



Academia and society in collaborative knowledge production towards urban sustainability: several schemes—three common crossroads

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Abstract

Arrangements for collaboration in knowledge production across academia, government, non-governmental organisations, and corporations have several names, such as citizen-science, community-based participatory research, engaged research and hybrid forums. The multiplicity of schemes does not lie only in the high number of names for various versions of collaborative knowledge production. Different scholars also use concepts in multiple ways, depending on their individual choices, mother disciplines, and the problem area in which collaboration occurs. At the same time, there is a lack of analytical tools that address the full range of collaborative research schemes and provide a systematic set of questions to learn about the schemes, challenges, and opportunities. Based on our review of academic journal articles highlighting collaborative research schemes, this paper aims to analyse three parameters which it is fair to say that virtually all arrangements of collaborative knowledge production ought to consider when making decisions, parameters that are often partially missed or misunderstood: (A) epistemic-procedural, (B) exclusive-inclusive and (C) aggregative-integrative. By examining the three parameters, their political theory origins, and how they connect to and challenge existing schemes of knowledge collaboration, we provide analytical tools that could facilitate processes of developing and scrutinising arrangements of collaborative research.

Keywords Urban sustainability · Transdisciplinary science · Learning · Citizen-science · Community-based participatory research · Engaged research · Hybrid forums · Collaborative research · Literature review

1 Introduction

Increased collaboration in knowledge production across societal realms—academia, communities, non-governmental organisations (NGOs), and government—is commonly held to be crucial for enhancing the quality of knowledge and for strengthening democracy. The underlying goal of such schemes is to understand and meet significant societal challenges

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by enabling mutual learning across participants and establishing policy and planning-orientated solutions. Such collaborations—for which we here use the term collaborative research—are perceived by their proponents as particularly useful in multifaceted, ‘wicked’ problem areas. These include environmental and climate-related problems (Dillon et al., 2016; Harris & Lyon, 2014; Irwin, 2006) and issues related to health and social well-being in specific communities (Kullenberg & Kasperowski, 2016).

When comparing schemes of knowledge collaboration—regardless of which factors above seem to have influenced them the most—it becomes apparent that such schemes have many names. These include sustainability science, citizen-science, community-based (Ortega-Álvarez & Calderón-Parra, 2021), interactive or participatory research (Ahvenniemi & Huovila, 2021), and hybrid forums (Leunbach & Nielsen, 2019). In addition, different scholars also use the concepts in various ways, depending on their individual choices, mother disciplines and the problem area in which the collaborative research occurs. Several concepts have been initially coined to highlight a few specific—often local—collaborative research projects. This makes it difficult to present generalised claims concerning what each concept ‘should really’ denote and how each concept differs from others. The point of departure of this paper is the recognition that there is a lack of analytical tools that would help address the full range of collaborative research schemes. Such tools would enable the development of a systematic, scientifically grounded set of questions to learn about the schemes, their challenges and opportunities. This paper intends to provide such analytical tools and fill significant parts of this gap.

Based on our review of academic journal articles highlighting collaborative research schemes, analysed abductively through theories of participation, this paper aims to analyse three basic parameters that virtually all schemes of collaborative knowledge production ought to consider when making decisions. Yet, these parameters are often partially missed or misunderstood in such contexts. The parameters can be formulated as adjectives, namely (A) epistemic-procedural, (B) exclusive-inclusive and (C) aggregative-integrative. These specific parameters have been selected for this paper since, together with other names and framings, they have often constituted fundamental parameters in a neighbouring intellectual area where challenges involved in participation have been studied and tested for the longest time and most thoroughly: theories of political participation and democracy (Dryzek, 2011; Simon, 2002). The rationale behind incorporating insights from this neighbouring tradition is that the core of research collaboration is participation.

The next section gives a brief historical introduction to collaborative knowledge production and identifies the knowledge gap in previous studies. A description of our methodological and analytical choices follows, in turn, proceeded by the main section of this paper: the results, consisting of our analysis of the three parameters. The paper ends with conclusions and a brief discussion about the further implications of this study.

2 Brief history and previous research

Notions of collaborative, participatory research can be traced to the mid-1940s, with Kurt Lewin’s article ‘Action Research and Minority Problems’ (Lewin, 1946). The collaborative research schemes more closely connected to environmental awareness emerged in the 1980s and early 1990s. A few factors have been particularly significant for the increased interest in designing and conducting collaborative research schemes at that time and onwards.

One was the Chernobyl nuclear power catastrophe in the mid-1980s. It entailed an increased recognition of the need for transcending scientific expertise, by including groups that had routinely been seen as irrelevant as participants in knowledge production and risk prevention (Jasanoff, 2003; Thompson et al., 2017).

Another factor was the recognition of biodiversity loss. In the 1980s and 1990s, this issue led to a focus on local knowledge—beyond science in the traditional sense—as key to understanding and reducing this problem (Legrand & Chlous, 2016). A corresponding demand for broad and local participation in knowledge production has been seen in urban areas for dealing with challenges with significant overlaps between the social, economic, and ecological pillars of sustainability, such as social exclusion, crime and pollution (Mittlin & Thompson, 1995).

