 'interdiscipline' already). Both Hernán and Chris are based at a technical university, and therefore very familiar with talking and working with scientists and engineers. Although leading researchers at the National Institute of Geophysics and Volcanology in Italy, Silvia and Giuseppe are also specialists in geoethics and have extensive field experience in engaging local communities across different cultures.

A first challenge, and one that occurred even before the involvement of the colleagues from STEM and political consultancy, was that of the disciplinary differences between the philosophy of science and STS. Although both disciplines fall under the umbrella of SSH and are closely related, they are nonetheless different enough to cause confusion about key terms, such as 'justice'. In philosophy the term has long been debated by scholars from varying perspectives seeking to elucidate the meaning of 'justice' in an abstract manner. In STS, however, the term is much less common, with scholars instead preferring to employ adjacent terms such as 'politics' or 'equality'. Moreover, to the extent that 'justice' does figure in STS research, it is rarely treated in an abstract sense but instead as concretely situated and enacted. Furthermore, STS scholars might focus on related topics, such as the lay-expert divide, perhaps wishing to uplift the knowledge of the former in respect to the latter, but to the extent that this constitutes 'justice' is mostly left underarticulated. The issues that such differences can give

rise to reared their head already at the very start of the project when Hernán and Chris sought to define the scope of the project and identify potential collaborators.

A second and more challenging difficulty in comparison to the first was that of mixing the perspectives of SSH and STEM scholars. This involved navigating the broader ideological and political assumptions and commitments of each respective discipline – disciplinary stances that are often tacitly assumed and not always explicitly articulated – and negotiating various cultural, professional, and maybe even generational differences. For example, a key aspect of accomplishing epistemic justice is the inclusion of knowledges that have hitherto been ignored or dismissed into dominant systems of knowledge. Incorporating and representing the perspectives and knowledges of marginalised communities might be considered a laudable collective ideal but can lead to complicated interdisciplinary discussions about how this practically can or even should be achieved. A key instantiation of this challenge is the status of perspectives that might not be deemed 'knowledge' let alone 'scientific knowledge' but instead as representing a religious worldview, local tradition, or superstition, and thus considered, by some, as not worthy or potentially even troubling to include in policymaking decisions. As scholars in STS and the philosophy of science – and as younger and non-strictly European researchers – we were more inclined to accommodate non-scientific perspectives and recognise them as local knowledge to ensure broader representation and inclusion. But as practicing scientists with extensive field work experience, the STEM researchers were, understandably and justifiably, concerned with the potential implications that the inclusion of such perspectives might have for the status of scientific knowledge and its role in policymaking.

A third challenge concerned the obstacles faced when integrating varied disciplinary perspectives specifically for the production of a policy recommendation as well as for the development of a process indicator of epistemic justice. This challenge involved the process of moving from an interdisciplinary discussion towards a transdisciplinary endeavour that sought to co-create a concrete and actionable outcome both with and for policy professionals. A primary issue in this case is that we – the researchers from both SSH and STEM – had little to no experience with policymaking processes, let alone EU-level climate adaptation policies specifically. We were entirely unfamiliar with how policy recommendations are produced and written, or with the prospective audience of our recommendation and how they might engage with this. Furthermore, we were also relatively unfamiliar with the concrete and applied nature of policy recommendations, which need to be specific and actionable or otherwise risk being useless. This gave rise to another challenge, namely finding ways to support our policy recommendation by providing policy makers with a tool, such as an indicator, that would facilitate quantitative assessment of a non-quantifiable phenomenon (that is, justice), and thus further undergird our recommendation.

A fourth and final challenge involved the mixing of disciplines and professional perspectives that takes place post-collaboration, that is, once the policy recommendation has been completed and is being disseminated. This phase was important for finding a broader audience for our policy recommendation and the process indicator underpinning it, and involved engaging with a broad, varied set of disciplines at multiple workshops and

conferences. However, it also brought concrete challenges in terms of developing a clear and convincing presentation of our policy recommendation, explaining its scope and possible implementation (potentially modified for specific contexts or issues). This called for flexibility and concrete efforts to tailor the message to varied audiences with a shared interest in advancing epistemic justice by integrating local knowledges.

