

Citizen participation for science-related policy

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1 Science-policy knowledge gaps

Many of society's most pressing issues are science-related. Yet, scientists often express frustration that policy decisions do not "follow the science" (Morgan, 2021; Pearce, 2024). From the policymakers' perspectives, often science information is not provided in a format, or at a time, that they can utilise (Olejniczak *et al.*, 2019, p94; Hodgetts, 2024). Ultimately, it is citizens who are most impacted by this gap between science and policy, often experiencing harms before policy catches up with the science (e.g. consequences of global heating and algorithmic injustices) and, when policy on science topics is enacted, citizens can find themselves at the brunt of decisions that exacerbate existing social ills, like inequality (Sprain, 2016, p67; Drews, 2021, p237).

On considering the governance of contemporary scientific endeavours, Jasanoff (2003, p238) concluded that the greater uncertainty and ambiguity called for "more meaningful interaction among policy-makers, scientific experts, corporate producers, and the public". Here, I propose active citizen participation in design and co-design as a means of *interaction* (Section 2) and discuss determinants of *meaningful* interaction (Sections 3 and 4), before examining some real-world examples (Section 5) and reflecting on my findings (Section 6).

2 The knowledge triangle

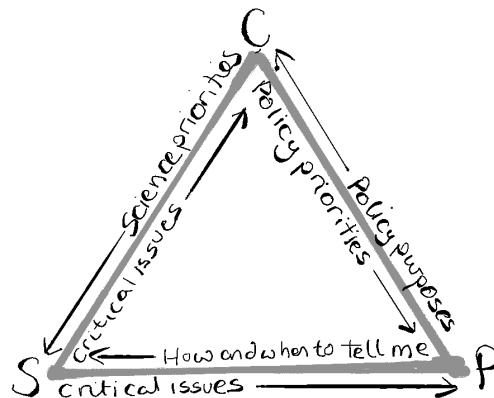


Figure 1: Example knowledge flows that are needed between citizens (C), scientists (S) and policymakers (P).

Scientific expertise is acknowledged as an important input to the development of policy, its delivery and governance (hereafter: "policy"). However, there has been less attention to drawing on the expertise held by citizenry in the domains of life experiences, beliefs and worldviews. Much science-related policy aims to change behaviour, usually of citizens, and thus their domain expertise is at least as important as science expertise. Both domains can benefit from the knowledge of policy-makers regarding policy-making processes and how they may be influenced, as well as from each others' expertise to develop more socially meaningful science and to enrich lived experience.

There is thus a triangle that represents necessary flows of knowledge (Figure 1) between the domains of citizens, scientists and policymakers (CS&P) to support robust science-related policy and science understanding, and to fill a range of knowledge gaps (exemplified in Figure 2).

Citizen participation for knowledge exchange and discovery

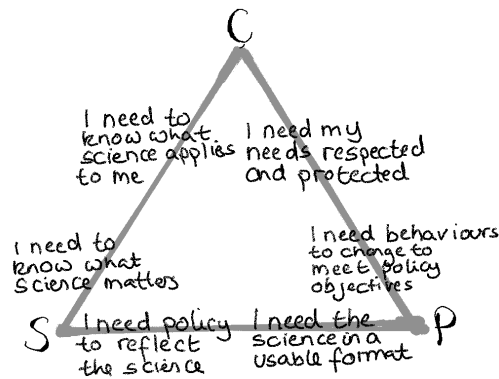


Figure 2: Example knowledge gaps between citizens (C), scientists (S) and policymakers (P).

Whilst some of this knowledge is in the form of written and spoken artefacts, there is much tacit knowledge (Spinuzzi, 2005) in all three domains that is not easily shared through these means. Participatory approaches have been suggested to bring citizens' perspectives into policy-making (Jasanoff, 2003; Pascual *et al.*, 2018, p11; Renn, 2006; Davies, 2022 and science perspectives into policy-making (Cerna *et al.*, 2020; Velandar and Donà, 2024), to develop scientists' understanding of citizens' perspectives (Mayer, 2003; Ferraro *et al.*, 2015, p374; Martin, 2016, p436; Kerschner and Ehlers, 2016, p140), for citizens to gain science knowledge (Allan, 2023), and for all relevant parties to collaborate on science-based decisions (Norström *et al.*, 2020; Moallemi *et al.*, 2023).