The third factor is the inclusion of ‘external partners’—firms, industrial organisations or state authorities – to participate and thus influence what research questions are most relevant to society regarding their instrumental value and problem-solving direction. This broad inclusion has been frustrating to some researchers in traditional disciplines worried about an erosion of scientific quality and a reduction of funding for intradisciplinary research. On the other hand, such inclusion has been embraced by some civil servants and politicians (Nowotny et al., 2003; Scholz & Steiner, 2015).

A final factor is called ‘roll-out neoliberalism.’ This refers to an arguably cynical tendency where new institutions and governmentalities, such as schemes for participatory research, are introduced—often in low-stake issues—to consolidate and stabilise neoliberalism, hence increasing its legitimacy (Brenner & Theodore, 2005; Peck & Tickell, 2002).

The two latter factors point to the fact that collaborative, participatory research—as a general phenomenon or strategy in research policy—is continuously subject to various types of criticism. Critical arguments contend, for instance, that collaborative, participatory research typically places an excessive focus on local specificities and small-scale participation while overlooking structural challenges and opportunities for democratic, social transformation at the regional, national and global levels (see e.g. Cooke & Kothari, eds. 2001; Burns, 2007). Moreover, collaborative research traditions have been criticised for often being preoccupied with the solving of concrete, local problems (rarely defined by the more vulnerable groups in the community) rather than generating a broader, deeper, and generalisable understanding of the object of study (see e.g. Pohl et al., 2010; Ozkul, 2020).

Two patterns are particularly evident when reviewing previous studies on collaborative knowledge schemes. One is that the research typically focuses on one or a few highly specific—often local—initiatives where a particular knowledge collaboration concept has been coined or used (e.g. Brandt et al., 2013; Hessels & van Lente, 2008; Sjöö & Hellström, 2019). Publications of this kind have usually concentrated on examining one type of scheme or sector. To be sure, this makes sense in light of the conceptual complications noted in Introduction. However, research findings generated by studying such initiatives become tricky to apply to other policy contexts, such as environmental policy and planning in different regions (Hardon, 2008). This is regrettable since—as Van de Kerkhoff notes—there are indeed unifying features of the collaborative knowledge schemes:

‘[W]hile the terminology varies, one of the key features of this change is a move away from individualistic, discipline-driven science to utility-focused research that connects research activity across a number of boundaries’ (van de Kerkhof, 2006, p. 453).

Moreover, Lang and colleagues point out another characteristic that collaborative knowledge schemes have in common, namely a shared ‘*focus on research collaborations among*

scientists from different disciplines and non-academic stakeholders from business, government, and the civil society' (Lang et al., 2012, p. 26).

This paper aspires to fill the knowledge gap between, on the one hand, the individual characteristics of particular schemes and, on the other hand, broad-brushed strokes depicting the general idea of collaborative knowledge production. The paper does this by developing and examining parameters within which actors in most, if not all, schemes of collaborative knowledge production have to make decisive choices. Our focus is on how scholars and practitioners can understand and manage the ambiguities and challenges when navigating the terrain of collaborative, participatory research schemes. To illustrate this, we use numerous examples from concrete collaborative knowledge schemes in sustainability and health.

3 Materials, methods, and analytical choices

This paper examines and compares scholarly perspectives on various collaborative schemes by reviewing peer-reviewed journal articles. The selection is based on systematic uses of search words and journal searches in university databases of academic journals (cf. Kuckartz, 2014). The focus has been on specific academic journals and articles using particular terms to denote collaborative research, as discussed above. In order to be as inclusive as possible, we did not restrict the period for when the articles had been published. Since a broader interest in collaborative research started at the beginning of the 1990s, the papers in the analysis are within the year span of 1990 to 2021.

The identification and selection of terms to be included in the analysis took place in two steps. The first step consisted of searches for multiple words addressing the topic of collaborative research, utilising snowballing as a sampling method, through which one article could introduce us to others. The first selection process included 120 articles and 20 research reports. The search began with the synonymous terms referring to collaborative research that we already knew existed in scientific discussions. These articles usually included additional terms related to collaborative research, which encouraged further searches in the databases using these additional terms. The outcome of this procedure was a compilation of a total of 16 different terms: citizen-science, communities of practice (CoP), community-based participatory research (CBPR), community-engaged scholarship (CES), cross-sector research, engaged research, hybridisation/hybrid forums, knowledge brokerage, learning partnerships, mode 2, popular epidemiology, social learning, street science, synthesis centres, think tanks and triple helix. The compilation of 16 terms entailed a reduction of publications analysed to 86 articles and 15 research reports. Key academic journals in the final sample of articles are *Research Policy*, *Sustainable Science*, *Environment Science & Policy*, *American Journal of Public Health*, *Journal of European Public Policy* and *Environment Policy & Governance*.

As a second step, we analysed and compared the articles based on the 16 terms. We excluded all terms that were too specific and that were used only in a few studies (e.g. street science). We also excluded triple helix and mode 2, as these concepts are used mainly to discuss the broader societal phenomenon of collaboration between academia and society rather than concrete schemes focusing on collaborative research. The literature review process resulted in seven terms that were selected for further analysis and that are examined in this article: citizen-science, communities of practice, community-based participatory research (CBPR), engaged research, hybrid forums, integrated research/science

and integrated sustainability assessment. These terms are all broad and inclusive. They are also used more widely concerning collaborative research and across different disciplines and are therefore particularly suitable for our analysis. The following section discusses how these terms are used in the research articles examined in this literature review.

