

# *Philosophy of Scientific Advice to Policymakers*

:: Luana Poliseli

## Abstract

In this essay I offer philosophical reflections on the emerging theme of the philosophy of scientific advice. I discuss some of the challenges of science-based policymaking, underscoring how philosophy of science can contribute to more robust policy development. The piece concludes by introducing new imaginaries that can support more reflective and just approaches to policymaking, one of the aims of our project within the ISR (UKRI) Interdisciplinary Systematic Review: mechanistic evidence and epistemic justice.

## Keywords

Governance, science-based policy, evidential pluralism, scientific advice.

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As global challenges such as climate change, health crises, and technological transformation demand immediate informed decisions, the ability to effectively embed scientific knowledge into governance structures becomes critical. Scientific advice is a crucial tool in enabling guidance on scientific matters to inform and assist policy decisions facing the recent polycrises (e.g. COVID-19, biodiversity loss, AI governance, etc.). However, the integration of scientific advice into policymaking processes is increasingly complex and has been frequently contested as technocratic (Strassheim & Kettunen 2014). For instance, the neglect of other relevant world views of legitimate stakeholders in deciding policy-relevant facts are the result of an intensive and complex struggle for political and epistemic authority (ibid.) which sometimes can result in flawed policy prescriptions (Saltelli & Giampietro 2017).

In addressing these and other concerns, in July 2025, the Finnish Academy of Sci-

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ence and Letters together with the Scientific Advice Mechanism to the European Commission hosted a Workshop titled Philosophy of Science Advice Mechanism<sup>1</sup>. This informal working meeting brought together international scholars and practitioners engaged in the philosophy of science advice. This essay is inspired partly by discussions that took place during this workshop and goes further, it outlines three core challenges of science advice to policy making (i.e. epistemic, normative, and institutional) and explores innovative imaginaries to overcoming these barriers.

## **The Challenges of Integrating Scientific Advice into Policy Making**

In the *Honest Broker*, Roger A. Pielke Jr. offers two models and four roles of scientists in policy advice.

The Linear Model assumes the position that knowledge is always a prerequisite for action and should sometimes compel policy - scientists would take the role of pure scientists (aligning with a traditional positivist philosophy of science which posits that scientific knowledge can be entirely separate from values and political contexts) or science arbiters (akin to certain standards of empirical engagement, aligned with pragmatism or logical empiricism).

The Stakeholder Model maintains that policy-relevant science should not be considered value-free and that user and use considerations should have a bearing on the production of knowledge for policy - scientists would take the role of issues advocates (reflects an overly normative or activist philosophical stance, linked to critical theory or value-laden pragmatism) or honest brokers of policy alternatives (integrates expertise with democratic pluralism, similar to aspects of deliberative democracy or value-aware post-positivism).

Regardless of possible advantages to his model, Pielke's framework has been criticized as poorly representing the STS scholarly debate and of being too simplistic (see Jasanoff 2006). It is hard not to argue that policy advisers should act as honest brokers of scientific alternatives - disclosing the limits of their information and the extent of their uncertainty in a spirit of professional humility. However, when these are not met, decision-making might run the risk of having ambiguities concealed behind monolithic claims of scientific certainty (ibid.)

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<sup>1</sup><https://scientificadvice.eu/events/philosophy-of-science-advice-workshop/>

Scientific advice in policymaking is not merely a technical exercise of using scientific information but a complex negotiation of knowledge, values, and institutional arrangements. Thus, whenever addressing complex socioenvironmental problems, science advice faces at least three core challenges: epistemic, institutional and normative. These challenges shape the relationship between science, policy and society and will be addressed below. If scientific advice is to drive meaningful and fair policy outcomes, it must not only navigate these adversities but actively work to dismantle them.

*Epistemic challenges: what counts as knowledge and evidence?*

Intrinsically to scientific advice is the epistemic challenge of determining which knowledge is relevant and reliable to count as evidence for policymaking. In this paper, knowledge refers broadly to the diverse epistemic resources available to inform decision-making including scientific theories, models, experiential insights, and tacit or local know-how, whereas evidence denotes the subset of those resources that are selected, justified, and mobilized to support concrete policy recommendations. This distinction matters because not all available knowledge is automatically treated as evidence in policy contexts, particularly under conditions of uncertainty, contestation, and urgency. For instance, in many cases, scientific fields are themselves divided, making it difficult to establish what should count as truth or evidence (Greenhalgh & Engebretsen 2022). Beyond formal science, experiential and tacit knowledge from citizens, practitioners, and stakeholders also plays an essential role. Effective policymaking therefore requires the integration of both systematic scientific evidence and context-specific experiential insights, without reducing one knowledge system to the other (Poliseli 2025). This pluralistic approach demands evidence that values diverse forms of knowledge and navigate contested epistemic terrains.

However, existing philosophical accounts of evidence in public health and sustainability research are not adequate to deal with the kind of evidence generated and used to support interventions (Caniglia & Russo 2024). As Susan Haack (2001) argues, evidence should not be understood as a rigid hierarchy or as a mere aggregation of data points, but rather a network of clues that gain credibility through mutual support and coherence. In contrast to hierarchical models commonly used in policy contexts, which privilege specific methodologies such as randomized controlled trials, Haack's network model allows diverse evidential sources to contribute to justification without being reduced to a single evidential standard. Evidential reasoning, on this view, involves both empirical grounding and inferential coherence, so that diverse sources of evidence (statistical models, qualitative narratives, experiential and participatory knowledge) can jointly constitute to the

overarching evidence complex without being forced into a single methodological standard. These ‘clues for action’ (Caniglia & Russo 2024), allows to deal with the messy, pluralistic epistemic ecology of public-health and sustainability interventions, enabling judgments under complexity and uncertainty while preserving critical standards of justification.

