

Chapter 8. Challenges in the Application of Science to Global Affairs: Contingency, Trust, and Moral Order

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In this chapter, I explore three challenges to the application of science to global affairs: (1) the contingency and uncertainty inherent in knowledge about the global environment, (2) the need in global environmental policy contexts to secure credibility for scientific claims among far-flung, often highly diverse audiences, and (3) the often highly contested moral choices embedded in particular systems for producing and warranting policy-relevant science advice in international organizations. The efforts of experts and other policymakers to cope with these challenges are critical to the constitution of new governing institutions capable of equitably and effectively managing environmental change on planetary scales. To understand, evaluate, and contribute to such efforts, I argue, social scientists must adopt a more reflective approach to theorizing the relationship between, on the one hand, knowledge and ideas, and on the other, social and political institutions.

For many social scientists, global environmental issues are important sites in the construction of novel forms of social order on worldwide scales. The prominence of phrases like global civil society, global polity, and global environmental governance in recent scholarship reflects a growing sense that something new is happening in international environmental regimes that cannot be captured by traditional models of international relations that conceptualize states as independent rational actors (see, e.g., Litfin 1998; Young et al. 1996; Yearley 1996b; Lipschutz and Mayer 1996). Rather, global environmental regimes appear in these writings as institutions in which a wide array of societal actors, from states and NGOs to corporations and individuals, are busily working out, often in the face of serious opposition, new arrangements for living together in a worldwide community. In this chapter, I explore climate change as just such a site of societal (re)construction and resistance.

Implicitly or explicitly, most accounts of global civil society and global governance tie the emergence of new patterns of worldwide social and political interaction to cognitive convergence. New forms of social order emerge, according to this perspective, from the development of shared ideas among government officials, scientists, and citizens around the planet (Litfin 1998; Lipschutz and Mayer 1996; Haas 1990a, 1990b). Agreement on the risks of environmental change and the need for political cooperation among all the world's peoples, these accounts suggest, increasingly motivates people to band together in new, transnational communities. Consider, for example, the concept of epistemic communities. As described by Haas (1990b), these communities form around shared factual and

causal understandings of global environmental change and proposals for policy change. Moreover, once established, they use their authority as “experts” to persuade other people to adopt the same ideas and, having done so, to agree to the creation of new environmental regimes (see also Haas 1992, Haas and Haas 1995).

In this chapter, I argue against this narrative. Theories of cognitive convergence generally posit the emergence of shared ideas as causal variables without exploring in detail the question of how particular ideas acquire credibility and authority among diverse audiences and therefore come to be shared in the first place (see, e.g., Jasanoff 1997b). Examining this fundamental question below, I suggest that what happens in international institutions is, in actuality, frequently the reverse of the causal story adopted by conventional accounts. Rarely do people adopt convergent ideas and then decide to band together in communities or form new institutions; rather, they come to share ideas as a result of social interactions that help constitute the community in the first place (e.g. Zehr 1994; Jasanoff 1993; Taylor and Buttel 1992). Shared understandings of nature and society, in this sense, may sometimes inspire social reorganization. But before they can do so, they must emerge from and attain widespread credence in detailed, day-to-day negotiations of meaning and practice (Lynch 1990). Frequently—as in the situations I describe in this chapter—these negotiations simultaneously constitute new social orders, so that shared understandings and new institutions arise together (Latour 1988). Institutions can thus play as important a role in the construction of new ideas as ideas do in stimulating institutional change. An adequate explanation for changes in global order must therefore take into account how cognitive understandings of global civil society and the global environment are coproduced with the social arrangements that connect up their meaning with the activities of individuals around the planet (Jasanoff this volume).¹

This alternative view of the emergence of global civil society carries potentially important implications for our basic understandings of international politics. To date, theories of international relations have tended to assume the production of knowledge takes place outside of the domain of social analysis – and therefore that ideas can be treated as independent sources of power in society. By contrast, if the production of shared knowledge is itself a deeply political process, a complete understanding of changing patterns of global environmental governance must investigate not only what happens after ideas acquire consensual status but also how and why those ideas – and not others – acquired credibility and authority. Note that this is not an assertion that science is shaped by political forces. Nor is it an indictment of the role of science in global environmental policymaking. Rather, it is to say that the processes by which policy-relevant knowledge is produced, validated, and used to make global policy are part and parcel of political foundations of global governance being built in emerging environmental regimes and must be analyzed as such.

From a more pragmatic perspective, the view of knowledge and politics presented here also carries important implications for the design and evaluation of international institutions. Recent scholarship in international relations has sought to revitalize the study of international institutions and to find universal standards for their proper design and evaluation (e.g. Keohane and Levy 1996; Chayes and Chayes 1995; Haas et al. 1993). These approaches are grounded in the belief that the effectiveness of institutional designs can and should ideally be assessed on instrumental criteria. The recognition, however, that shared understandings of environmental risks are, in part, a product of social negotiation calls into question the ability of instrumental reasoning to provide a privileged standpoint from which to judge institutional performance. Consequently, the search for new criteria of institutional design and evaluation must take other forms. A more reflective and potentially more promising approach may be to take seriously the proposition that conceptual models of global nature and global society as well as social norms and practices for producing knowledge and managing social affairs are constantly being (re)negotiated in specific institutional contexts. If we adopt this view, then two questions become important for social scientists: first, how do particular understandings come to be shared by people across the globe (Jasanoff and Wynne 1998)? And second, according to what criteria should the processes by which this happens be evaluated?