Citizen participation can achieve substantive aims, such as exposing possible flaws in policy (Renn, 2006, p40-1; Stirling, 2008) and instrumental aims, such as achieving accountability and transparency of policy (Stirling, 2008; Quick and Bryson, 2022, p159). Bringing together diverse perspectives could also elicit new ideas from *between and across* the knowledge domains of participants. These ideas can turn knowledge into action, by identifying problems, opportunities and solutions. Participatory approaches are also suggested to improve the legitimacy of, and compliance with, consequential policy (Mazepus, 2018; Mellor and Hawksbee, 2018).

Design approaches participation on policy

Digging deeper, however, there are some profound differences in languages, mindsets, worldviews, values, and aspirations between the CS&P domains (Pascual *et al.*, 2018, p12; Olejniczak *et al.*, 2019, p94; Matuk *et al.*, 2020, p95) that can create barriers to successful problem solving and knowledge exchange. Design has been extolled as offering creative means to reframe complex problems and identify novel solutions (what Nussbaum (2011) calls "Creative Intelligence") and the idea of design in policy-making is well-established (e.g. Hallsworth and Rutter, 2011; Bason, 2017; Peters, 2018; McGuinness and Slaughter, 2019) arguing that design brings perspectives to problem solving that are missed by

“rational” and “decisionistic” policy approaches (Renn, 2006; Lewis *et al.*, 2020). Owen (2007) suggests that design offers a complement to science’s analytic use of process and abstraction of subject matter (Figure 3). In recent years, design has developed a greater emphasis on empathy and centring the experience of people (Norman, 2016; Bason and Austin, 2019; Gram, 2019). Participation on science-related policy can therefore benefit from design’s methods that bridge different ontologies and epistemologies.

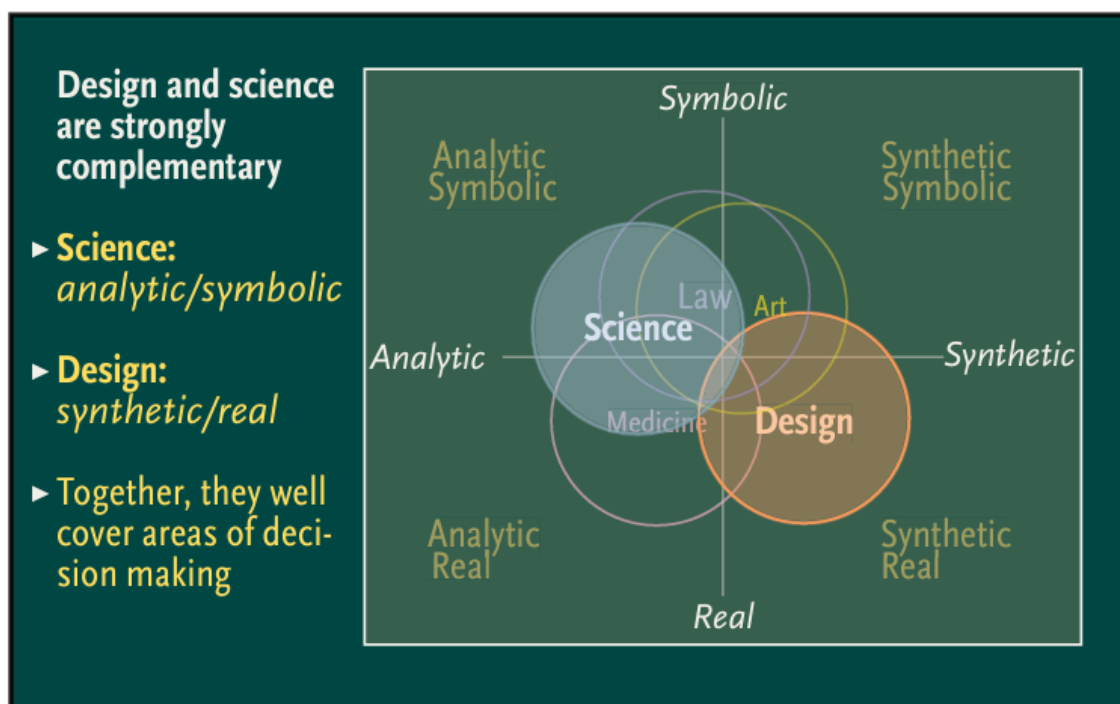


Figure 3: Owen’s (2007) knowingly “subjective” placement of science and design in complementary regions of his Context and Process map.

