Research Articles

When Does Science Matter? International Relations Meets Science and Technology Studies

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Despite widespread agreement on the importance of science for policy-making, there are still diverging understandings of how, when, and under what conditions science influences policy, and accordingly, on how the interplay between science and policy should be best organized. Some researchers claim that science can effectively influence policy only if it is autonomous from the political process. Others claim the opposite: that science can influence policy only by being deeply attached to it from the beginning.

Within the field of international relations (IR), scholars argue that "[t]he more autonomous and independent science is from policy, the greater its potential influence."[1] These scholars believe that science and policy should only unite after consensus has been reached among scientific experts. This is what makes "speaking truth to power" possible.[2]

In contrast, researchers within the field of science and technology studies (STS) state that science is not as pure as it claims to be and that what makes science important is that it is messy, impure, and political: "to the old slogan of science—the more disconnected a scientific discipline from society, the better—now resonates a more realistic call for action: the more connected a scientific discipline, the better."[3] Thus, the validity of the model of "speaking truth to power"—with its understanding that "technical input to policy problems has to be developed independently of political influences"—needs to be reassessed.[4]

The point of departure for this paper is research from IR scholars on separation and consensus in the science–policy debate. By confronting IR research with insights from the field of STS, we aim to achieve a deeper understanding

1. Haas and Stevens 2011, 131.
2. Price 1965.
3. Latour 1998, 209.
4. Jasanoff 2003, 225.

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of the dynamic interactions between science and policy in international environmental governance, both regarding how the relationship between science and policy actually operates and how it should be organized.

The ambition of this article is not to systematically compare IR and STS, but to use STS research to elaborate upon and deepen IR research regarding how and when science connects to policy. The IR literature has long discussed the conditions and possibilities for developing international environmental governance. Overviews of the field present realist, liberal institutionalist, and constructivist approaches, highlighting particular approaches that aim to bridge differences between realist and constructivist ways of understanding the role of science in international relations.[5] Not least, studies of institutions for global environmental assessments have focused upon the role of science in international environmental governance.[6] Nevertheless, there have been few attempts to systematically deal with the contribution of STS to enriching the IR understanding of the role of science in international environmental governance.[7] STS often focuses on the micro-level of the interplay between science and policy when criticizing the distinction between science and policy and has provided a small number of contributions to the field of international environmental governance.[8] Although we are well aware of the differences between the two academic traditions, we are nonetheless convinced that STS can supplement and deepen IR discussions on the use of science in policy.

The role of the Intergovernmental Panel on Climate Change (IPCC) in shaping climate policy serves as an illustrative case of the conditions under which science matters. The case study was selected because the IPCC is one of the most ambitious examples to date of mobilizing science, building consensus, and providing policy advice. However, the lack of progress in international climate negotiations under the UN Framework Convention on Climate Change (UNFCCC) demonstrates the substantial challenges involved in transforming research recommendations into practical policies. How is this "failure" related to the questions of consensus and separation raised above? Based on the various assessments of the IPCC made by scholars from IR and STS, we attempt to reach an improved understanding of consensus and separation.

The paper is divided into five sections. The first section presents an IR perspective on how the science–policy interplay should be designed to ensure that science matters in international environmental policy-making, namely by focusing on separation and consensus. To constructively evaluate this proposal, the second section presents the STS concepts of coproduction, stage management, and civic epistemology, followed by a critical discussion and reconstruction of

5. O'Neill 2009, Social Learning Group 2001, Young 2008.
6. Farrell and Jager 2006; Mitchell et al. 2006; Miller 2001, 2007.
7. Büger and Gadiner 2007, 91. *Global Environmental Politics* has published no articles that systematically discuss STS in relation to international environmental governance, but some recent articles discuss STS in relation to particular environmental issues (Forsyth 2012, Goeminne 2012).
8. Lidskog and Sundqvist 2011, 14.

the IR understanding of the science–policy interplay using these concepts, in section three. The fourth section analyzes the IPCC by first presenting a critical assessment made by IR scholars and then presenting an STS interpretation, which enables a more nuanced evaluation of the IPCC's importance in influencing climate change policy. The final section concludes that IR's focus on *formal aspects* of the interplay between science and policy—for instance how the separation between science and policy is organized in specific international arrangements—needs to be complemented by an improved understanding of the role of *contextual factors*, e.g., how policy cultures and public support are crucial for explaining the role of science in policy-making.