The three analytical parameters were generated by combining inductive and deductive approaches. Combining the two—sometimes labelled abduction—is a well-established way of generating analytical themes (Eriksson et al., 2014; Swedberg, 2012). In our study, the pair *inclusion–exclusion* was the easiest to identify empirically in collaborative knowledge schemes since it explicitly defines and justifies some schemes. The *epistemic-procedural* parameter was selected by examining disputes among participants in the collaborations we have studied about what constitutes successful knowledge collaboration—strengthened social networks between participants or generalisable knowledge, for instance. Such disputes are repercussions of centuries of debates in political theory over why (if at all) or when participatory democracy would be preferable to authoritarian models. The parameter *aggregative-integrative* was brought into the analysis through readings of political theory (March & Olsen, 1989, in particular). This helped us identify several tensions in the practical scheme related to who had the power to define the problem and to what extent the ‘expert’ can be expected to be ready to modify their knowledge beliefs in light of experiences shared by local citizens, for instance.

To judge from numerous examples in research publications about knowledge collaborations, both organisers and participants usually seem to be aware, at least intuitively, of the individual parameters and the challenges the collaborations entail. However, the three parameters in combination, their possible relationships—including trade-offs—as well the sub-themes that we have identified deductively and inductively are arguably far less intuitive and obvious.

4 Results and analysis

4.1 Epistemic—procedural

The first parameter to consider is the purpose of initiating or participating in a collaborative scheme. As obvious as this seems, it turns out that this is often the most difficult parameter to verbalise through definite and concrete answers among participants in such schemes.

In democracy theory, it is common to distinguish between factors that refer to the epistemic (the actual knowledge produced, the cognitive virtue of choosing the procedure that entails the best knowledge outcome) and the procedural (usually the breadth of participation, where the inclusive process responds to a high, ‘civic’ virtue of socially inclusive processes) (cf. Worthington et al., 2013). Among partly overlapping terms, we find the terms ‘epistemic’ and ‘procedural’ most relevant to shedding light on collaborative research. Similar to the question of why it would be worth the effort to create democratic decision-making processes is the question of the rationale(s) for developing a collaborative research project. The epistemic factor refers to the claim that knowledge collaboration beyond academia may improve the quality of knowledge that is generated (Pellizzoni, 2001; Whitmarsh et al., 2009). As shown below, the issue of relevant quality criteria regarding the epistemic factor is subject to much dispute—and ranges from applicability to specific, local conditions to generalisability at a global level. The procedural factor, on the other hand, concerns the research process, the roles of the participants (see also 3.2:

Inclusive–Exclusive), the degrees of participation, and to what extent the participation of actors from outside academia is considered inherently or instrumentally valuable.

4.1.1 Prioritising the epistemic factor

Concerning the epistemic factor, there is a type of scheme where this is emphasised particularly strongly: the version of citizen-science in which ‘amateurs’ assist professional scientists in collecting and classifying data. This type of citizen-science is most often initiated in natural sciences, for example, to collect rich amounts of on-site data in order to analyse climate change (Bonney et al., 2014). The participatory aspect has been incorporated mainly to improve the quality of scientific results by increasing the data set and the number and range of observations. However, critics question whether the participation of amateurs serves primarily as a means or an intrinsic end. This becomes evident when reading articles and reports by leaders of such projects. A sign of this instrumental view of citizen participation is the number of statements pointing out the time and money that citizen-science costs for research projects. Gura (2013) defines one side of citizen-science as ‘a way to get others to do cheaply what researchers cannot or do not want to do’ (Gura, 2013:260). He further refers to a climate scientist, Brohan, who says that ‘[c]itizen science is enormously expensive in terms of time and effort managing people, websites and databases’ (Brohan in Gura, 2013). Brohan works at a research centre in Exeter, UK, creating data sets based on weather records from old ships. In this project, Old Weather, 3500 amateurs digitally transcribed handwritten weather logs of 1.5 million historical weather observations in less than 90 days (Hawkins et al., 2019).

4.1.2 Between the epistemic & procedural factors: learning

The type of citizen-science mentioned above has become popular over the years, not least through the introduction of new apps through which citizens can register the data that they observe in areas of health and epidemiology, ecology and climate research (Jones et al., 2018). At the same time, a significant number of schemes created under the umbrella of collaborative research have been set up based on its assumed procedural factor as a necessary, even intrinsic, value. In such schemes, inclusive engagement among all participants in a knowledge society is often emphasised most strongly (Fischer, 2017; Nowotny et al., 2003). One example is ‘communities of practice’, a type of knowledge collaboration initiated by Lave and Wenger (1991). This type of collaboration has been described as ‘always a group of people who interact, build relationships and learn together [...] It fosters interactions and relationships based on mutual respect and trust.’ (Karner et al., 2011:25).

The strong emphasis on procedure rarely means that participation is treated as if it were all that mattered, regardless of the epistemic factor. Usually, a factor considered valuable is located between the epistemic and procedural factors, a factor that many collaborative research projects stress as key and that is also mentioned in the quote above: the learning that is generated among participants, whether scientists, authorities, NGO members or private citizens.