3 The scalene triangle

Increasingly, the distorting effects of privilege and power within participatory processes are being recognised (e.g. Stirling, 2008; Sprain, 2016; Turnhout *et al.*, 2020; Udoewa, 2022). Power can be exerted in how an issue is framed, who is invited to participate, and what is permitted within the processes, resulting in the privileging of some perspectives and barriers to others (Costanza-Chock, 2020, p88-9). Stirling (2008) even questions if participatory processes are more democratically progressive than expert analysis given these power dynamics. A participatory process needs to acknowledge and mitigate these dynamics. The following describes how relationships between and within CS&P risk being asymmetrical (represented in Figure 4).

The positionality of the policy-maker

The policy domain will often have the initial say on the process, its purposes and scope, explicitly or implicitly defining who participates and what they participate in. Thus, the process outcomes are usually in the gift of the policy-maker (Fischer and Forester, 1993, p7). Additionally, for these outcomes to have political credibility, they often need to demonstrate objectivity, by being “evidence-based” and “rational” (Lewis *et al.*, 2020, p116),

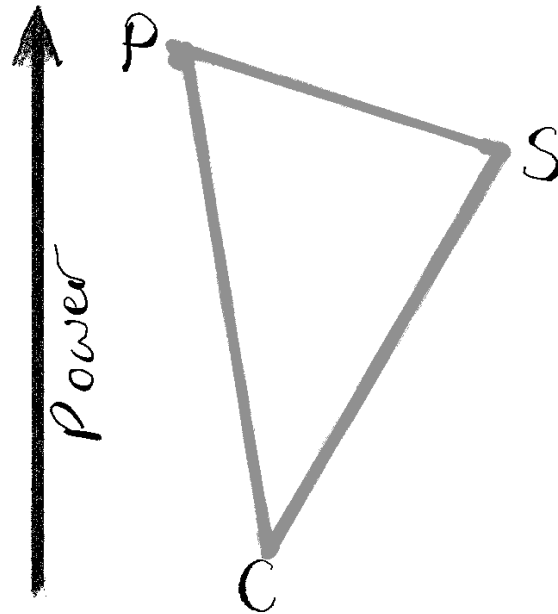


Figure 4: The dynamics of power across the knowledge triangle are not evenly distributed between citizens (C), scientists (S) and policymakers (P).

which narrows the opportunity for diverse values to be included in the final decision, even if they have been elicited during the process.

The positionality of the scientist

With centuries of being regarded as the pinnacle of knowledge acquisition, science holds a position of authority and legitimacy not held by other knowledge systems (Turnhout *et al.*, 2020, p16). As such, “unscientific” epistemologies can be subordinated in science’s discourse and practice. Natural and formal sciences can lack reflexive and critical practices, or attention to other worldviews, meaning scientists can perpetuate power asymmetries in participatory processes. However, this power holds only so much sway within policy settings. Although, Velander and Donà (2024, p11) found experienced scientists within one SPI were able to exploit “windows of opportunity” to have their views heard by decision-makers, recent climate reports demonstrate how science can be subordinated to policy because “scientists have not wanted to confuse or naysay policymakers looking to build public support for climate action” (Pearce, 2024).

The positionality of citizens

Turnhout *et al.* (2020) details the affect that biases in participatory approaches towards elite actors, such as policy-makers and scientists, reproduce and even exacerbate existing inequalities (also the Matrix of Domination in Costanza-Chock (2020), p20-2). These, and factors such as implicit beliefs, energy levels or internalised social norms (Boswell, 2021), affect an individual’s capacity to participate, particularly in line with norms (e.g. language, topics, timing) assumed by policy and science (Costanza-Chock, 2020, p88-9).

Within-group power dynamics

It is important to recognise that none of these communities are homogeneous (Arnstein, 1969, p217; Udoewa, 2022, p15; Olejniczak *et al.*, 2019, p106) and power relations play out within the groups (Balvanera *et al.*, 2020, p349-50). An unchecked power imbalance can instrumentally undermine the legitimacy of any participatory process. Also, substantively, it limits the potential for the discovery of new knowledge by excluding inputs from some domains.