Making Science Usable: The IR Perspective

A major approach within the discipline of IR is regime theory, an academic field with a strong focus on international environmental governance. According to this theory, under certain circumstances, science can play an important role in designing effective international environmental institutions. Because science produces representations of the environment, negotiators can use its results to influence international agreements.[9] However, in regime theory, science is understood as a resource that nation-states can use in their negotiations concerning international agreements and has no independent role relative to state interests. Indeed, knowledge is but one of many resources that a state can use when bargaining over international cooperation.

The epistemic community approach—originally developed by Peter M. Haas—suggests an alternative perspective within IR studies.[10] This approach emphasizes the importance of science, and in particular consensus-based knowledge in policy-making. Haas argues that consensus-based science can play an independent and important role by influencing and even reformulating state interests, thereby helping to bring about international agreements that transcend and reshape state interests. This is made possible through the involvement of experts. Thus, from the epistemic community perspective, environmental regimes are driven not only by state powers but also by epistemic networks and under certain conditions, scientific consensus among expert networks can be a crucial factor in shaping policy.

Haas, together with Casey Stevens, has analyzed more than thirty existing international environmental regimes that involve scientific bodies in order to determine what conditions enable scientific knowledge and epistemic communities to influence policy-making.[11] They find that the maintenance and support of scientific bodies within multilateral environmental governance arrangements are necessary but not sufficient conditions for science to be able to speak truth

9. Andresen and Skjærseth 2007.
10. Haas 1989, 1992a, 1997.
11. Haas and Stevens 2011.

to power. They also find that the design of the science–policy interplay is of vital importance; however, regimes vary widely in how this interplay is organized.

Based on their evaluation, Haas and Stevens argue that to be influential, scientific knowledge should be separated from the policy process. First, scientific bodies should establish their own agendas. Committees that set their own agendas appear to be the most politically insulated, whereas ad hoc panels seem to be the most vulnerable to political interference. Second, individual state governments should not select the members of the scientific bodies; instead, experts should be nominated exclusively on the basis of scientific merits. If they are selected by intergovernmental organizations and on scientific grounds—i.e., on the basis of their reputation and authority as active researchers and not on their merits as policy advocates or science administrators—the legitimacy of the scientific body and the governance process will be increased. Third, scientific bodies should not be organized in an open-access fashion, in which all member countries are able to appoint representatives. A small expert group, nominated by intergovernmental organizations and geographically distributed across the member states, could better establish the proper degree of insulation between the scientific body and policymakers. In sum, Haas and Stevens argue that by separating the expert community from political involvement, science has the possibility to create knowledge that is credible and thereby able to influence policy. The more autonomous the science, the greater its potential influence.[12]

According to Haas and Stevens, separation is not the only important factor in the science–policy interplay. Consensus, and knowledge as to how that consensus was reached, are also necessary. They stress the importance of distinguishing between compromise and consensus.[13] Compromise can be obtained much more readily than consensus; however, consensus is necessary for science to become credible. Reaching consensus demands that scientists are given funding and time independent of political influence. Unfortunately, political actors often attempt to mobilize science rapidly, which makes it difficult to achieve scientific consensus. In this way, consensus is related to autonomy. If scientific experts are not allowed to identify and formulate research questions independently, with some degree of autonomy from political processes, it is only possible to achieve scientific compromise. Thus, the autonomy of scientific work is at the greatest risk when politicians wish to take action at the same time as scientific consensus is lacking.[14]

Should consensus be reached independent of political processes, Haas and Stevens then believe "its consequences should be discussed publicly."[15] This raises the question, how should science connect to policy? Haas' asserts

12. Haas and Stevens 2011, 131.
13. Haas and Stevens 2011, 138.
14. Cf. Collins and Evans 2002, 269.
15. Haas and Stevens 2011, 131.

that this is a task for epistemic communities, which act as the "transmission belts" for the transfer of new knowledge to decision-makers.[16]

Epistemic communities are knowledge-based, transnational networks of professionals holding political power through cognitive authority.[17] Several studies have revealed how epistemic communities evolve and can successfully change the understanding of an environmental issue, thereby persuading policy makers to take action.[18] Expert knowledge becomes an important explanatory factor for international cooperation, which implies that ideas can change a state's conception of its interests. However, it is the existence of an epistemic community as an agent that makes "speaking truth to power" possible.

