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Deliberative democracy meets democratised science: a deliberative systems approach to global environmental governance

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ABSTRACT

The main achievements of the debates on deliberative democracy and democratised science are investigated in order to analyse the reasons, meanings and prospects for a democratisation of global environmental policy. A deliberative systems approach, which emphasises the need to explore how processes in societal spheres interact to shape the deliberative qualities of the system as a whole, is adopted. Although science plays a key role in this, its potential to enhance deliberative capacity has hardly been addressed in deliberative theories. The democratisation of science has potential to contribute to the democratisation of global environmental policy, in that it also shapes the potential of deliberative arrangements in the policy sphere. Deliberative arrangements within the policy sphere may stimulate the democratisation of science to different degrees.

KEYWORDS Global environmental governance; deliberative democracy; democratised science; science and technology studies; deliberative systems approach

Introduction

There are several challenges which together suggest that a democratic and capable global environmental governance requires new ways of organising policymaking. First, environmental problems tend to be transboundary in character. Their effects transcend not only spatial borders (such as national borders) but also temporal ones (affecting future generations) (Lidskog et al., 2011). Second, due to the complexity of many environmental issues, there are uncertainties and contestations of knowledge claims (Irwin and Michael, 2003, Beck, 2009). Third, anthropogenic environmental problems are closely intertwined with global capitalism (Eckersley, 2004). This means that states (as players in the capitalist system) are caught in the imperatives of securing competitive advantage and maintaining short-term domestic political legitimacy (Hay, 1996). These challenges have spurred academic debate and led to calls for democratisation of global environmental policy.
However, the complexity of environmental issues has resulted in theories and empirical studies focusing on different spheres or aspects of the problem, and there is a lack of integration between the debates. Calls for enhancing deliberation in global environmental governance have been especially pronounced in two related contemporary debates. The first, and broader, debate concerns global environmental policymaking, in particular the use of deliberation as a means to make global policy both more democratic and more efficient (Dryzek 2006, Higgott and Erman 2010, Payne and Samhat 2012). The second comes from Science and Technology Studies (STS) and concerns the need for a new relationship between science and society. The emphasis is on democratising science: that is, on allowing the public and stakeholders to play an active role in the production and/or evaluation of scientific knowledge (Liberatore and Funtowicz 2003, Jones 2014, Esguerra et al. 2017). This situation – the plea for deliberative democracy and for a democratised science – is the background for our discussion here, which investigates the potential role of science in the democratisation of global environmental policy.

There has been surprisingly little interaction between these two debates, despite the fact that they overlap in a number of areas, and that STS draw on ideas from deliberative theory (Jasanoff 2005, Durant 2011, Lövbrand et al. 2011). Both concern environmental governance and its challenges, as well as procedures for interaction and mediation between competing interests (of different nations, generations, stakeholders, parts of nature) and discourses (scientific, lay or other environmental discourses). Both also have the ambition to make policy decisions more democratic, legitimate and/or effective. The debates may appear to have different objects – one involves the making of knowledge and the other the making of policy – however, these are related and intertwined. Science and policy are only distinct on the surface, where they most often are presented as two separate spheres with different rationalities and goals. On a more fundamental level, however, they are mutually shaped or co-produced (Jasanoff 2012, Lidskog and Sundqvist 2015). Policy influences the production and stabilisation of knowledge, while knowledge supports and justifies policy.

Our point of departure is the theory of deliberative systems (Mansbridge 2012, Owen and Smith 2015), which stresses that different parts of a system can have different democratic functions, and that deliberation therefore should be assessed on a system level. This means that it is crucial to consider the wider implications of the deliberative qualities (or lack thereof) in a single sphere. Despite the fact that expertise strongly dominates global environmental governance, the literature on deliberative systems only engages briefly with this sphere, without any detailed understanding of the interrelationship between science and policy. In addressing this gap, we turn our attention to STS, and the empirical and normative arguments
for a ‘democratised science’. We address different positions in terms of what should be included and by whom, and how this inclusion should be organised and why. We then distinguish between moderate and radical options for a democratisation of science. These two highlight the different positions within the debate and enable an assessment of the effect of a democratised science on deliberative policy arrangements. The implications of a democratised science are illustrated in relation to three institutional arrangements proposed by deliberative theorists which have come relatively far in concretely addressing the challenges of global environmental governance. We argue that, in a democratisation of global environmental governance, the dynamic interactions between the spheres of policy and science may play a crucial part. We find that the democratisation of science has a neglected potential to contribute to the democratisation of global environmental policy, in that it can affect the establishment and functioning of deliberative arrangements in the policy sphere. However, we also illustrate that these kinds of deliberative arrangements within the policy sphere may stimulate the democratisation of science to different degrees.