*Institutional Challenges: Who advises whom?*

The institutional dimension concerns who provide scientific evidence advice, and how such advice is structured and communicated. There is growing concern about fragmentation and underrepresentation of certain scientific perspectives (Conti et al 2025). Moreover, institutional models must also create space for stakeholder and citizen involvement, ensuring legitimacy and inclusivity in decision-making processes. This requires robust institutional design that bridges science, policy, and society. This might also require thinking on to *whom* are these policies made for? Recent debates have argued that decision-making should be no longer made through a top-down approach but a bottom-up approach. The earlier emphasizes hierarchical control and clear policy design, while the latter focuses on local actors’ practices, motivations and interactions in shaping policies outcomes.

Notably, the contrast between top-down and bottom-up approaches mirrors the epistemic tension between hierarchical and network-based models of evidence. Just as pluralistic evidential networks resist rigid methodological hierarchies, non-hierarchical institutional arrangements may allow for more adaptive, reflexive, and context-sensitive forms of scientific advice. While this paper does not propose a fully developed institutional model, the analogy suggests that institutional pluralism, distributed across advisory bodies, stakeholders, and levels of governance, may better accommodate the epistemic complexity of contemporary policy problems.

*Normative challenges: ethics and consequences*

Scientific knowledge alone cannot dictate political decisions. Policymakers must weigh the likely consequences of different policy options against their ethical implications, a process that extends beyond forecasting impacts to navigating value pluralism and contested notions of fairness. Policy disputes often arise not because of disagreement over empirical projections, but because stakeholders hold divergent views about responsibility, acceptable risk, distribution of burdens, and procedural justice. This normative dimension requires an understanding not only of what *can* be done, but what *should* be done. For example, in climate policy, scientific models can predict emissions outcomes, but decisions about fairness, responsibility, and sacrifice are ethical judgments. The increasing complexity of pol-

icy environments, shaped by overlapping crises and stakeholders' interests, makes identifying universally "correct" solutions increasingly elusive.

## Reimagining the role of Science in Policy

To address these challenges, science must assume multiple roles. It should seek fundamental understanding; provide knowledge to achieve policy aims; and help shape inclusive and reflexive decision-making processes. These latter suggest a need for interdisciplinary and transdisciplinary approaches that transcend traditional academic boundaries.

### *Innovative models: the Interdisciplinary Systematic Review (UKRI)*

Dealing with the challenges discussed, the project *Interdisciplinary Systematic Review: mechanistic evidence and epistemic justice* (UKRI 2025-2027) stands out as a promising framework for reaching expert consensus in complex policy domains, overall, in public health. Traditional evidence-based evaluation methods rely heavily on specific types of studies, especially randomized controlled trials, while often overlooking other valuable forms of evidence, such as mechanistic research and stakeholder perspectives. The ISR-UKRI project, by adopting two approaches to review, the Evidential Pluralism Review and the Mechanism-Informed Narrative Synthesis, *both in development*, adopts a structured, interactive format for causal enquiry, to create a more comprehensive and systematic approach to evidence review. By integrating diverse forms of evidence across disciplines, the project aims to deliver more informed and inclusive evaluations. These methods are being tested through a new review of the effectiveness of face-mask efficacy, mandates and use during the COVID-19 pandemics. It is expected that this framework will allow experts and stakeholders to refine their views and converge on informed recommendations, consensus and guidance on specific issues. Furthermore, it is also expected that these review methods will promote transparency, trust, and shared ownership for policy decisions.

Seen through the lens of the three challenges outlined earlier, the Interdisciplinary Systematic Review framework can be understood as addressing epistemic, institutional, and normative dimensions simultaneously. Epistemically, it operationalizes systematic review by integrating mechanistic, quantitative, qualitative, and experiential sources without imposing a rigid hierarchy. Institutionally, its iterative and participatory review structure creates spaces for interdisciplinary collaboration and stakeholder engagement, thereby, mitigating fragmentation and exclusion. Normatively, by making value assumptions, uncertainties, and trade-offs explicit, the

framework supports more transparent deliberation about biases, fairness, responsibility, and acceptable risk in policy recommendations.

## Conclusion

The study and practice of science in policymaking have developed significantly in recent years, yet their philosophical underpinnings remain somewhat under-examined. Scientific advice in policymaking is not merely a technical exercise but a complex negotiation of knowledge, values, and institutional arrangements. Robust philosophical scrutiny from a variety of normative and epistemic perspectives helps to ensure that the theoretical foundations of the discipline are robust. Addressing epistemic, normative, and institutional challenges requires adaptive, inclusive, and collaborative approaches. Methods such as the UKRI SR+NR+ initiatives, combined with sustained reflection on the role of science in society, can help build more effective and legitimate pathways for integrating complex knowledge into public decision-making. However, we should continually ask whether policymaking is truly about diagnosing pre-existing social problems and applying evidence-based scientific solutions, or whether it is, instead, a contest over how problems are defined and framed. Competing framings determine not only what counts as a problem but also who is held responsible and what kinds of scientific interventions are deemed appropriate.

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LUANA POLISELI

 <https://orcid.org/0000-0001-7334-2093>

University of Manchester

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