Throughout the process of crafting scientific consensus independent of policy, Haas and Stevens also stress the importance of usable knowledge—knowledge that both has a substantive core (which makes it useable) and mechanisms for its transmission from science to policy (procedures).[19] A critical stage of this process concerns the shaping of the substantive core; it needs to be credible, legitimate, and salient, which requires letting experts alone develop it without influence from non-experts.

Haas and Stevens thus conclude that science must first develop truth and then speak to power. Both aspects—developing and communicating knowledge—are of vital importance, but Haas and Stevens argue that they should be kept as distinctly separate phases. Based on this approach, we can describe the role of science in policy formation as involving a three-step process: separate science from policy; build consensual knowledge; and connect knowledge to policy.

According to this process, the problem with many current environmental regimes is that science becomes involved in policy-making too early (before consensus has been established), which fuels scientific controversies and restricts the possibility that science will be viewed as a legitimate and credible advocate for the environment. As a result, no social learning occurs, and states, unaffected by science, seek to advance their own material interests in international cooperation. Haas and Stevens mention climate change, biodiversity, and fisheries as examples of processes that have not granted autonomy to expert groups, thereby undermining science's ability to speak truth to power.[20] They devote particular attention to the IPCC, which they assess as an example of a failed attempt by science to influence policy.

Before further analyzing and assessing the role of the IPCC, we will augment Haas and Stevens' approach with important insights from the field of STS, to improve the understanding of what is meant by separation, consensus, and connection.

16. Haas and Stevens 2011, 131. Cf Haas 1992b, 2007.
17. Haas 1992b, 3.
18. Haas 1990, 1997.
19. Haas and Stevens 2011, 129.
20. Haas and Stevens 2011, 141.

The Contribution of Science and Technology Studies

In contrast to IR, the STS community has shown little interest in developing a coherent framework for studying and evaluating international environmental governance.[21] STS does, however, concern science and the role of science in policy processes, making it a valuable field to consider for this study.

In contrast to regime theory and the epistemic community approach, STS scholars understand science and policy as intertwined. The science–policy relationship is thus characterized as a process of *coproduction*.[22] Coproduction happens when policy influences the production and stabilization of knowledge, while knowledge simultaneously supports and justifies policy. Actors may accept a particular knowledge claim because it supports their policy strategies. Similarly, knowledge claims and social interests adapt to one another in a process of mutual development. In this way, causes and effects become functionally interrelated. Coproduction thus means that uncertain or contested science can grow stronger in a conducive policy context, and a weak policy context can become stronger through the support of science.

The coproduction thesis is similar to what Bruno Latour calls processes of hybridization, as opposed to processes of purification.[23] Processes of purification view the institutions of science and policy as separate and distinct, with clear boundaries between the two. Processes of hybridization demonstrate the interdependency and blurred boundaries of science and policy. The coproduction theory asserts that processes of separating science from policy, which are frequently undertaken in modern societies, always begin from a place of coproduced hybrids. Behind a publicly presented separation between science and policy, a multiplicity of collaborations and connections among actors, activities, and spheres can be observed. Thus, science that appears detached from policy is not the whole story; rather it is a representation that conceals deeper and more fundamental processes of hybridization, that is, coproduction.

STS scholars argue that separating knowledge and science from policy creates a false dichotomy. Scientific propositions have no power per se, and thus require social enforcement and are made credible through social interests and strategies.[24] These strategies are part of what has been called *stage management*, a process by which science and policy are balanced to present science as an authoritative source for determining what should be done and why certain actions are important.[25]

Stage management is never possible within a purely scientific arena. Rather, it requires a combination of science and policy, which may occasionally lead

21. Among the few examples are Grundmann 2006, Jasanoff 1996, Jasanoff and Martello 2004, Lidskog and Sundqvist 2002 and 2011.
22. Jasanoff 2004.
23. Latour 1993.
24. Latour 1987.
25. Hilgartner 2000.

to a successful presentation of scientific knowledge as true knowledge able to influence policy by its "purity." Stage management can also happen through both "backstage" and "front-stage" activities, both of which are important to understand the strategic management of the boundaries between science and policy.[26] Backstage management refers to the process of knowledge production, which is uncertain, controversial, and risky. In front-stage management, science becomes explicit and public, and is often portrayed as certain and independent of political considerations.[27] Taken together, stage management makes it possible to study how actors, in practice, address the coproduction of science and policy. Thus, something created in close collaboration between science and policy can, through stage management, be presented as distinct and "pure." It is therefore important to determine what types of stage management make science credible and trustworthy.