In a collaborative scheme called ‘community-engaged research’ (cf. Comfort et al., 2018), one learning-related objective that is sometimes mentioned is to build competence and capacity for all partners. This increased capacity, not least among non-scientific communities, is arguably located between the procedural and epistemic. However, achieving this demands modifications at the procedural end, particularly through shared leadership:

‘CEnR [...] involves collaborative partnership and shared leadership between community members and (academic) researchers in all phases’ (Oetzel et al., 2015: 1161).

This, in turn, functions as a means to develop research that is beneficial to the community, especially since ‘community-engaged research’ entails the translation of research results to the community (Oetzel et al., 2015: 1161). The degree to which this happens is implied to measure quality.

A similar position on the ‘spectrum’ between epistemic and procedural can be found in another type of collaboration, namely community-based participatory research (CBPR). When discussing the experiences of CBPR, Shiu-Thornton (2003) mentions that society has a moral obligation to improve the procedural aspects of knowledge production. References are made to developing cultural competencies among all participants involved and new methods for sharing knowledge and experiences of different skills among participants (Shiu-Thornton, 2003). Cultural competencies and new methods are neither entirely epistemic (i.e. new knowledge or new solutions to a substantive problem) nor entirely procedural (i.e. where the intrinsic goal is the process, networking, fairness between participants, and so forth).

4.1.3 Procedural and epistemic factors as mutually reinforcing?

Regardless of whether a collaborative research project places its highest value on epistemic or procedural factors, actors arranging these projects usually portray the factors as mutually reinforcing. The typical view among the proponents is that such studies, when done correctly and purposefully, entail a win–win between these two qualities. One example concerns ‘engaged research,’ based on continuous interaction between local community members and scientists. Whitmer and colleagues (2010) hold substantial empirical evidence that environmental knowledge generated through engaged research is more likely than conventional research procedures to win public acceptance, be relevant for policy-making, and influence the outcome. This, these authors argue, has, in turn, positive consequences in terms of reduced environmental harm. This is how the authors describe the general procedure in that programme:

‘Students begin with discussions of the political system and then transition into “hardball” politics, with guest lectures from congressional science staff, science journalists, lobbyists, and pollsters. The seminar concludes with an examination of five case studies in science advocacy. Students break into teams, identify a politically relevant science issue of their choosing, develop an advocacy strategy, and then take their issue to the US Congress’ (Whitmer et al., 2010: 315).

While this is described as constructive and valuable, objections might also be raised. Although the factors mentioned above are epistemic, none of them would pass as central to the research quality from the perspective of traditional intra- or interdisciplinary science projects. Still, the claim of mutual nourishing between procedure and epistemic quality often implies the view that the quality of the research product does not have to be compromised or altered in any way compared to traditional science projects. For instance, in an analysis of ‘community-based participatory research (CBPR), Delemos notes the following tendency: ‘CBPR is supposed to honour research product as much as process’ (Delemos, 2006: 331).

In CBPR projects aimed at, among other things, improving health outcomes such as reduced inequality in the access to health services, it is easy to understand that this objective is as important as the process—if we stretch the term research substance to include health outcome and community benefits (Green & Mercer, 2001). The fact that CBPR sometimes falls under the category of ‘action research,’ a way of using research to effect a planned social change, is consistent with this way of stretching the concepts. Yet if we allow research substance to refer to what it usually means—research findings—it is harder to assess what an equal weight of research process and epistemic quality of results means in practice. This raises questions about how to evaluate substance (research product) in relation to the quality of the collaboration process.

5 Summary: Questions to raise about the ‘epistemic—procedural’ parameter

In sum, these are the main questions that the epistemic-procedural parameter raises for collaborative research projects:

- Will the procedural factor be used as a mere means to the epistemic factor, or will both be treated as intrinsically valuable?
- What are the epistemic factors—the epistemic quality criteria—in the project, and how have they been decided?
- Should learning among the participants—between the epistemic and procedural factors—be pursued—and thus allocated more time—as an explicit goal in the project?

5.1 Exclusive–Inclusive

A second parameter to consider when planning or examining collaborative research is who should be invited to participate. Our impression is that this is often treated as the major issue in discussions about inter- and transdisciplinarity and lies at the heart of democracy theory. Still, we hold that it is most fruitfully dealt with after the epistemic-procedural pole has been considered.

5.1.1 Status and roles of participants

Several types of knowledge-generating partnerships are founded on criticism of stiff divisions between particular types of actors (Pellizzoni, 2004; Renn & Schweizer, 2009). The reason for this criticism is that actor division supposedly implies role division, where, for example, ‘the lay public’ is included to present their views and knowledge claims, but where their words and claims are not valued as highly as those of ‘experts’. Based on this criticism, the idea of ‘hybrid forums’ (Robinson et al., 2014) is rooted in a perceived need to challenge the standard separation of experts and non-experts. Accordingly, it is not merely the case that both experts and non-experts should be included. Their ‘antagonistic bureaucratic divide [...] should be ‘undermine[d]’ through hybrid forums (Harrison, 2013: p 223, citing Callon et al., 2009). This ought to mean, in practice, that the standard separation between risk assessment and evaluation (traditionally performed by experts only) and risk management (traditionally open also to non-experts) should be removed (Gardoni et al., 2015).