4 The hyper-triangle (other dimensions of participation)

Participatory approaches have further dimensions that that tend to affect the position, authority and influence of participants.

Stage that participation occurs in the decision process

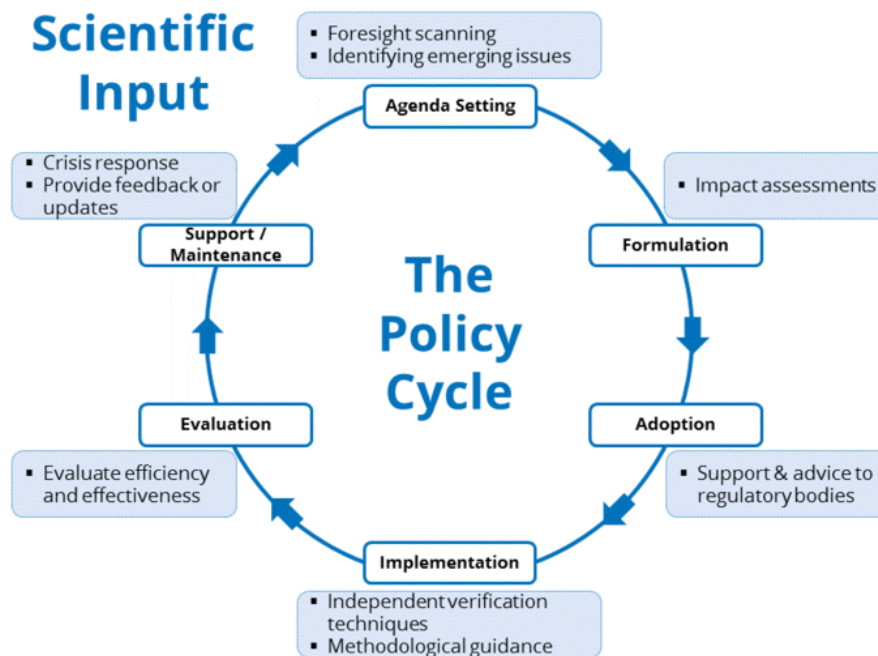


Figure 5: An idealised policy process (white boxes) with possible intervention points for science (blue boxes) (from Connors, 2016).

Figure 5 illustrates the idealised policy process, in this case superimposed with opportunities for science to intervene (Connors, 2016). Citizen and scientist participation can occur at any and all stages. However, at each stage the issue framing and path forward will have been narrowed by previous steps, meaning that the opportunities to change the course of policy are reduced.

Degree of participation

Different degrees of participation can alter the process and its outcomes. Arnstein (1969), described a “ladder” of processes (Figure 6) that endow participants with increasing agency. Similarly, International Association of Public Participation (IAP2) developed a spectrum, representing increasing influence on the decision-making process from left to

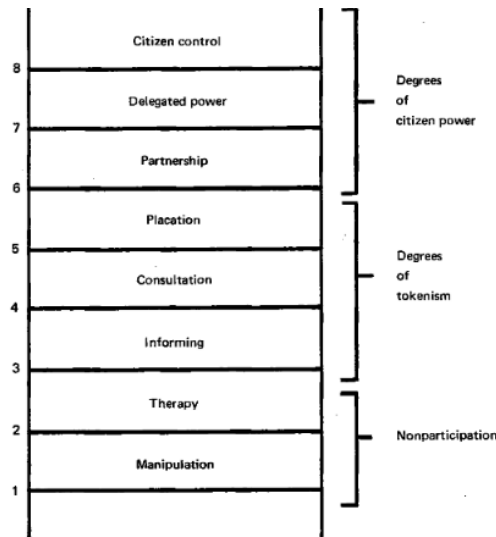


Figure 6: Arnstein’s Ladder Of Citizen Participation (1969) with greater agency afforded towards the top of the ladder.