Experts consciously employ stage management to meet the expectations of other actors (e.g., negotiators, industrial corporations, environmental movements, and the public), thereby increasing the possibility to influence them; however, more fundamental and deeply embedded processes also exist. These processes are not necessarily recognized by the actors involved. For example, in the domain of public decision-making, the processes of purification (separation) and hybridization (coproduction) of science and policy rest within the broader frames of what Sheila Jasanoff has called *civic epistemologies*.[28] Civic epistemology refers to collective knowledge-ways through which the rationality and robustness of knowledge claims are assessed in a given society.[29] It is a crucial part of political cultures, conferring meaning on issues and shaping the identities of the members of a specific culture. They can confer meaning on technological projects or regulatory efforts and ascribe certain capabilities to actors. Thus, a nation's population is acculturated into relatively settled forms of public knowledge-making and argumentation.

In addressing the concept of civic epistemology, we depart from *a priori* assumptions regarding science and policy and how to establish an effective interplay between science and policy. Instead, we pose the question of how knowledge comes to be perceived as reliable in political settings. In other words, civic epistemology treats the credibility of science in contemporary political life as a phenomenon to be explained, not as something to be taken for granted.[30] Civic epistemologies do not concern technical details, but answer instead broad questions such as "what is the purpose; who will be hurt; who benefits; and how can we know?"[31] Although these epistemologies are fundamental constructs embedded in particular political cultures, they are not immutable. Like all

26. Hilgartner 2000, 7.
27. Latour 1998.
28. Jasanoff 2005.
29. Jasanoff 2005, 255.
30. Jasanoff 2005, 250.
31. Jasanoff 2003, 240.

cultural phenomena, civic epistemologies are changing, although gradually. They not only influence the strategies, actions, and science–policy hybrids developed by actors, but are also influenced by them. These influences are not, however, consciously exerted. Rather, they are unintended consequences of human action and social strategies. Whereas actors can strategically and flexibly engage in stage management, civic epistemologies are more fixed and stable. Actors must adapt to them while not necessarily being aware of them. Stage management concerns how science is strategically presented, whereas civic epistemologies concern how the relationships between policy and science are configured. This focus enables specific science and policy relationships to be explained by understanding them as components of a particular civic epistemology. It also explains why particular science–policy relationships may be effective in one culture but not in another.

In summary, coproduction, stage management, and civic epistemology are suitable analytical tools for investigating science–policy relationships.

STS Contribution to IR

From an STS perspective, we will now interpret and evaluate the IR suggestions presented earlier, particularly with regard to how the notions of separation, consensus, and connection might be enriched by the three STS concepts.

Scientific Autonomy Concerns More than Formal Design

Whereas Haas and Stevens are interested in *formal procedures* concerning autonomy, and search for indications of who decides, who should decide, and what should be decided, STS scholars are primarily interested in more *informal procedures* that influence cognitive processes. Political influence on science does not end when political representatives delegate the research agenda to scientists or when formal boundaries and procedures are established to protect scientific autonomy.[32] Scientific autonomy concerns more than the formal design of the science–policy interplay, and formal and explicit social procedures for protecting integrity are only one dimension of scientific autonomy. Behind formal procedures, which may serve to protect knowledge autonomy, there are always processes of hybridization. Moreover, involved actors act strategically in relation to the boundaries between science and policy; by staging their activities as independent from policy, they attempt to achieve credibility among actors outside the scientific community.[33] This does not imply that STS claims that everything is political, or that the politicization of research agendas and selection of expertise are meaningless topics to discuss. Rather, STS highlights that science and policy

32. Wynne 2003.
33. Hilgartner 2000.

always influence one another, even in those cases where they are presented as separate activities and are organized into different camps.

Scientific Consensus is Based on Compromises

The nature and significance of scientific consensus have long been of substantial interest to STS. Over thirty years ago, Harry Collins formulated the notion of the "core set," the idea that only members located at the center of a specific scientific area can legitimately contribute to the formation of consensus.[34] According to Collins, we should look for these groups when studying how science develops, how new problems are introduced and settled, and how agreements are reached. Identifying core scientists is a task for empirical sociology; it concerns assessing who are considered the most important researchers within a particular field. When studying consensus and controversies in science, core sets are of crucial importance.