Other terms also refer to collaborative research, yet in very different ways concerning the type of inclusiveness that should prevail and during what stages broad participation should take place. The term citizen-science is probably best known as something that refers to the practice of citizens, sometimes with a particular interest in and knowledge about a specific issue, participating in the scientific processes by collecting and classifying data (Bonney et al., 2014; Davies et al., 2016). Such crowds of ‘amateur scientists’ are usually excluded from other parts of the research process, such as formulating the scientific research question, analysis and reporting. This type of citizen-science is increasingly common in ecology, nature conservation, geographic information research and epidemiology concerning environmental issues and health (e.g. Hennon et al., 2014). The fact that the citizens participating are amateurs does not mean that competence is irrelevant for inclusion. Where possible, such as in the Planet Hunters project, the ‘real’ scientists perform regular quality checks by inserting false planet signals to examine to what extent the amateurs can spot them (Gura, 2013).

The scientists can thus distinguish the ability of individual amateurs and use this information to weigh the results based on the level of skill of each amateur. In an analysis of another citizen-science project in astronomy, Galaxy Zoo, the analyst notes that the project began by displaying the 25 most productive volunteers in a ‘league table’. However, this was later removed since ‘the project team worried that [thousands of] volunteers making fewer classifications would regard their own contributions as not valuable to the project, thus leaving the project’ (Darch, 2018: p. 66). Unless scrutiny and ranking of individual volunteers are openly discussed among all participants at the outset of a project, this issue risks becoming, if not demoralising, subject to rumours and mistrust. In another project, which was aimed at classifying images of storms in order to understand climate change better, the superior competence of certain amateurs led the scientists to invite them to participate at a higher level by helping the ‘real’ scientists to analyse data or to lead other amateurs (Gura, 2013).

Citizen science may, however, also draw on the tradition of more extensively participatory research, which has been promoted by Irwin (1995). This refers to a more thorough collaboration between the public and science in most, if not all, stages. In such a ‘deeper’ version of citizen-science, the conventional way of perceiving competence and merits is put aside since each citizen’s unique experiences and position (ideally) make each participant’s input equally valuable. This latter type of citizen-science has democratic ambitions and, to a lesser extent, the goal of making extensive data collection efficient and less expensive (Kullenberg & Kasperowski, 2016).

5.1.2 Translation for inclusion

In any collaborative knowledge scheme with the ambition of including wider groups of the public, the issue of cultural translation becomes crucial. The regular line of thought among collaborative research scholars is that one criterion for successful knowledge collaboration is that skills, knowledge and experiences should be translated so that all participants can understand the essentials. In the collaborative scheme labelled ‘integrated science,’ for example, the underlying goal is to enable mutual learning among participants from various disciplines, sectors and actors, and thus to create solution-orientated and socially responsive knowledge. This necessitates at least a basic understanding among everyone

participating. A challenge is sometimes a reluctance among academic actors to translate their work into more popular versions.

Nonetheless, Fischer (2017) maintains that the role of experts ought to include interpreting and deciphering complicated issues for non-expert participants and audiences to improve the conditions for informed deliberation and decision-making. Topics in need not only of deciphering by experts to non-experts but also of mutual knowledge translation can be found particularly in the health sector in culturally diverse regions. When discussing this in the context of CBPR, Wallerstein and Duran (2010) mention the need for ‘translational sciences to [...] redress power imbalances; facilitate mutual benefit among the community and academic partners, and promote reciprocal knowledge translation]’ (2010: p. 40).

5.1.3 To clarify vague social categories

The different types of collaborative research raise the following issue: To whom does ‘the public’, ‘the community’ or even ‘the industry’ refer? In the two types of citizen-science mentioned above, it might appear that there is a massive difference regarding who are included as participants. In the former, amateur scientists are involved. The latter, however, can seem far more inclusive by stressing the need for broad public participation for procedural reasons. At the same time, there is evidence indicating that projects of the latter type have a strong tendency to end up in the involvement of a similar, tiny fragment of the public or community. It typically consists of those most interested and knowledgeable and has socio-economic positions in which they are used to exert influence (Lang et al., 2012). This is a well-known problem, where suggestions for solutions have been many (Skagen Ekeli, 2007). Still, the challenge of diversifying the stakeholder participation beyond ‘the usual suspects’ is, in many cases, only partly managed. For example, in the Greater Manchester Low Carbon Stakeholder Forum, aimed at co-producing knowledge that could contribute to sustainable urban development, the initiators tried to cope with this problem through efforts to engage more people from NGOs (in addition to local authorities and businesses). The result was a doubling of stakeholder participants and an improved gender balance. Yet, the ethnic and socio-economic gap remained wide (Perry & Atherton, 2017).

In collaborative research processes called ‘Integrated Sustainability Assessment’ (ISA), Whitmarsh and colleagues (2009) note that ISA usually engages a loud minority of the community rather than the silent majority. In schemes with a serious ambition to develop research collaboration processes, it is, therefore, imperative that several strategic and evidence-based measures be taken so that the inclusion process entails an actual representation of broad segments of the population. This would enable the project leaders to elicit the views of the topic at stake among the entire range of socio-economic groups (Whitmarsh et al., 2009).