3. Recommendations for mixing geology, philosophy, and sociology in making policy recommendations

In this section, we provide recommendations for how the four challenges above can be, to greater or lesser degrees, addressed. Although the first two challenges are similar – involving problems of interdisciplinarity within SSH disciplines or between SSH and STEM disciplines – and could potentially be grouped together, we nonetheless provide specific recommendations for each challenge. Moreover, parts of our recommendations are interconnected in that they apply to multiple challenges.

- **Move out of your comfort zone, beyond what you already know**

A primary challenge for us as the SSH members of this project was to overcome the disciplinary differences between the philosophy of science and STS, which although closely related disciplines nonetheless have important differences in terms of their distinct concerns, methods, and objectives. That is, before figuring out how to work with STEM collaborators and policy professionals, we first had to figure out how to work with each other. The process of learning how to work together, of course, took place throughout the entire collaborative endeavour.

In a very basic sense, producing a transdisciplinary policy recommendation involves leaving the familiarity of one's home disciplines behind and entering into a new domain of activity. Moreover, since the objective of the transdisciplinary collaboration involved the creation of an entirely new output – a policy recommendation – it is necessary to gain at least a basic understanding of how other disciplines conceptualise key terms. For Chris, as an STS researcher, this first meant engaging with the literature in philosophy on the topic of 'justice' [5, 6, 7]. Furthermore, it also meant figuring out what other disciplines besides STS, such as ecology, anthropology, and geography, had written about expertise or local knowledge, reading up on these studies, and subsequently deciding which ones would be most fruitful or important to share with Hernán. Although reading is the bread and butter of academic life, it is not necessarily easy or comfortable to read studies that apply different methodological approaches or theoretical frameworks and to assess their potential utility for a collaborative endeavour. For Hernán, as a philosopher of science, moving out of his comfort zone meant engaging with the canonical STS literature on expertise [8, 9, 10] as well as the relevant literature in other disciplines on local knowledge and climate adaptation, and subsequently sharing these with Chris.

Reading widely and extensively both the literature of the other collaborator as well as of adjacent disciplines is, however, just a starting point. Indeed, familiarising oneself with studies from other disciplines can highlight how wide the differences between oneself and one's collaborators are, thus potentially hampering or even paralysing the process. Equally important is therefore to think through and discuss these differences frequently and at length. This too involves moving outside of one's comfort zone because it demands both recognising and acknowledging the limits of one's own discipline and how some of its strengths can also be thought of as weaknesses. A pertinent example in this case is Chris's recognition that STS researchers rarely clearly articulate what their conceptualisation of justice is and instead highlight what they perceive as injustice (or more frequently, inequality). While pointing to an injustice may help foster justice, articulating that ideal – and determining how it might be achieved – is considerably more challenging.Through frank and regular face-to-face interactions, such limitations were easier to acknowledge, and made easier to address by recourse to other approaches.

- **Collaborate for relational and reflexive integration of differences**

In addition to the challenge of mixing philosophy of science and STS, our collaboration also involved the additional challenge of collaborating with STEM researchers from the Earth Sciences. Although, as noted above, our STEM collaborators were rather exceptional in terms of their existing experience in engaging with local communities and geoethical issues – topics generally not broadly considered by their peers – there were nonetheless important differences between the epistemic and political assumptions, concerns, and commitments of our respective SSH and STEM fields.

From our experience as the SSH scholars leading this collaboration, transdisciplinary projects thrive when differences are treated as productive tensions rather than problems requiring immediate resolution. We therefore encourage structuring this kind of collaboration to, at least initially, reveal rather than eliminate epistemic, cultural, and political diversity. This might cause collaboration to be rather slow at the onset, however, and therefore potentially unsuitable for more short-term collaborations. Furthermore, individual differences need to eventually be resolved at a collective level in order to make decisions about the collaborative product. In the medium and long term, however, the acknowledgement and indeed upholding of such differences was, we believe, crucial not only for ensuring that our policy recommendation was as broad and comprehensible as possible but also for establishing mutual understanding and trust.