STS scholars have no specific perspective on whether it is good or bad for core scientists to be connected or unconnected to policy processes; however, in empirical studies they have found that if core scientists can expand their social networks to include other scientists and also actors outside of science, they will be more likely to settle controversies and thereby attain consensus.[35] Different types of connections—to bureaucrats, funding agencies, media, and other non-scientific actors—improve the likelihood that scientists' research agendas will be successful. To settle a conflict, scientists also need to connect to non-scientific actors.[36] Thus, whereas Haas and Stevens suggest that isolation makes scientific actors stronger, STS scholars claim the opposite: scientists can only be influential by building networks with other actors, and these are to be built in parallel with the development of scientific arguments.

STS also differs from IR studies on the science–policy interplay in that STS does not understand consensus as a limited, rational outcome of expert work.[37] Instead, STS sees scientific consensus as the result of negotiations and compromises between actors. The notion of closure, rather than consensus, is used to describe the results of such processes.[38] These processes primarily involve scientific actors, but non-scientific actors may also intervene. Allocating research funding or supporting the development of research programs are examples of how politicians and research administrators can influence the process leading towards—or away from—consensus. Scientific consensus should therefore be understood not as a process untouched by actors outside research communities, but instead as a broad social process based on negotiations and compromises. Moreover, STS scholars assert that consensus may not be necessary for science

34. Collins 1981.
35. Collins 1992; cf. Latour 1987.
36. Collins 1992; Knorr-Cetina 1999.
37. Bijker et al. 2009; Collins 1992.
38. Collins 1992.

to gain credibility. This is because the credibility of science depends on the persuasive power of the individuals and institutions that speak for science rather than the strength of internal consensus (measured by internal scientific criteria). If experts and institutions are trusted, their claims are also trusted, even if consensus is not yet established.[39]

Science and Policy are Always Connected

The epistemic community suggests that groups of experts can consciously act to influence international negotiations and state interests. Whereas much effort has been devoted to analyzing how these networks operate overtly, less attention has been given to what occurs in the cultural contexts that make these actions possible, meaningful, and effective. An emphasis on civic epistemology, coproduction, and stage management allows for a deeper discussion on the transfer of knowledge from science to policy, what makes it possible, and why it matters. Importantly, the pivotal role accorded to an epistemic community needs to be further explored. According to STS, the delegation of policy-making authority to a small group of experts cannot be properly understood unless we focus on the contexts and broader networks in which these expert groups act.[40] Similar to the process of consensus formation, the mechanisms that connect science to policy—such as epistemic communities—are always part of broader networks, and from a coproduction perspective this implies that science and policy are connected from the start.

With their focus on usable knowledge, Haas and Stevens focus on the context of expert knowledge, because usable knowledge must be credible, relevant, and attractive to actors outside the expert community.[41] However, they fail to recognize that different civic epistemologies exist, which means that there is no universal recipe for making expert knowledge credible. There can be no direct path from science to policy as long as there are different ways of knowing and acting, which explains why the same expert knowledge receives different political responses in different social and political contexts.[42]

Interpreting the IPCC and Climate Policy

Thus, IR and STS present different answers to the question of the conditions under which science matters. By discussing how IR and STS assess the work of the IPCC, we will further address the question of how to understand the role of science in international environmental governance.

39. Jasanoff 2011.
40. Latour 1987.
41. Haas and Stevens 2011.
42. Jasanoff 2011.

Is the IPCC a Failure?

The IPCC is one of the most ambitious efforts ever undertaken by the international community to develop and communicate science to inform policy. Nevertheless, according to Haas and Stevens, it has failed in its task.[43]

The IPCC is designed in a manner that enables government control over individual scientists, who are afforded limited opportunities to influence the agenda of climate change negotiations. Although the IPCC relies on extensive peer reviews of its assessment reports, it is governments that formulate the research agenda, appoint scientists, and approve the reports. The scientific representatives overwhelmingly come from the global North, which limits the scope and legitimacy of the panel.