6 Summary: questions to raise about the ‘inclusive–exclusive’ parameter

In sum, these are the main questions that the ‘inclusive-exclusive parameter raises for collaborative research projects:

- Are people from outside academia included or excluded?
- If non-academic groups are to be included, which ones and why?

- During what stages of the collaborative research (from the planning to reporting & dissemination) are participants included with influence?
- What roles and influence will each participating person and group have in the project?
- How could various methods be combined to include demographic categories beyond 'the usual suspects'?

6.1 Aggregative–Integrative

The third parameter to consider is more subtle than the issues of why a collaborative research project should take place and who should participate. How should the research proceed regarding the character and 'social climate' of the interaction and debate? By extension, towards what type of results should the participants strive? Should they strive towards consensual results, where all parties sincerely agree on the collective knowledge claims that come out of the collaboration? Or should they aim at compromises, a middle way between the participants' fixed, competing knowledge claims?

It is helpful to distinguish between aggregative and integrative procedures to examine these matters. The distinction stems from March and Olsen (1989, pp. 117–134) and their examinations of political processes. Nevertheless, the distinction applies to participatory knowledge collaboration, both bottom-up schemes for empowering oppressed groups and government-driven, policy-oriented processes of knowledge collaboration. The concepts of aggregative and integrative procedures refer to participation (cf. the distinction by Elster, 1999 between bargaining and arguing). If we apply the concepts to collaborative research, aggregative procedures include participants within and outside academia.

In aggregative procedures, the participants hold fixed views and interests for which they negotiate, bargain, and sometimes fight (Skogstad, 2003; Tuomela, 2010). These views and interests may consist of a particular type of issue, method or solution. Even if, say, engineers and planning experts in a collaborative research project on urban transport produce extensive data indicating that the current number of cars does little harm to human health, safety, global pollution and child-friendliness, the NGO's fixed knowledge belief might nevertheless be that reducing or removing the vehicles from the urban area would be beneficial to the community. In aggregative procedures, each group in the scheme is goal-rational, unlikely to be influenced by alternative information and knowledge sharing by the others. This type of procedure leads the different interests to be aggregated into collective choices (March & Olsen, 1989: pp 119–22). Common traits here are bargaining and power struggles. Whereas political or business-oriented processes of this kind may sometimes lead to 'the winner takes it all', the goal of collaborative research projects, even in cases where they are aggregative in character, is more often to reach a resolution, usually through compromise.

Conversely, in integrative procedures, the participating groups may enter with concerns and the first preference in an individual issue (for a wide range of cases, see <https://participedia.net>). For example, the local NGO may begin with a worry about the number of cars and the dominant car culture in the region. When procedures are integrative, the communication consists of arguments based on knowledge and experience (Skogstad, 2003). Each group is willing to learn from the others. In the case of local car use, the NGO might learn that the poor air quality in the region is to a greater extent due to a particular industry rather than the number of cars. On the other hand, the transportation experts may learn from citizens that they are unwilling to let their children play in a playground close to the traffic even if statistics indicate that traffic accidents have been reduced in recent years.

Conflicts are to be expected during certain stages of integrative procedures. These are handled and resolved through open deliberation. Deliberation implies the absence of self-interested power struggles and is instead characterised by an honest and uncompetitive exchange of knowledge and experiences among participants (Dryzek et al., 2019). The shared goal is not compromised since compromise implies fixed, diverging views brought closer to each other but where no one is entirely satisfied. Instead, integrative procedures usually strive towards consensus, a profound sense of agreement regarding knowledge and results as the basis for decision making. This is said to be possible in part since there is a common good that is defined within the collaborative research scheme. Although there is no guarantee that consensus will be reached in integrative procedures (Dryzek, 2001), it is more likely than in aggregative procedures.

6.1.1 Not necessarily integrative

Where are collaborative research schemes on the spectrum between aggregative and integrative procedures? Is it possible to assess where they should be? It is easy to assume that collaborative research, by definition, equals integrative procedures. After all, the various academic and non-academic actors and groups have (usually) chosen to collaborate of their own free will. Moreover, it is easy to assume that integrative procedures equal a high degree of inclusion of various actors (regarding the number of people or groups). However, as Klintman and Kronsell (2010) show, the level of inclusion–exclusion of a collaborative research scheme may say very little about where the knowledge-producing procedure is located on the aggregative–integrative spectrum.

Still, when examining collaborative research schemes, the firm emphasis on integrative procedures becomes evident. Not only is there such an emphasis in normative discussions on how collaborative research schemes ought to proceed. Even more value-neutral analyses of the communication climate in collaborative research schemes tend to emphasise an integrative, deliberative style. For instance, ‘integrated sustainability assessment,’ sometimes referred to as ‘sustainability science’ (Brandt et al., 2013), has, according to Weaver and Rotmans (2006), the categorical goal of generating a consensual view of what sustainability would be for a particular system (a sector, country, region or city). The perspective and vision should accordingly be shared among all the stakeholders involved in the assessment. The assessment should include exploring how to reach the resolution through various innovative experiments, a resolution subject to consensus. Spangenberg (2011) has suggested three factors where there should be consensus within sustainability science communities in each project: the project’s purpose in question, the value added by combining scientific and non-scientific knowledge in the project, and the importance of integrating the result into a consistent whole.