In practical terms, during our collaboration we emphasised the value of our distinct disciplinary backgrounds and created explicit spaces and moments for presenting our divergent perspectives openly, both in online and in-person meetings as well as in our various online working documents. During our opening workshop, for instance, each participant was provided with 15 minutes to outline their intentions and contributions and asked to reflexively frame their perspective within their own discipline. This was followed by an explorative session in which we collectively mapped key ideas and tensions using an online whiteboard tool. An

important discussion that took place in this context, for example, was the challenge of including knowledges that have debatable scientific value and instead can be considered as religious or superstitious. In part because of our respective differences in this regard, we eventually opted for the design of a 'process' indicator rather than an 'outcome' indicator, thus prioritising justice in the policy making process. Subsequent meetings focused on identifying main insights and making collective decisions while preserving areas of uncertainty, disagreement, or confusion for later discussion and development.

Effective collaboration also depends on concrete organisational support: shared repositories, communication routines, regular meetings, and co-developed resources. These infrastructures and tools are not mere administrative details but instead the foundation for collective work. More concretely, we maintained a shared online folder for relevant resources and drafts that could be commented on, thus carrying on discussions asynchronously when not meeting face-to-face. It must be noted, moreover, that the policy consultant was actively involved in all our meetings and online discussions, regularly reminding us as researchers of the concrete end goal of our collaboration, namely the policy recommendation (this aspect gave rise to its own set of challenges, which are addressed in the following subsection).

Face-to-face interaction, informal and regular discussions, and opportunities for collaborators to reflect on and express their disciplinary perspectives are also essential for establishing mutual understanding and trust. These were part of the in-built structure and overall framing of our project, including the online and in-person meetings. There are various ways to implement this aspect. For example, during our opening workshop's explorative session, we devoted extended time to conversational exchanges: questioning, explaining, and especially connecting personal experiences (the sort of which are rarely described in papers and books). This allowed participants to understand each other's context, from fieldwork with communities to effective policymaking negotiations.

- **Centre pragmatism and actionability over theoretical elaboration**

The two previous recommendations concern challenges that occur in interdisciplinary collaboration between researchers from various academic disciplines. Here, we turn to the transdisciplinary challenge of co-creating a concrete and actionable output both with and for policy professionals. Transdisciplinary collaborations must continuously balance theoretical rigour and academic nuance with practical impact (in our case, policy relevance) in order to formulate concrete solutions to complex problems. Our specific project required translating (often abstract) concepts and frameworks from our various disciplinary literatures into both a concrete tool and practical recommendation. That is, for our project to be transdisciplinary and our policy recommendation to be transformative, we needed to provide both the means and the justification for the proposed change in climate adaptation policy. We therefore deliberately sought to limit extensive theoretical debate and instead focused on how both the indicator and the recommendation could respond to policymakers' needs and local communities' concerns about fairness in knowledge integration.

Given our inexperience as academics with making policy recommendations, the involvement of a political consultant with close-up experience of policymaking at the EU level was crucial for shifting our collaboration from an interdisciplinary project towards a transdisciplinary process and outcome. Unsurprisingly, our academic instincts frequently proved impractical, tending to assert statements abstractly and justifying them theoretically rather than clarifying how our recommendation might complement the EU's Adaptation Strategy and existing EU guidelines for regulations [11, 12]. The active participation of the political consultant in our meetings and his direct involvement in the formulation of the policy proposal was invaluable in creating an implementable policy recommendation with the strongest potential impact on national adaptation policies.

Equally important was the consultant's involvement in creating the indicator, namely the tool by which to evaluate justice in policymaking processes, which he recommended to structure as a checklist that lawmakers could use when making policies for climate adaptation. Besides serving as a tool for assessing various dimensions of epistemic justice, the indicator specifically focused on two important phases of policymaking, namely the *ex-ante*, problem framing stage and the *ex-post* stage for appraisal of the policy's design. Without going further into the technical details (see [2] for further details of the indicator prototype), the involvement of the policy consultant enabled us to propose a tool for evaluating the inclusion of local knowledge into both phases of policymaking, which could therefore serve as a semi-quantified approach to evaluating epistemic justice, and thus complement existing EU-level approaches.