A systemic approach to deliberative democratisation

Scientific knowledge and its applications are widely recognised as essential elements in setting environmental standards, which are crucial to defining what should be counted as ‘good’ or ‘bad’ environments (Jasanoff 2004, Fischer 2009, Lidskog 2014). In that sense, science plays an active though indirect role in setting goals for society (Jasanoff and Martello 2004), a task generally ascribed to the public sphere and the political system (Christiano 2012). We therefore argue that when considering democratisation of environmental policy, it is crucial to consider the scientific sphere and its interrelationship with the policy sphere (what Dryzek 2006 calls empowered space), as well as the public sphere.

We conceptualise democratisation as deliberative capacity building (see Stevenson and Dryzek 2014, p. 60). Ideals of good deliberation, including inclusion and authentic dialogue, may strengthen democratic values such as legitimacy, mutual respect, public spirited perspectives and mutual understanding (Gutmann and Thompson 2004). While deliberation is crucial for democratisation at any level, when it comes to democratising global politics, it is perhaps the single most suitable practice, due to the lack of democratic institutions and sovereignty at the international level. A specific feature of global politics is that it is characterised by discursive struggles (Hajer 1995), even more so than domestic politics, due to the diversity and relative informality of governance mechanisms at the international level (Dryzek 2006). However, while a broader set of opposing discourses encounter each other in an increasingly integrated global sphere, they
seldom engage (Stevenson and Dryzek 2014), and the form of power at work to a large extent is concealed power (Dryzek 2006, p. 163, see also, Partzsch 2017, on power in environmental politics). Thus, at the international level, there is a lack of deliberative engagement between discourses, as well as a deficit of accountability mechanisms.

Deliberative theorists have increasingly come to focus on deliberative capacity at a system level (Dryzek 2009, Chambers 2012, Mansbridge 2012, Owen and Smith 2015). Moving beyond a focus on specific instances of deliberation, such as mini-publics, it seeks to understand the interaction between different institutions, organisations and spheres, and the role that their deliberative qualities (such as inclusion, open-mindedness or reason) play in the greater system. Thus, deliberative qualities are features of deliberation, while deliberative capacity is an attribute of the system. An assumption is that we cannot expect any single institution to meet all the demands of deliberative democracy (Mansbridge 2012, p. 25; see also, Bohman 2012, p. 72). In that sense, deliberative systems theory adopts a more relaxed attitude towards the Habermasian deliberative ideal. Different institutions or spheres may enhance different deliberative qualities, which together form the deliberative capacity of the system. From a deliberative systems perspective, the interrelations between science and policy do not necessarily demand a democratisation of the scientific sphere. However, the systems perspective implies that it is crucial to account for the effects of the scientific sphere (democratised or not) on the deliberative capacity of the system as a whole. Currently, deliberative systems theory lacks a thorough account of the impact of science (Brown 2014) building on a detailed understanding of the science–policy interface. As a consequence, its potential for generating (or degrading) deliberative qualities of the system is not well understood. To the extent that deliberative systems theorists explicitly elaborate on the role of science and expertise, it is primarily from the perspective of it being a resource within the policy sphere (where authoritative collective decisions are produced) – a resource that deliberators may or may not draw upon or take into account (Christiano 2012, Stevenson and Dryzek 2014, pp. 184–186).

We argue that it is crucial to conceptualise science as a distinct sphere, with intrinsic logics and deliberative qualities that affect the deliberative capacity of the broader system. However, though distinct in character, the scientific sphere is interrelated with the policy sphere. As we have argued, science and expertise play an active role in shaping discourses and framing problems, thereby including or excluding perspectives and affecting the political agenda. At the same time, actions within the policy sphere affect what scientific projects are funded and produced. The scientific sphere is also interrelated with the broader public spheres; the background and
experience of the people who embody the scientific sphere influence the knowledge produced (cf. Christiano 2012, p. 49). The scientific sphere speaks both to the policy sphere and to the public sphere, generally translated through the media or other communicative channels (cf. Stevenson and Dryzek 2014, p. 185).