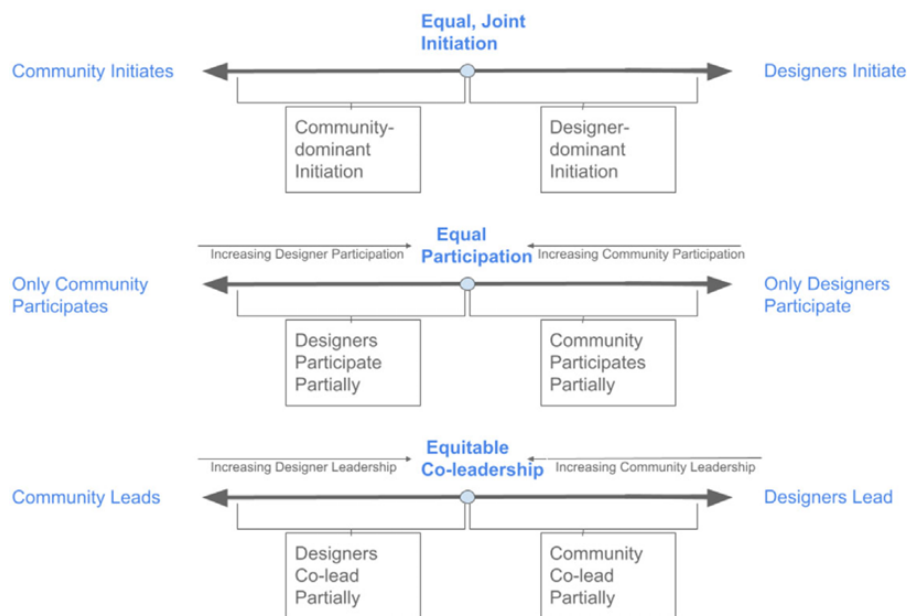


Figure 7: Udoewa’s (2022) framework describing how citizens (“community”) and designers can *initiate*, *participate*, and *lead* participatory processes. Processes that fall further to the left on each role-axis endow greater agency to citizens.

right (IAP2, 2018). Udoewa (2022) observed varying degrees of citizen *initiation*, *participation* and *leadership* of the process (Figure 7). This adds another dimension to the most empowered ends of the ladder and spectrum, in which citizens may occupy roles of initiation and leadership to a greater or lesser extent. These frameworks proffer that increasing the degree of citizen participation structurally increases citizens’ authority, influence and power. Nabatchi (2012) identified that more deliberative communication modes along IAP2 spectrum (Figure 8) elicit better insights into public values, what Sørensen and Torfing refers to as “thick” participation (2019, p28). Thus, greater autonomy in participation can also create policy with deeper understandings of citizens’ perspectives.