Another example of an integrative ideal is the collaborative scheme of the ‘hybrid forum’. This has been developed in the sociology of science when referring to knowledge collaboration to bring non-scientists and scientists together in consensus-orientated deliberations (Callon et al., 2009). In that context, it is explicitly stated that consensus should not only be the goal in scientific *or* non-scientific issues. The hybrid should be built on a ‘new construction that goes beyond the opposition between the two’ (Crowley, 2015: p 9). At the same time, Crowley argues that hybrid forums, or hybridisation, need not mean that each part of the subject in question should be an issue of consensus. Instead, the wider conclusion and message should be consensual, something he exemplifies with the Intergovernmental Panel on Climate Change (IPCC).

Despite the critical outlook fundamental to a large share of the sub-discipline of the sociology of science, hybrid forums (created within this sub-discipline) are intriguingly presented with a solid belief in the integrative approach and consensus-building rather than mere compromise. This also means that organisers of hybrid forums throughout the collaborative process may somehow dissolve particular local interests and interest conflicts between various groups of non-scientists. Whereas aggregative procedures could lead to compromises (where no party is entirely satisfied), the goal of consensus—to which hybrid forum endorses are assumed by the authors mentioned above to subscribe—connotes something more profound. Consensus demands that the parties commit to exercises of knowledge exchange and empathy with the conditions and initial positions of the others. This implies a high degree of integrative, deliberative procedures.

6.1.2 Aggregative procedures with a focus on non-academic partners

Scholars and evaluators sometimes recognise aggregative parts of collaborative research procedures that ought to be integrative. When examining collaborative research in general, Lang and colleagues (2012) argue that conflicts need to be ‘prevented’ or ‘mitigated’. According to them, this could be done through mediated negotiations, reflexive meetings and so forth. In such conversations, the institutional setting, power relations as well as political and economic interests need to be brought up. These authors also hold that initial conflicts between academic and non-academic actors about what methodologies should be used are common in various collaborative research schemes on sustainability. The authors—with their implied integrative ideal—find this problematic.

The aggregative aspects identified in research on collaborative research schemes tend to focus, as mentioned above, on methodological conflicts between non-academic and academic actors or on the explicit and manifest interest differences that may prevail between groups of non-academic actors. For example, the type of collaborative research scheme labelled ‘integrated research’ (not to be confused with integrative procedures) has been used to provide the knowledge basis for an extensive project in Rotterdam, the Netherlands, on urban adaptation to climate change. As in the former example of hybrid forums, an evaluation of the latter case emphasises deliberative and integrative parts of the procedure. This is in line with the standard type of analysis in integrated research, where an exchange of knowledge and experiences, synthesis, and consensus is emphasised (Eriksson et al., 2014). Still, even collaborative research projects such as this are nonetheless likely to face particular challenges of conflicting interests—aggregative parts of the procedures. In the Rotterdam project, the municipality and its civil servants promoted planting more trees for climate adaptation. However, the proposal to plant trees could not be realised due to ‘the different [partially fixed] interests amongst the local stakeholders,’ (Groot et al., 2014: p. 8), and the proposal to plant trees could not be realised.

6.1.3 Aggregative procedures driven by interests of academic disciplines

Additional, special interests that ought to be discussed in collaborative research schemes are the interests of academic actors within their various disciplines. There are reasons to believe that such interests and conflicts of interest prevail and that they may influence collaborative research procedures. These interests are typically more implicit and latent than the special interests of corporations, government officials, NGOs, citizen groups, etc. Yet, there might be more profound reasons. Traces remain of the romantic view that academia

is the neutral, truth-seeking sector, whereas the other sectors are filled with special interests. In reality, however, actors in the academic community do, of course, also have several interests—both as individuals and groups—aside from improving the quality of knowledge (Klintman, 2019). Providing elegant arguments and strengthening their position, funding, increasing esteem, job security and so forth are factors subject to fundamental drivers among scientists (Johnson, 2011).

One example of aggregative procedures that involve academia took place in Detroit, the USA. Several facilitating factors were identified in evaluating four years of community-based participatory research on public health in Detroit. These included increasing trust between the partners and active leadership from the community. Challenges included balancing community interests with the interests and needs of the academic actors. Communities were mainly interested in improving and renewing local services. They did not want to be ‘mere research subjects’ whose own local interests were overlooked in a top-down process (Lantz et al., 2001: 503). The academics had their primary interest in producing generalisable knowledge. None of the parties perceived this interest conflict as insurmountable. Still, the goal of striking a balance between stable interest differences implies compromise. This is an aggregative trait rather than an integrative one. Although most of the needs referred to practical conditions that the academic partners perceived as necessary, underlying interests and fixed goals can be assumed to prevail among all partners, academic and non-academic.