Deliberative capacity is enhanced if the system becomes more inclusive of perspectives and arguments, broadening the set of perspectives to account for disadvantaged groups or positions, and becomes more authentic in terms of stimulating deliberative qualities such as reason-giving, consistency and reciprocity (Bächtiger et al. 2010, p. 56, Stevenson and Dryzek 2014, Owen and Smith 2015). It should be noted that increased inclusion does not necessarily imply enhanced deliberation. For one thing it is crucial that an inclusion of perspectives is somehow linked to decision-making processes (Parkinson 2012), either directly or indirectly, by strengthening deliberative qualities and thereby also the democratising function on a system level (cf. Dryzek 2009). It is beyond the scope of this discussion to evaluate the deliberative capacity of global environmental governance. Our more modest aim is to show that a democratised science has a fundamental effect on the deliberative capacity of the policy sphere, and that it substantially affects the potential of different deliberative initiatives proposed for this sphere. Although there is a mature debate within STS concerning democratisation of science, few participants in this debate address how the potentials of a democratised scientific sphere can be understood in relation to, and in terms of, a democratisation of the broader political system (cf. Brown 2015).

Enhanced deliberations in the scientific sphere

The STS debate has strong, though implicit or undeveloped, ties to democratic theory (Durant 2011, Lövbrand et al. 2011). In particular, we will examine the arguments for inclusion, as proposed in the STS debate, and explore how they may foster deliberative qualities. We believe that reason-giving (i.e. explicating standpoints and arguments and aiming at reasoned agreement) and consistency (i.e. logical coherence and reliability of claims) are deliberative qualities that are closely tied to the functioning and role of the scientific sphere. We further claim that the scientific sphere fosters abilities such as derived and transparent argumentation, openness to different and often conflicting claims, coherence and truthfulness, all of which are relevant for stimulating these deliberative qualities at a system level. They may however be fostered to different degrees and weighed differently, which we will illustrate in relation to the democratised science debate.
Towards a democratised science?

In the wider public and political debate, there has been a plea for democratising science in the sense of opening it up for public inclusion and stakeholder engagement (UNECE 1998, EC. 2001, Vogel 2003). These proposals primarily aim to strengthen the legitimisation of decisions and the robustness of regulations. Parallel to this plea, social scientists have elaborated on a democratised science, though with regard to its contribution to knowledge; important perspectives, experience and knowledges apart from scientific ones may be needed to develop more broad and valid knowledge on an issue. Under the heading of ‘democratised science’, a number of rather heterogeneous proposals can be found with different epistemological and normative assumptions, as well as implications (Lidskog 2008). The proposals run from stating that scientific expertise is important but needs to be complemented by other forms of knowledge (De Marchi and Ravetz 1999) to claim that expertise has dissolved as a discrete category and has now been replaced by hybrid assemblages (Irwin and Michael 2003). Furthermore, they find different drivers of this development, such as an increase in mass higher education (Nowotny et al. 2001), new forms of knowledge production (Gibbons et al. 1994) and the new character of industrial risk (Ravetz 1999). For our purposes here, four aspects are of particular relevance: what should be included, by whom, how and why, i.e. the claim for inclusion.

A commonly held view is that those who are directly affected by an environmental problem should be included because their experience gives them unique and relevant knowledge. An example of this is the ‘popular epidemiology’ originally developed to describe a situation where a growing number of local residents experienced negative health effects and began tracing their environmental cause, despite the fact that governmental bodies, private companies and expert communities argued that there was no reason to suspect that the environment was contaminated (which later was proven to be wrong) (Brown 1997). Another example is that of ‘post-normal science’, which states that scientific findings within the laboratory context are not sufficient when facing the complex conditions of the real world but require elements of enriched local knowledge to be applicable in finding solutions (Ravetz and Funtowicz 1998, De Marchi and Ravetz 1999). Local knowledge and personal experience – ‘extended facts’ in the language of post-normal science – can create a unique and important body of knowledge on environmental problems. This view is shared by the proposal for ‘citizen science’, which stresses that environmental problems (including global ones) always are embedded in local contexts (Irwin 1995). Thus, the argument for including different categories of people is that local residents’ contextually generated knowledge of environmental issues is
crucial data that could extend the scientific understanding and make it relevant for different contexts.