For these reasons, Haas and Stevens find that the IPCC is designed to keep science on a tight leash, rather than meaningfully influence policy. Indeed, the IPCC's efforts to summarize and synthesize research have not remained separate from the policy process. Instead, governments have shaped the science advisory process, have circumscribed the autonomy of science by controlling the selection and autonomy of individual scientists involved in the assessment process, and have thereby also hampered the social learning that science could potentially facilitate. When issues are highly politicized and involve high stakes—as in the case of climate change—it is difficult for science to inform policy. Nevertheless, according to Haas and Stevens, certain international conventions have been more successful in this respect, such as those regulating pollution in the Mediterranean region (Program for the Assessment and Control of Pollution in the Mediterranean Region—or MED POL—1975), air pollution (Convention on Long-range Transboundary Air Pollution, 1979), and the depletion of stratospheric ozone (Vienna Convention for the Protection of the Ozone Layer, 1985). Other regimes can learn from what these three have accomplished, as they enabled the creation of autonomous scientific bodies able to develop consensual knowledge that has helped foster consensus in various policy fields.

Haas and Stevens argue that the IPCC's expert work is an obvious example of a low degree of autonomy. The IPCC is structured in such a way that the highest deciding body (the Panel) consists of representatives of its member countries, i.e., the member states of the United Nations (UN) and the World Meteorological Organization (WMO). The Panel makes the major decisions, including the approval of the outline of work, setting the research agenda, and determining the structure and mandate of the IPCC working groups and task forces. The chairman invites governments and other bodies to participate in the IPCC working groups, task forces, and workshops. The IPCC may invite experts from the WMO or UN member countries, as well as international, intergovernmental, or nongovernmental organizations, but in such cases the IPCC

43. Haas and Stevens 2011; cf. Haas 2008.

is required to inform governments in advance to make it possible for them to nominate additional experts.[44] The governments of IPCC member states are responsible for nominations to positions on the IPCC Bureau and Task Forces.[45] The individuals who serve as coordinating lead authors, contributing authors, and review editors are selected by the relevant working group or task force bureau from among the experts cited on the lists provided by governments and observer organizations, as well as other suitable experts known through their publications and activities.[46] Haas and Stevens consider the clearest sign of a low (or nonexistent) degree of autonomy in expert work to be when politicians and bureaucrats representing national governments decide the agenda and select the experts, something they find evidence of in the work of the IPCC. Its close connection to policy processes makes it difficult to achieve scientific consensus, instead of compromises, and thereby become credible. This is why the IPCC has failed to influence policy-making: its design makes it poorly equipped to develop useable knowledge.

The IPCC as a Success

In contrast to Haas and Stevens' view, STS sees the work of the IPCC as a partial success in terms of creating a shared scientific understanding of the climate issue.

The IPCC was developed to be the authoritative center for knowledge claims on climate change and is the pivotal institution for making global assessments of climate change.[47] It has succeeded in taking on the role of a privileged speaker for what climate change is and implies—no other scientific or nonscientific institution has similar authority when it comes to defining the very meaning of climate change. Through the IPCC, climate change is framed and defined as a political issue in pressing need of multilateral agreements and concerted political action with carbon emissions as the primary focus. This understanding of the issue has been successfully disseminated to political institutions, and few governments disagree with the assertion. The IPCC's role in world politics has also affected other expert bodies and global assessments, and has served as a role model for the configuration and development of other expert organs. This is most evident in the newly established Intergovernmental Platform for Biodiversity and Ecosystem Service (IPBES, established in 2012), which explicitly states that its establishment and design were strongly inspired by the IPCC.[48]

Thus, from an STS perspective, the work of the IPCC is a partial success. Moreover, despite strong public attention to the uncertainties in climate science, the authority of science and the IPCC has not decreased. Scientific uncertainty

44. IPCC 2012a.
45. IPCC 2012b.
46. IPCC 2012c.
47. Hulme and Mahony 2010; Mahony 2013; Miller 2004; van der Sluijs 2010; Wynne 2010.
48. www.ipbes.net.

has even been used to give science a more central position in public discussions of climate change, not least because science is generally regarded as the institution best suited to competently interpret and address scientific uncertainty.[49]

Connection rather than Consensus Matters

The IPCC has successfully framed the issue of climate change and disseminated it to political institutions, but this has not led to concerted political action. Indeed, at present there are no international agreements that have led to extensive reductions of greenhouse gases. Haas and Stevens argue that this failure is because science and policy are not sufficiently separated. They assert that the knowledge presented by the IPCC is of insufficient quality and does not surprise policy actors, as nothing is presented that they did not request.