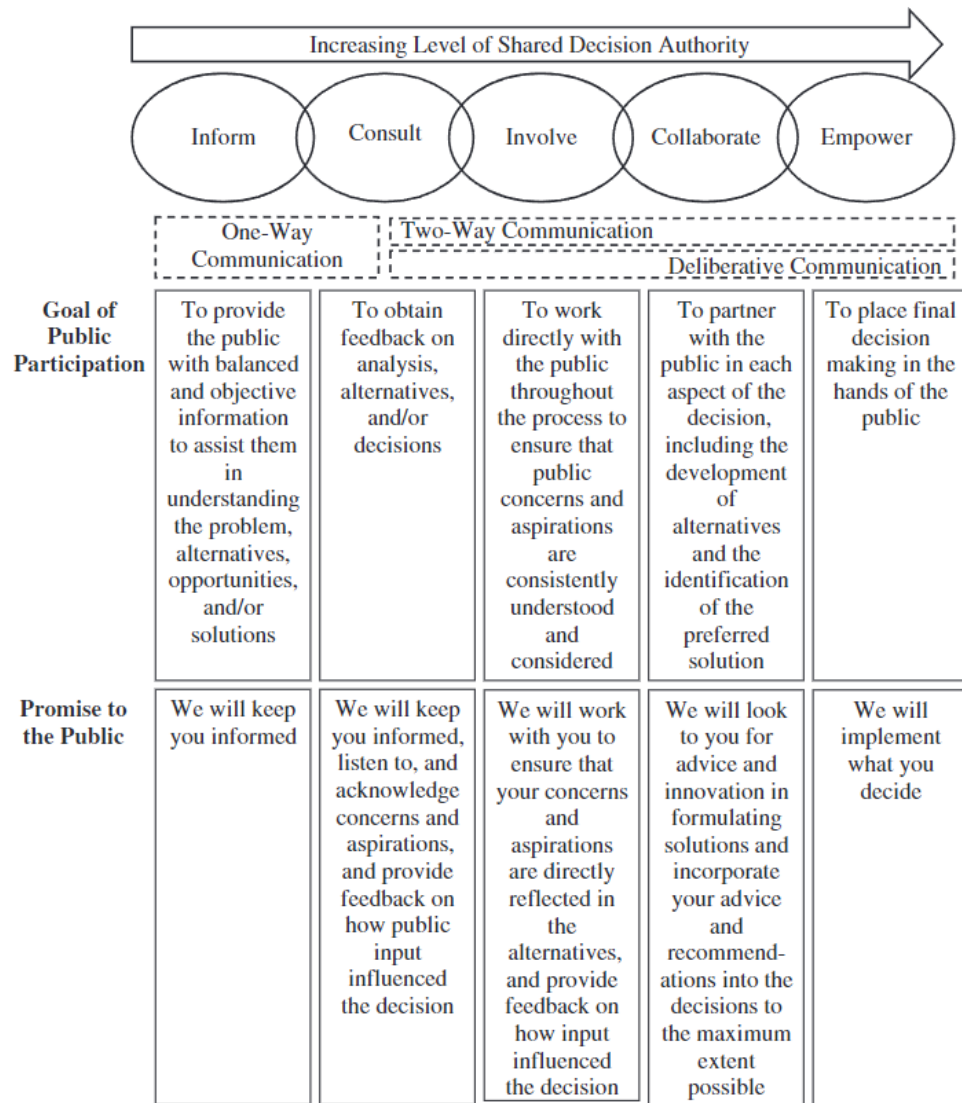


Figure 8: The IAP2 Spectrum of Public Participation (IAP2, 2018) as developed by Nabatchi (2012) to show how increased authority and quality of communication (from *one-way*, through *two-way* to *deliberative*) develops to the higher (right) end of the spectrum).

Authority and mandate to affect policy

Meaningful participatory processes need a clear mandate and authority to influence policy. Velander and Donà (2024, p11) referred to the mandate as a “leash” restraining participants but find this is crucial in enhancing the policy-relevance of outputs. There is therefore a paradox related to authority (noted somewhat crisply by Sprain (2016), p72-3), that greater agency of participants within the process may diminish the ability of the process to influence policy. An ill-defined mandate and little authority can undermine citizens’ trust. When considering cases of citizen participation in government, Bland *et al.* (2021) noted:

The picture from the case studies is that this kind of participation has limited influence over local decision-making. Such experiences are disempowering, and in case studies have led to disengagement by communities.

Bland *et al.*, 2021 p12

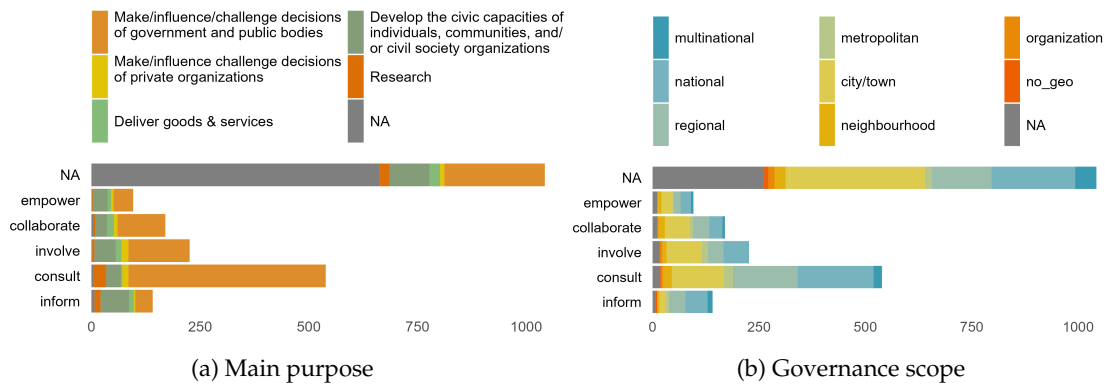


Figure 9: Results of a selection of participatory activities extracted from [Participedia](#) by searching for cases with purposes of “science” or “environment”. Plots show the number falling into each category of the IAP2 Spectrum of Participation, with bars coloured according to the *main purpose* (left) and the *governance scope* (right) of the decision-making process. 2215 results returned. “NA” indicates no information supplied.