Another, partly overlapping, view stresses that it is those who possess specific competence who should be included in knowledge production. The most well-known variety of this view is probably ‘the new production of knowledge’, which finds that two generations of mass higher education have brought about a dramatic increase in the number of knowledgeable actors. Hence, trusted knowledge can no longer be created behind closed institutional doors but must arise through discussions, negotiations and deliberations involving experts from outside the scientific community (Gibbons et al. 1994, Nowotny et al. 2001). The traditional form of scientific knowledge (labelled ‘Mode 1’), which is characterised by the hegemony of theoretical and experimental science, an internally driven taxonomy of disciplines and the autonomy of scientists and universities, is being superseded by a new paradigmatic form of knowledge production (‘Mode 2’), which is socially distributed, application oriented, trans-disciplinary and subject to multiple accountabilities. Even if this development (from ‘Mode 1’ to ‘Mode 2’) implies a broadening of expertise and a more inclusive view of science, knowledge production is not open to all actors, but only those possessing specialist knowledge. This view is in line with a specific strand of STS which claims that expertise always concerns unique competence, and there is therefore no need to include lay people in knowledge issues (Collins and Evans 2007, Collins 2014). Expertise is always elitist – a social category possessing unique competence – but this competence is not necessarily acquired through formal education, it can also be experience based. Thus, those who should be included are not affected people in general, but instead those possessing specific knowledge relevant for the issue at stake.

A third view is more far reaching in terms of inclusion, stating that people in general should have the right to have a say in knowledge issues. The basis for inclusion is not that people have contextual knowledge or possess a specialised competence that can complement (or question) science, but that the public always can contribute knowledge about public concerns (Jasanoff 2003, Wynne 2003, Marres 2007). The general public should be involved not in order to evaluate and complement scientific claims in a restricted sense, but to broaden the issue by asking questions about the underlying causes of an environmental problem as well as its broader social consequences (including the consequences of proposed solutions) (Jasanoff 2005, Wynne 2005). The reason for inclusion is not to increase the consistency of the current framework but to generate a more inclusive and reflexive problem-framing process, which could increase the
perspectives represented within research and thereby enable a more multi-
faceted knowledge base.

Thus, there are different answers to the questions *what* and *who* to include in a democratised science, and the claims for inclusion (*why*) differ. However, it is not enough to state who possesses this knowledge and what kind of contribution they will provide; it is also necessary to find forms for *how* to organise this contribution. If spaces should be opened up for wider inputs to science, the question arises of how this space should be structured and how this knowledge should be transferred to the scientific sphere.

Many of these proposals concern a *democratisation of the science–policy interface*; how science should relate to other knowledge systems, not least how it should stop ignoring or even silencing other forms of knowledge (Irwin and Michael 2003, Jasanoﬀ and Martello 2004, Callon et al. 2009). Numerous social experiments and methods – such as stakeholder dialogue, public inquiries and consensus conferences – have been tested to support the development and acknowledgement of knowledges other than scientiﬁc ones. On the international level, the most well known of these is probably The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services which is designed to bridge different knowledge sys-
tems, in particular the divide between scientiﬁc knowledge and indigenous and local knowledge (Díaz et al. 2015, Löfmarck and Lidskog 2017). The aim is not to inﬂuence or change science, but to conﬁgure a dialogue between science and other knowledge systems in order to provide policy-relevant knowledge for global environmental governance.

However, a democratised science does not only concern external relations between science and other knowledge actors, it may also involve the scientiﬁc sphere per se (i.e. science’s own internal knowledge production). Within science, a common way of approaching non-scientiﬁc knowledge is to see it as an object for science to analyse. Non-scientiﬁc knowledge can be measured, gathered and systemised through various methods and thereby be included as scientiﬁc facts. A particular problem here is that when public and specialist knowledge is translated into scientiﬁc vocabulary, it is simultaneoulsy transformed; a change of form also implies a change in content. This has caused some STS researchers to be critical, especially of questionnaire surveys that remove public knowledge from the social context where it emerged. Instead, context-sensitive approaches (such as ethnographic studies) that do better justice to the complex and contextual character of public knowledge are favoured (Irwin and Michael 2003, Callon et al. 2009). Another way is to be open to extended peer review and public evaluation of science (Ravetz and Funtowicz 1998). Through this, science gets input in the form of complementary knowledge of which use can be made in further research. Thus, internal science processes may be more or less sensitive to
other knowledge forms. In any case, knowledge from outside science has to be refined and validated before contributing to science.