6.1.4 Special interests beneath the surface

The case mentioned above was founded on explicit reflection among the participants about their different positions and interests. This helped to expose its manifestly aggregative character. In other cases, a much stronger latent pressure of power influence on knowledge production may occur from various academic disciplines than is usually recognised in examinations of collaborative research. For instance, it is expected that collaborative research projects based on an integrative, deliberative approach have an introductory phase consisting of a one-way provision of facts from experts to non-experts (Polk & Knutsson, 2008). The argument supporting such a procedure is that integrative procedures of open deliberation require that all parties are given the facts right at the beginning of the procedures before a fruitful exchange of experiences and consensus building can take place. To be sure, this is probably a valid point in many cases. Yet both democracy theory and practical cases of political participation indicate that such a division of roles runs the risk of becoming permanent throughout the entire process, so that framings of the research problem, its causes and possible solutions are defined beforehand by the experts:

‘An important test of the deliberative legitimacy of a political process [...] is the degree to which groups may not only gain a hearing for their opinions about issues and proposals already under discussion, but are also able to initiate discussion of problems and proposals’ (Marion Young, 2003: 116–17 referring to James Bohman’s deliberative theory).

Therefore, some academics have suggested that collaborations with integrative aspirations might include meta-deliberations of how to avoid the initial provision of facts from experts to non-experts. One suggestion that addresses this risk is that organisers of collaborative knowledge schemes could hold discussions beforehand with different groups of participants and learn about the breadth of local problem perceptions. This—along with ‘expert

data’—could then be available from the outset of the collaborative scheme (Polk & Knutson, 2008).

7 Summary: Questions to raise about the ‘aggregative–integrative’ parameter

In sum, these are the main questions that the ‘aggregative–integrative’ parameter raises for collaborative research projects:

- What is the institutional setting into which collective knowledge is produced, and does this setting push the collaboration in a more aggregative or integrative direction?
- Are all stages of the research process—from planning to reporting—likely to be either fully integrative or aggregative?
- If not, what stages can be expected to be more integrative or more aggregative, and what interests differ between participating groups?
- What interests can be brought quickly to the surface of group discussion (e.g. financial or symbolic interests of industry or NGOs) and what interests run the risk of being kept under the surface (e.g. interest conflicts about providing the significant intellectual impact between the academic disciplines participating)?

8 Conclusions & further discussion

In light of the multiple terms used inconsistently for examining and promoting transdisciplinary research collaborations aimed at mutual, transformational learning, this paper has provided and analysed in-depth three parameters for studying or planning for such research collaborations. These are the epistemic–procedural, exclusive–inclusive, and aggregative–integrative parameters.

Concerning the epistemic-procedural factors, it is not to be expected that they can be perfectly distinguished and separated from each other. The underlying assumptions of planners and participants are often that the ‘value’ is produced at the interface of the two, either through the participant learning between the epistemic and procedure or through synergies. Still, it is nevertheless meaningful for planners, analysts and participants to reflect on what type of result they expect, or wish, to see and what would constitute more or less valuable outcomes of the collaboration.

Exclusive-inclusive factors raise issues very similar to those of democratic participation in general: What roles should the various groups be given, during what phases should they be invited to have influence, and how should one make sure that terms such as ‘community’, ‘citizens’ or ‘lay people’ refer to the socio-economic breadth promised or hoped for by the project leaders?

Finally, as regards aggregative-integrative factors, previous research mentioned indicates that collaborative research in most of the schemes can be expected to oscillate between these factors during various phases of the project process. Some special interests are likely to become explicit at an early stage. Other particular interests may remain under the surface while influencing the research process. These may include the amount of time

devoted to the project by various participants or the openness to learning and accepting knowledge presented by other participants.

An essential trait of collaborative research is that it is frequently promoted as not ‘merely’ knowledge for knowledge’s sake, but knowledge for improving something external in the world, such as the local, regional or global environment. Moreover, this ‘something’ typically includes—but also goes beyond—the problem solving aimed at essential, intrascientific endeavours. When scholars examining collaborative research distinguish between basic, applied, knowledge-to-action, and ‘community-engaged research’ (Stanton, 2007) the unit of the scale (from low to high) does not appear only to be the degree of research engagement with the world. The scale also implies concern for usefulness and benefits to ‘society’ (e.g. to a local community where the collaboration takes place). However, collaborative research is frequently promoted with the claim that it should bring about mutual benefits to anyone involved in or affected by the collaboration. For example, community-based participatory research is typically promoted using this explicit goal (Delemos, 2006; cf. Gagnon, Gorman and Norman, 2017). One of the cornerstones of community-based participatory research is, according to Delemos, to ‘engage in reciprocal research that is mutually beneficial to researchers and communities’ (2006, p. 331). The development of a mutually beneficial partnership is an often-stated goal, for example, in community-engaged scholarship (Martin & Pyles, 2013).

In addition to the challenge of assessing (or stipulating) who constitutes the community, it is important to reflect on a social group that is used to thinking about the biases and special interests of others and perhaps less of their own: academics from various disciplines involved in collaborative research. In idealised and schematic discussions, the interest of actors in academia is ‘novelty production’, full stop (Leydesdorff & Meyer, 2006). Although we have earlier pointed to latent interests of academics in prestige, social status and increased job opportunities, the claim of novelty production need not contradict this; the reason is that they overlap, at least partly. If it is possible to agree that the primary interest of academia is novelty production, then schemes of collaborative research—if founded on mutual benefits—ought to include deliberations on how collaborative research procedures may stimulate novelty production beyond the local community, political biases, and business interests at stake. Such discussions ought to be valuable not only for academic actors but also for people excluded from the narrow community focus of many collaborative research projects.

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