5 The triangle in the wild

Various forms of evidence about participatory design approaches for science-based policy are available in the literature. These include summaries of particular types of institution such as Policy Labs and Science Policy Interfaces (SPIs), reports on single endeavours and databases of initiatives. None of these sources fully detail information related to the dimensions in Sections 3 and 4. However, a few insights can be gleaned.

Many Policy Labs are applying multiple participatory approaches whilst also drawing on scientific expertise but tend to retain the authority to set agendas (Olejniczak *et al.*, 2019; Kimbell, 2019). For example, the Moral Imaginings activity within UK Gov Policy Lab (Sharma *et al.*, 2024) is a participatory approach to evoking non-human perspectives for decision-making about a local river, which included local residents and science experts. SPIs aim more at bringing together science and policy, with less emphasis on the expertise of citizens (e.g. Velandar and Donà, 2024, p7-8). Yet, the SPI of The Intergovernmental Science-policy Platform on Biodiversity and Ecosystem Services’ (IPBES) has sought Indigenous and local knowledge (Pascual *et al.*, 2018; Kelemen, 2022). Matuk *et al.* describe decision-making by land planners with Indigenous peoples in the Brazilian Amazon (2020, p110), which found evidence for a changing discourse of planners to align better with Indigenous knowledge.

A brief interrogation of “science” and “environment” cases extracted from [Participedia](#) is summarised in Figure 9. It was possible to identify locations of cases on the IAP2 spectrum, finding cases overwhelmingly in the form of a consultation. Just under half the cases were listed as having some evidence of impact, but this was not easy to find within the cases. Considering the data about the purpose (plot 9a) and governance scope (plot 9b) of the decision-making process, it seems that most processes aim at national and governmental decision-making, but that a greater degree of participation is associated with an increasing proportion of local initiatives.

6 Critical analysis

As a scientist, I have experienced unease both with the knowledge gaps that I perceive between science and policy, and also with the language and measures used to justify science and science-related policy. I have presented the knowledge triangle to reflect this starting position. In my analysis, I have somewhat painted science as neutral, subjugated by policy and politics, but Jasanoff (2003) discussed how science advances create their own risks or, as Brown (2014) puts it, science generates “matters of concern” that drive the need for policy.

As I have worked through this piece, I have become conscious of the absurdity of science as a discipline apart. The veneration of systematically acquired knowledge over experiential knowledge is a false dichotomy. The triangle is also limited as there are other parties that should participate in the design of science-related policy, such as workers in health, education, agriculture (Singh-Watson, 2024; Bell, 2024 highlight such policy gaps). Proposals for transdisciplinary practice (e.g. Russell *et al.*, 2008; Pascual *et al.*, 2018) offer further options for creating even more meaningful interactions across the triangle.

It was difficult to find evidence of much impact on enacted policy in the reviewed real-world examples, except in the very local Brazilian Amazon case. If one infers that those processes that fall at the empowered end of the participation spectrum have greater influence, there is a suggestion from the Participedia examples that local processes are more effective. This observation aligns with the subsidiarity principle (Wanzenböck and Frenken, 2020), suggesting that another aspect to consider in participatory design is the governance scope of the process, perhaps favouring local decision-making. It also emphasises the importance of an influential mandate for the process.

I have placed the greater emphasis on participation than design. However, my sense having completed this inquiry is that, whilst participatory approaches can bring the potential of diverse perspectives into the room, it is design that creates the capacity to receive them. Whatever the domains within the triangle may be, a great deal of empathy and creativity is required for successful, sensitive and empowering knowledge sharing and discovery. Design values the emotional engagement and improvisation that many other domains, including my own sciences, reject as irrational.

Citizen participation approaches to designing policy need to consider how power, process, autonomy and mandate affect outcomes for participants and for the process. Additional considerations include the governance scope of the process and the development of flexible transdisciplinary practice. There is already a wealth of work developing this area, with scientists and policy makers developing knowledge sharing practices that centre diverse citizens’ perspectives, thus demonstrating that calls such as Jasanoff’s are being heeded.

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