There are different opinions regarding the extent and the way non-scientific knowledge should influence the production of scientific knowledge. Some argue not only that science should swim downstream, considering local and practical implications of its work and how it is evaluated by non-scientific actors, but also that citizens and other actors should swim upstream, taking part in the very definition of research problems (Nowotny \textit{et al.} 2001). The public evaluation of science could then function in a more radical way, not merely enriching the input to pre-existing scientific practice but also questioning assumptions and frames that are taken for granted by science (Wynne 2005). By presenting different ways to frame an issue, this gives science opportunities for critical self-reflection.

\textbf{Democratised science and global environmental governance}

In order to be able to discuss if and how a democratised science enhances deliberation in global environmental policy, we will now assess the proposals for democratised science with regard to how far reaching they are. We will sketch two options for democratisation, one moderate and one radical. At one extreme are proposals that only allow public input to evaluate and complement scientific practice, while at the other extreme are proposals for public contestation of existing scientific framings of environmental problems.

The \textit{moderate option} holds that, even if scientific knowledge is valid and relevant, there is also a need for other forms of knowledge. Science is not sufficient for solving real-world problems. The latter requires not only abstract, universal and formalised scientific knowledge but also highly practical, case-specific knowledge. It is not possible, for example, to guide political action for combating climate change only by means of knowledge about the carbon cycle. We also need to understand why certain social activities develop and how actors attach meaning to activities that cause greenhouse gas emissions. Without this contextual knowledge, science will be able only to (partly) diagnose a problem and unable to propose viable means for solving it. The task of developing and contributing such knowledge may be assigned to social scientists but may also involve extended peer communities and public inquiries, through which non-scientific actors can evaluate the relevance of research as well as provide local knowledge and personal experience which are vital for solving specific environmental problems. Even if this option allows for wider input and different voices, it should be noted that it also restricts the space for non-scientific knowledge contributions, to assess the relevance and applicability of scientific knowledge in a particular context and to provide complementary (local or
specialised) knowledge. Thus, the scientific framing remains unquestioned and determines the relevance of other knowledge claims. As Collins and Evans (2007) stress, if no distinction is drawn between experts and the public, science will collapse into politics.

The more radical option also involves the questioning of the scientific framing of an issue. Deliberations should not only concern contextual aspects of environmental matters but also upstream matters, such as what these matters are and how they should be framed. Although the public often has a limited ability to contribute to technical details in a narrow sense, and has little interest in doing so, it can contribute to the discussion of what the issues are and how they should be framed and can even challenge frames proposed by experts (Jasanoff 2003, Wynne 2003). A democratisation of science should therefore not solely involve the evaluation of scientific claims; it should imply a broadened perspective on environmental issues, asking questions about the underlying causes of an issue and evaluating its broader social roots as well as consequences (Jasanoff 2005, Wynne 2005). This does not mean that one (technical) frame should be replaced with another (broader) frame, but rather that knowledge claims are always developed and assessed through frames which should be made explicit and open for deliberation and contestation. By means of multiple frames, spaces are opened to consider and evaluate the full range of alternative options (Beck et al. 2014).

One could say that the moderate option calls for an inclusion of complementary knowledge that could help extend the scientific understanding, not least in terms of its applicability to different contexts. Such inclusion contributes to improving and expanding the consistency of the scientific frame. In the radical option, inclusion is intended to structure the frames of research and to provide a more diverse and multifaceted knowledge base better rooted in the diverse set of social contexts that constitute society. There are good arguments in favour of both options. Many issues have distinctly technical aspects, and public decision-making needs knowledge about them. Even in strongly political disputes, demarcated scientific expertise is needed to provide knowledge about technical matters (Collins and Evans 2017). When it comes to the more radical option, numerous STS have found that experts often dominate frames concerning environmental issues in a technocratic way. This has implied, seemingly paradoxically, that stakeholders often accord science the most prominent role (i.e. expect it to describe the ‘true’ nature of the issue at stake) even when striving for public dialogue and public deliberation (Jasanoff 2003, Wynne 2005). They often take a technical framing for granted, which limits their capacity to discover, understand and internalise challenges that arise outside a particular frame. It also tends to stimulate research in a certain direction, while other perspectives remain relatively unexplored. Thus, in order to be reflexive,
experts need to be aware of how the issue at stake is framed. Seeing other actors as knowledge contributors and letting them present alternative framings of an issue increases the possibility of revealing taken-for-granted assumptions within science.