The lack of political action could, however, be cast in a new light by adopting an STS perspective. The IPCC has developed a specific idea of what climate change concerns, which includes knowledge about nature as well as conceptions about the capacity of actors to define and address it, what should be considered knowledge, and the role of science and policy in solving the issue. In this sense, science and policy are coproduced: science involves not only a diagnosis of climate change but also an understanding of society. Thus, what is staged as a scientific activity—a global scientific assessment—also implies a specific perspective on how society operates.

STS studies have demonstrated that environmental science is most trusted when it relates to shared normative and cultural understandings of the world.[50] The current framing of climate change has, however, been developed with little public input and has precluded alternative ways of understanding the issue.[51] The meaning that IPCC scientists have given to the understanding of climate change—in the form of science-based definitive statements about carbon emissions and the disastrous risks associated with them—is not false, but it is only one of many possible understandings.[52] Climate experts accordingly adopt a certain view of the public meaning ascribed to climate change under the orchestration the IPCC, which leads to publics being less willing to accept the results presented.

The fundamental problem is therefore not that the IPCC has failed to establish consensus or kept science sufficiently separate from policy-making. Instead, the problem is that science has not been connected to what individuals and other stakeholders consider important, meaningful, and manageable.[53] This has been further exacerbated by the IPCC's adoption of a linear model of speaking truth to policy, which has resulted in politically relevant questions

49. Zehr 2000; cf. Bijker et al. 2009.
50. Jasanoff 2010; Welsh and Wynne 2013.
51. Hulme 2009; Hulme 2010; Wynne 2010; cf. Grundmann and Stehr 2010; Wynne 2001.
52. Hulme 2009.
53. Jasanoff 2011; Wynne 2005.

framed in an abstract and nonpolitical manner. With its focus on achieving consensus through expert assessment, the IPCC has denied the plurality and uncertainty of science and thereby also limited the possibility to discuss alternative policy approaches.[54] The IPCC rests on a specific epistemology of what should be regarded as relevant and trusted knowledge and where the boundary between science and policy should be drawn.[55] The IPCC has been excessively focused on establishing scientific consensus, thereby subjecting the complex issue of climate change to scientific reductionism and alienating policy actors and publics.[56]

The existence of different civic epistemologies further complicates the argument that the IPCC's problems are caused by its lack of detachment from society; it is primarily connected to a rather small segment of society, and the meaning it assigns to climate change resonates poorly with broader social and cultural understandings of what matters. Civic epistemologies provide the context for interpreting scientific messages. Therefore, there is no simple path from science to policy. Even countries that are similar in technological and epistemic terms evaluate the IPCC's message differently. This is because they have different civic epistemologies, or different ways of evaluating knowledge claims in the public sphere.[57] Scientific knowledge only becomes influential if it resonates with civic epistemologies. Thus from this perspective, there is a need for greater interaction, not greater separation, between science and society, including a better and more reflected-upon connection between scientific knowledge and civic epistemologies.

What Counts as Success?

In their examination of the role of the IPCC in international policy-making, Haas and Stevens' emphasis on what makes science usable is of crucial importance. However, by restricting their assessment to explaining the IPCC's limited political influence in terms of a lack of scientific autonomy and consensus building, they provide a narrow and limited understanding of the IPCC's work and importance. Credible and usable science involves a more complex picture that recognizes the importance of how policymakers perceive science. Contrary to Haas and Stevens, STS researchers find that many actors consider the IPCC a credible and trustworthy institution. Paradoxical as it may seem, from an STS perspective the problem is not that the IPCC has failed, but that it has been too successful. The Panel has defined the problem of climate change, and its understanding of the issue has been successfully disseminated throughout society. However, its framing of the issue has also produced particular identities, delegated responsibilities, and prescribed specific remedies. This also

54. Beck 2011; Jasanoff 2013; van der Sluijs et al. 2010; Vasileiado et al. 2011.
55. Beck et al. 2014; Hulme 2009; Lidskog et al. 2015; Mahony 2013; Wynne 2010.
56. Hulme 2009.
57. Jasanoff 2011.

affects the ability of political representatives, at least in democratic societies, to develop policies. Without public mobilization and support, it is difficult for politicians to formulate and implement radical climate policies and take a leading role in policy negotiations. The reason for this failure is thus not that science is too closely associated with policy, but that it lacks a sufficient connection to society.