- **Treat dissemination as a continuation of the transdisciplinary process**

Our final recommendation addresses challenges that emerged after the formal conclusion of our transdisciplinary collaboration, which are related to disseminating the policy recommendation and the process indicator. Unlike the previous recommendations concerning the orchestration of mixed-disciplinary collaboration, this recommendation addresses the equally complex task of making our policy recommendation intelligible, persuasive, and ultimately useful for diverse audiences that were not originally envisioned as part of the process.

Although dissemination is often treated as an administrative endpoint (upload the result, circulate a link, present it at a conference), our experience suggests that dissemination should be treated as another round of transdisciplinary engagement. More concretely, it reintroduces disagreements, but in new guises and by new interlocutors. For this reason, it can provide new valuable insights, particularly in terms of highlighting missed opportunities and critical gaps. Finally, dissemination also provided opportunities for new transdisciplinary collaborations in which our policy recommendation and indicator would become only the starting point.

We highlight here three insights that, taken together, call for treating dissemination as a continuation of the transdisciplinary process. First, dissemination requires anticipating disciplinary and professional sensibilities well beyond the original team and target audience. Even though our collaborative team had already negotiated significant epistemic differences,

we were not fully prepared for how the indicator would be received in settings where discussions about epistemic justice and local knowledges were relevant but unfamiliar. Second, dissemination should be approached iteratively rather than as a one-off announcement. After uploading the indicator prototype to Zenodo and circulating our policy recommendation via professional networks, we quickly realised that interest alone does not guarantee uptake. Accordingly, we have searched for additional spaces to advance our outputs, including a workshop on geoethics, a new transdisciplinary collaboration using these outputs, and this very chapter. Third, dissemination can open unforeseen and productive pathways if one treats it as an extension of the research process. Presenting the indicator across disciplinary and policy forums generated invitations we could not have predicted at the outset, including a collaboration with researchers and policymakers from Norway and Uganda. The latter collaboration, which seeks to adapt our indicator for the evaluation of electrification policies in rural Uganda together with local communities and policymakers, demonstrates that dissemination may transform a finished output into a prototype for ongoing experimentation. In this sense, dissemination is a moment of renewed uncertainty and serendipity, conditions that proved generative throughout our project and which we propose to embrace rather than minimise in future transdisciplinary efforts.

In hindsight, our experience suggests that dissemination should be planned from the beginning as an extended, dialogical phase of the project. We therefore recommend that transdisciplinary teams design flexible dissemination strategies, allocate time and resources for early and iterative engagement with diverse audiences, and anticipate that new tensions will arise beyond the original collaboration. Treating dissemination as part of the transdisciplinary process not only enhances the reach and impact of the final output but also sustains the project's commitment to epistemic justice by enabling adaptation, critique, and co-development beyond the original collaborators.

4. Implications for sustainability research

Our experiences, we suggest, have implications for sustainability research more generally. Sustainability research that aims to be genuinely actionable requires a large degree of transdisciplinary (i.e. extra-academic) engagement. In our specific case, this was instantiated through our engagement with a policy consultant, as well as Earth scientists doing research in a technical, public institution, not exclusively concerned with academic interests alone. At the same time, all participants had formal academic training, which predictably shaped our reasoning and approaches to problems in distinctively disciplinary ways. We suggest therefore that 'transdisciplinarity' may not constitute a strict category but rather a spectrum of practices that can and indeed should evolve over the course of a collaboration.