**Enhancing deliberation in global environmental policy**

The starting point for most theorising on the democratisation of global environmental governance is the question of how to reorganise social and political institutions so that they are more sensitive to environmental and public concerns. For those drawing on deliberative theory, the solution lies (at least partly) in developing institutions that promote democratic deliberation (inclusive and reasoned political dialogue). Such institutions embrace a plurality of environmental values (Smith 2003) and are assumed to encourage the basing of arguments and decisions on the public good and shared interests, including the interests of future generations and of non-human beings (Dryzek 2013, pp. 236–237). These conditions are seen not only as normatively desirable in themselves, but also as conducive to efficient and sustainable environmental governance (Eckersley 2004, p. 241). We now turn to three institutional arrangements proposed by deliberative theorists to enhance the deliberative capacity of global environmental governance.

**Institutional means for enhanced deliberation**

**Chambers of discourses**

One of the proposed institutional means of democratising global environmental governance is discursive democratisation, conceptualised as ‘more effective inclusion of different voices, bringing an increasing range of questions to the public agenda, and rendering communication and deliberation more open and less prone to symbolic distortion’ (Dryzek 2006, pp. 160–161). Dryzek locates the potential for discursive democratisation to the public space, arguing that systemic change (through the altering of discursive ordering) may come about through diffuse reflexive action by a critical mass of actors (Dryzek 2006, p. 126). However, given the hierarchical power of discourses, discursive representation needs to be more formalised before it can be conceptualised as a process of discursive democratisation. Dryzek and Niemeyer (2008) suggest a way that discursive representation could be formalised by means of what they call *chambers of discourses*. Discursive representation (instead of traditional electoral representation) is beneficial at the global level because the number of discourses that need to be represented for any given issue is relatively small.
Dryzek suggests that chambers of discourses should be established in association with international organisations. Instead of building new institutions, he argues, it is more practical and feasible to identify the particular governance mechanisms at work and consider how they can be democratised. Global financial institutions (such as the World Bank or IMF), International Governmental Organisations (such as the United Nations Framework Convention on Climate Change) and National Governmental Organisations working for sustainable development and the like, are all dominated by and represent different discourses (Dryzek and Niemeyer 2008, p. 491). However, their representation of discourses does not imply that they engage in deliberation; on the contrary, the different discourses represented at the global level remain fairly separate (Stevenson and Dryzek 2014). Thus, discursive democratisation of international organisations could serve to enhance the democratic legitimacy of global policy by institutionalising deliberation and thereby make such institutions discursively accountable (Miller 2007, p. 351, Dryzek and Niemeyer 2008, pp. 489–90).

However, despite the emphasis on questioning dominant discourses, this proposition does not include science in the discussion. This is a significant omission because science plays a central role in deliberations between discourses (Hajer 1995, Fischer 2003), not least within knowledge-intensive policy areas such as environmental governance. Many environmental problems can only be detected by the instruments of science (Beck 2009). Since environmental governance often concerns future consequences of current activities, local and specialised bodies of knowledge are put in relation to elaborate scientific models and prognoses about what will take place (e.g. increased risk of flooding in a specific area). This implies a science dependency in the sense that no other actors have the competence and resources to develop models of the future state of a socioecological complex. Their reasoning will therefore lack the power lent by scientific support.

Indeed, empirical research has shown that scientific framing tends to dominate deliberative processes (Jasanoff 2003, Wynne 2005). If a narrow (scientific) framing of an environmental issue is taken for granted, one of the most fundamental aspects of environmental policy – the object of policymaking, the environmental problem – is not included in the deliberations. However, a radically democratised science, inclusive of frames and perspectives, would provide a broader set of claims and derived arguments that may enrich the ideational foundation for deliberation at the system level. It would thereby allow a broader set of standpoints to be articulated, drawing on the legitimacy, consistency and rationality of science. While a moderate democratisation of science would serve to broaden the deliberative space by allowing more voices to comment on the application of scientific findings, it would not affect the core claims of science or its position of authority when it comes to delivering valid knowledge.
In an arrangement such as discursive chambers, the selection and representation of discourses becomes a crucial question, and in doing this, social scientists will play a crucial role (Dryzek and Niemeyer 2008). As shown in our investigation above, social scientists are also ascribed a crucial role in a democratised science, whether in a moderate or a radical form. Social science is generally seen as the most suitable actor for enhancing inclusion by assessing other forms of knowledge, excluded experiences and diverse perspectives. By translating these other forms of knowledge and making them relevant for the scientific sphere, they may not only contribute complementary knowledge (the moderate option) but also serve to stimulate reflexivity and multiple frames within science (the radical option).