Obviously, global politics is not only motivated by what citizens perceive as important and meaningful. However, separating the IPCC from policy communities is not the most important element in making science matter. On the contrary, it is difficult to see how greater separation between science and policy will close, or even reduce the identified gaps between scientific knowledge, public meanings, and political action. Therefore, it is more important to evaluate the framing of the climate issue and the degree of latitude it allows for the public uptake of knowledge, agency, and action. An emphasis on what makes science usable is central to this. Haas and Stevens are correct in this respect, but their understanding is too science-centered.

Conclusions: Context Matters

Almost twenty years ago, Jasanoff argued that an uncritical view of science could be observed in IR research and that critical discussion on the contingency and plurality of scientific knowledge was lacking.[58] By taking scientific knowledge for granted, as an external input that negotiators may or may not use in negotiations, IR research encompasses a naive understanding of science. In contrast to this view, Jasanoff argues that there needs to be a focus on the social conditions necessary for science to become relevant for policy-making.

Haas and Stevens' study has responded to this critique by presenting a detailed investigation of the conditions under which expert knowledge influences policy, while acknowledging the contingencies of both science and policy.[59] Their focus on usable knowledge also involves understanding scientific knowledge in relation to its contexts of use. It is important to note that Haas has further developed his approach in a constructivist direction, and now focuses more on the processes that shape useable knowledge than taking this knowledge for granted.

There are converging trends between IR and STS. STS shares the emphasis on the importance of context for understanding how science works. There are also other similarities between the epistemic community approach and the STS perspective, such as the importance of credibility, the mechanisms for disseminating scientific knowledge, and understanding science in terms of process rather than product.

58. Jasanoff 1996, 186.
59. Haas and Stevens 2011.

In addition to these similarities, we also observe differences. The epistemic community approach focuses on the formalized interplay between science and policy in international negotiations. Taking this as their point of departure, Haas and Stevens find that the organizational design of the science–policy interplay is of crucial importance for making science matter. STS, however, allows for a broader understanding of the science–policy relationship, analyzing how it develops in practice and how it is acted upon. Whereas Haas and Stevens are interested in front-stage activities—how science–policy relations are formally designed—STS is primarily interested in backstage activities and how different actors represent the relationship between science and policy in front-stage performances to become credible to a particular audience or context.

The primary benefit that STS could contribute to IR research is a more thorough understanding of what transpires behind the formal design of the science–policy interplay. Science and policy are always intermingled and connected, and knowledge can never be credible in a non-contextual way; rather, it has to adapt to specific civic epistemologies.

From the perspective of stage management, Haas and Stevens may be correct in stating that consensus and separation from policy could be of substantial importance for making science influential. However, close contacts between science and policy are always present in backstage activities. In addition, scientific consensus is not a general recipe for success. It also has the potential to create problems, for instance by eliminating alternative frames and knowledge, leading to disengagement and a lack of support from other actors.

With respect to separation, we know that Western governments have broadly shared the opinion that science should inform policy while at the same time being kept separate from policy processes.[60] Such a viewpoint, including the notion that consensus-based knowledge is important for policy, may be well adapted to certain civic epistemologies, but according to STS, this does not make the importance of separation a general truth. We should instead encourage ourselves to conduct more thorough analyses of what transpires when science interacts with policy. We should not simply take existing stage management strategies for granted, but make them part of our studies. We must be aware that knowledge considered credible and usable in one context may not necessarily be so in another.

Above all, it is important to be aware that the interplay between science and policy does not exclusively concern formal and abstract organizational design. Instead, the focus should be on the relevance of a specific design within different regional, national, and local policy contexts, and not least, the variations in public acceptance of scientific knowledge understood in relation to specific civic epistemologies.

60. Miller 2004, 65; cf. Latour 1993.

An important finding of STS is that there is no uniform solution to the problem of how science can influence policy and the extent of scientific consensus required to do so. Instead, science, as well as our studies of science, need to be context-sensitive to influence other actors. The extent to which science succeeds or fails to influence policy-making is not primarily a question of content or consensus among the core-set of scientists, but rather one of how science is adapted to specific contexts. This is a lesson for studies in international environmental governance in general and specifically something that the IPCC needs to consider in greater depth in the future.

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