Our experience also underscores that sustainability problems demand an openness to diversity and uncertainty. Much sustainability research adopts problem-solution framings that presuppose relatively stable problem definitions, clear stakeholder roles, and predictable pathways of implementation. We suggest that genuinely transdisciplinary collaborations cannot be governed by a pre-established blueprint. Instead, the process – and its interim outputs

– unfold gradually through negotiation, misunderstanding, humour, friction, the shared vulnerability of working outside of the comfort of our disciplinary competencies, and the generosity and care with which we respond to one another. The volume editors' definition of transdisciplinarity as 'co-production of knowledge between academic and non-academic actors' captures part of this story, but it does not account for its affective and relational dimensions – the trust-building, the moments of confusion, the serendipity – that ultimately enabled us to move from an abstract critical impulse to a concrete policy tool. Sustainability research would benefit from acknowledging these less formalised aspects of collaboration as legitimate conditions for knowledge production rather than as either happy accidents or unfortunate inefficiencies.

Finally, we believe that sustainability research should engage more deeply with issues of epistemic justice, not necessarily only as a research topic or even as an ultimate goal, but rather as a methodological commitment. We acknowledge that the ideal of justice may remain elusive, in part because of our contingent personal and socio-economic limitations and in part because we hold different understandings of what justice entails. But while justice may remain an abstract ideal, the harsh realities of injustice are rather concrete. There are actions that progressively move us away from specific injustices, even if the ideal of justice remains perhaps ultimately unreachable. As researchers, our concern was – and remains – that there are always opportunities to improve our professional activities, such as reshaping our practices and guiding resources towards the creation of more inclusive, participatory, and recognitional spaces. These are lofty ideals, and commitments are often easier said than done, but even small steps, however seemingly inconsequential and imperfect, can go a long way in challenging established and sometimes ossified ways of knowledge production.

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6. References

[1] Bobadilla H, Di Capua G, Hesselbein C, Peppoloni S, Lampis F. Advancing Epistemic Justice with Local Knowledge: A Process Indicator for EU Climate Adaptation Policymaking. In Galende Sánchez E, Sorman AH, Cabello V, Heidenreich S, Klöckner CA, editors. Strengthening European Climate Policy Palgrave Macmillan; 2024. p. 49-60. https://doi.org/10.1007/978-3-031-72055-0_5

[2] Bobadilla H, Di Capua G, Hesselbein C, Peppoloni S, Lampis F. Epistemic Justice Indicator: An Annotated Prototype [Version 1.0 – 2024.05.10]. Zenodo. https://zenodo.org/records/13712721

[3] Klenk N, Fiume A, Meehan K, Gibbes C. Local knowledge in climate adaptation research: Moving knowledge frameworks from extraction to co-production. Wiley Interdiscip Rev Clim Change. 2017;8(5):e475. https://doi.org/10.1002/wcc.475

[4] Wheeler HC, Root-Bernstein M. Informing decision-making with Indigenous and local knowledge and science. J Appl Ecol. 2020;57(9):1634-43. https://doi.org/10.1111/1365-2664.13734

[5] Fricker M. Epistemic Injustice: Power and the Ethics of Knowing. Oxford: Oxford University Press; 2007.

[6] Rawls JA. Theory of Justice. Cambridge, MA: Harvard University Press; 1971.

[7] Sen A. The Idea of Justice. Cambridge, MA: Harvard University Press; 2009.

[8] Collins HM, Evans R. The Third Wave of Science Studies: Studies of Expertise and Experience. Soc Stud of Sci. 2003;32(2):235-96. https://doi.org/10.1177/0306312702032002003

[9] Epstein S. The Construction of Lay Expertise: AIDS Activism and the Forging of Credibility in the Reform of Clinical Trials. Sci Technol Human Values. 1995;20(4):408-37.

[10] Wynne B. Misunderstood misunderstanding: social identities and public uptake of science. Public Underst Sci. 1992;1:281-304.

[11] European Commission. Better Regulations Guidelines. 2021 Nov [cited 2025 Nov 15]. Available from: https://commission.europa.eu/law/law-making-process/better-regulation/better-regulation-guidelines-and-toolbox_en

[12] European Commission. Better Regulations Toolbox. 2023 Jul [cited 2025 Nov 15]. Available from: https://commission.europa.eu/system/files/2023-09/BR%20toolbox%20-%20Jul%202023%20-%20FINAL.pdf