However, STS also acknowledge the pitfalls of ascribing this role to social scientists, which leaves the boundaries of the scientific sphere intact. Social scientists also approach reality from within certain frames, and thus there is always a risk of their misrepresenting public and stakeholders’ framings, understandings and knowledges. It is therefore of crucial importance that social scientists make their own framings explicit and that the techniques they use to summarise and synthesise other knowledges are transparent and open for discussion. This is crucial for the validity as well as the legitimacy of science.

**Reflexive institutions**

Another institutional means for deliberative democratisation that has been proposed is what Hajer (1995) calls reflexive institutions. Reflexive institutions should not (as tends to occur) be conflated with more public debate, which does not necessarily enhance reflexivity (Hajer 1995, p. 284, Mouffe 1999). Reflexive institutions should rather be seen as an institutionalisation of public debate, which could take the form of societal inquiries coordinated by an authoritative independent agency (Hajer 1995). The agency would not only gather information and evidence but would also arrange hearings and invite people to deliver their points of view. In doing so, the inquiry should be oriented towards constructing the social problem. In relation to deliberative qualities, the process of an inquiry may be conducive to including a broad set of perspectives and may transform individual concerns into public positions related to broader social relations and developments (Hajer 1995, p. 290). Hajer proposes requiring actors representing different positions and interests to substantiate their standpoints, and giving them a chance to explain their dilemmas, thereby laying the foundation for more nuanced and better informed public debate and strengthening the quality of reason-giving. Reflexive debates should clarify options and costs and enable the expression of more explicit political positions and reflections regarding the sort of development that society really wants (Hajer 1995, p. 283, Eckersley 2004, p. 247).
The use of reflexive institutions is the option that most explicitly considers and addresses the involvement of science, as it stresses the need to scrutinise the cultural and political choices that often hide beneath what is presented as a scientific understanding of an environmental issue, and thereby to open up for other possible interpretations of the problem. It thus takes into account the tendency of science to ignore or even silence other forms of knowledge (Irwin and Michael 2003, Jasanoﬀ and Martello 2004, Callon et al. 2009) and strongly resembles the radical option of a democratised science. The discursive practices of reflexive institutions could have the function of contextualising scientiﬁc statements. Indeed, many framings put forward by scientists involve not only simpliﬁed models of nature (caused by scientiﬁc reduction of complexities) but also naive models of how society works. At a time when knowledge production is dispersed and knowledge is increasingly produced outside of universities (Nowotny et al. 2001), arrangements such as reflexive institutions can be seen as not only a deliberative democratisation of policy formation, but also an institutional arrangement for the democratisation of science (through its stress on alternative framings and options for action). However, for the inclusion and reﬂexivity to also have an effect within the scientiﬁc sphere, there would have to be an openness to boundary expansion (Gieryn 1999, p. 16) or to letting these kinds of deliberations aﬀect internal scientiﬁc processes and conceptualisations.

Constitutional adaptation

The third institutional arrangement that we will account for is constitutional adaptation. Constitutional adaptation does not directly concern deliberative democratisation, but it does concern the legislation of environmental rights and responsibilities. However, we argue that its eﬀect may very well be enhanced deliberative capacity. Constitutional adaptation implies the adaptation of a series of rights (such as the right to be informed about risk-generating proposals) and responsibilities (such as a responsibility to avoid, and when necessary pay compensation for any environmental harm caused to third parties, also across national borders) (Eckersley 2004, pp. 243–244). These rights and responsibilities are intended to enhance transparency and ensure greater accountability and responsibility (in terms of time and space), thereby benefiting communities aﬀected by the decisions of states, international organisations and corporations (Christoﬀ and Eckersley 2013, p. 191). Although constitutional adaptation focuses on the potential role of states, its goal is to promote the greening of international governance, by extending state sovereignty, responsibility and identity beyond the national level (Eckersley 2004). A crucial part of this is the extension of representation to non-human nature, future generations and aﬀected communities in
other territories (Eckersley 2004). The idea is that their perspective should be represented by an advocate and their ‘interests’ defended through the institutions of law.

The scientific sphere is relevant for such procedures but may also be affected by them. Science enjoys uniquely authoritative status in the domain of identifying and assessing risks. Therefore, the emancipatory potential of such constitutional adaptation is heavily dependent on science. The same counts for the identification and justification of environmental harms and associated responsibilities, where science and expertise play a key role even within judicial processes. As we have argued, the scientific framing of an issue tends to exclude the experiences and knowledges of the affected parties. Constitutional adaptation may serve a function similar to that of a moderate democratisation of science and could even initiate or stimulate a democratised science of the moderate kind. Not only does the right to participation (in environmental impact assessments and the negotiation of environmental standards) that Eckersley proposes give voice to affected and marginalised groups, thereby perhaps serving to complement more abstract scientific knowledge and perspectives, but such rights also ascribe authority to these groups’ views and perspectives.

However, a radical democratisation of science, one that involves the shaping of scientific approaches, could lead to the identification of new environmental risks and could alter the understanding of what constitutes an environmental risk. The public contestation of genetically modified crops and geoengineering provides examples of how the scientific framing of issues has been questioned and alternative framings have been elaborated – including examination of the motives and reasons behind these sociotechnical developments – that have challenged the originally scientific framing (Irwin and Michael 2003, Huttunen and Hildén 2014). A radical democratisation of science, one that includes a broader set of framings of an issue, may also come to question global processes that generate environmental risks and thereby question conceptualisations of responsibility. For example, it could question the current dominance of the economic discourse, which tends to justify and normalise actions that may create environmental risks or harm; that is, economic theory justifies/normalises the externalisation of environmental risks. This could in turn spark a debate on the extension of responsibility.

While constitutional arrangements are foremost about law, they may actually come to stimulate deliberation, to function as a form of discursive democratisation. They may bring about the representation of a broader set of discourses, since individual representation and interest representation are not possible to fully realise, and the only way to represent such groups is therefore to draw on discourses that directly or indirectly represent their interests. The acknowledgement and enforcement of such rights and
responsibilities would demand, and thus stimulate, enhanced public deliberation about the consequences of contemporary activities for others (including future generations and natural environments).

Finally, these three institutional arrangements are not mutually exclusive. An enhanced deliberative capacity of global environmental governance should not be sought in one institutional solution (Dryzek 2009), but in a beneficial combination of institutions. For example, although reflexive institutions belong to the realm of national politics, they could also be an alternative or complement to the chambers of discourses, if established in association with international organisations such as the UNFCCC.

**Conclusion**

We have approached global environmental governance from a deliberative systems perspective, which assumes that different spheres influence each other. We have argued that science should be considered as a distinct sphere, with intrinsic logics and deliberative qualities, despite it being fundamentally interrelated with the policy sphere as well as with the public sphere. The interaction effects between the spheres become evident when we consider the potential implications of a democratised science for deliberative institutional arrangements within the policy sphere. We claim that a democratisation of the scientific sphere has an essential but neglected potential to contribute to the democratisation of global environmental governance. Furthermore, different degrees of democratisation within the scientific sphere (moderate or radical) may have fundamental consequences for the democratic potential of arrangements within the policy sphere. If the processes of inclusion are directed at strengthening the consistency of the scientific framing and to some extent expanding it, this will strengthen the scientific foundation. This could increase the influence of science on global deliberations and is also assumed to facilitate decision-making (Collins and Evans 2017). If the processes of inclusion within the scientific sphere are allowed to shape scientific problem framings and stimulate new (and multiple) directions within research, this would have another effect on the deliberative capacity of global environmental governance. Proponents of a broader set of standpoints would be able to legitimate their views, and thereby strengthen their claims, by drawing on scientific findings. Deliberative space would thus be enlarged, and the reason-giving process would possibly be more equal.

We have also argued that policy arrangements may affect processes in the scientific sphere, since institutional arrangements are likely to stimulate the democratisation of science to different degrees. While constitutional adaptation stimulates a moderate democratisation, reflexive institutions may encourage a more radical one. Thus, the policy sphere and the scientific sphere are interrelated. The deliberative capacity of global environmental governance is dependent not only on the abilities of each of these
spheres but also on their interaction effects. STS and deliberative theory have a lot to learn from each other. Such a development would be beneficial for the understanding of democratising potentials of global environmental governance, and hopefully also for the shaping of its practices.

Lastly, it should be underlined that many of the theories assessed here ascribe a crucial role to social scientists. Environmental issues require scientific knowledge not only in the form of technical risk analysis, but also in relation to how society works, how activities are regulated and how power is exerted. Moreover, empirical studies have found that scientific expertise often presumes a technocratic understanding of environmental problems and is blind to its own framing and assumptions. Social scientists have an important role to play in this regard, by capturing alternative framings and knowledges, assessing their meaning and communicating them to science at large and thereby pointing out alternative ways to understand, frame and ultimately govern environmental issues.

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