Linking Science and Politics in the Climate Regime

A clear articulation of these arguments can be made about efforts to relate science and politics in the context of the climate regime.ⁱ The need to link science to politics has become widely recognized in international policymaking over the past twenty years, particularly around environmental issues (Chayes and Chayes 1995; Haas and Haas 1995; Young 1994; Benedick 1991; Haas 1990a, 1990b). However, most scholars and policymakers have generally taken this relationship to be insufficiently problematic to warrant detailed attention (c.f., Jasanoff and Wynne 1998; Jasanoff 1997b; Global Environmental Assessment Team 1997; Miller et al 1997; Litfin 1994, arguing more recently for the importance of research into science-policy linkages in international environmental issues). Detailed examination of the negotiation of scientific advisory arrangements within the climate regime reveals, I will illustrate below, that how science should relate to international politics has been deeply contested among the participants in international institutions. As nations entered into negotiations on climate change in the late 1980s with the creation of the Intergovernmental Panel on Climate Change (IPCC), no shared understanding existed for how scientific advisory processes should be instituted in practical or normative terms. Questions such as who should be granted expert authority, what should count as evidence, who should be allowed to subject expert claims to critical inquiry, and who should have the authority to make these judgements generated intense debate in international negotiations, both among Western governments and, especially, between North and South. Virtually all of the chapters in this volume have identified challenges that underlay these disagreements: divergent national

expectations about climate science and its role in public policymaking; heterogeneous distributions of scientific resources; normative assumptions embedded in climate science discourses; and contingency and uncertainty in climate modeling. Only over time, through complex negotiations, have participants in the institutions of the climate regime found ways to begin to overcome these challenges to create globally credible science advice and to link it to policy choices.

To explore how governments from around the world came to share at least temporarily settled models for producing, validating, and using expert knowledge within the climate regime, I analyze in this chapter the activities of the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the UN Framework Convention on Climate Change. Since its creation in 1995, SBSTA has constituted one of the key sites where questions about the proper organization of science advice in international governing institutions are being addressed and, occasionally, settled. Although its formal function within the regime was initially uncertain, SBSTA has subsequently emerged as the principal forum in which regime participants have articulated and negotiated among competing models of institutional design for providing expert advice about climate change. It has served, in other words, as a space where governments (and to a lesser extent NGOs) can deliberate the ground rules by which scientific experts and knowledge claims receive accreditation within the institutions of the climate regime. Settlements arrived at in SBSTA have thus created an important part of the normative and institutional contexts that will mediate future interpretations of climate change and choices about human responses to it within the climate regime.

Under SBSTA's auspices, policymakers have grappled with questions about what it means, in practical terms, to organize science advice in international institutions. To date, however, they have received very little help or guidance from scholars whose work might provide useful analytic perspectives on the relationships between global environmental science and politics (for an exception, see Jasanoff and Wynne 1998). International relations scholars, for example, have unquestioningly encouraged the expansion of scientific expertise in international regimes (Chayes and Chayes 1995; Haas et al. 1993). Largely absent, however, have been detailed, empirical studies of scientific knowledge and public policymaking of the kind undertaken in recent years in domestic political contexts (Bimber 1996; Nelkin 1992), let alone more theoretically informed studies of the relationship between expertise and democratic governance in the fashioning of contemporary social order (Jasanoff 1996a, 1996b, 1990, 1986; Porter 1995; Yearley 1991; Ezrahi 1990; Brickman et al. 1985; Wynne 1982). Those few scholars who have examined the workings of the climate regime closely have focused either on the IPCC (e.g. Shackley and Wynne 1995; Boehmer-Christiansen 1994) or the Intergovernmental Negotiating Committee and its successor, the Conference of the Parties (e.g. Bodansky 1994). In neither case, however, have they examined how the activities of such organizations help interactively define what will count as both good science and

good governance in international institutions. Put differently, they have yet to come to grips with the mechanics of coproduction.

It is precisely the simultaneously linked production of scientific and political organization in international institutions that I want to explore in the activities that have taken place under SBSTA's auspices. In the following sections, I explore the challenges that participants in SBSTA have faced in organizing scientific advisory processes; I analyze how they have managed to overcome these challenges in several instances and to make progress toward globally credible science advice; and I offer suggestions for how SBSTA's experiences might be generalized to other international institutions.

In carrying out this analysis, I draw heavily on data from participant observations I made in early 1997. During SBSTA's 5th meeting, February 25-28, 1997, in Bonn, Germany, I had the opportunity to observe and interview numerous scientists, government officials, and NGO representatives participating in SBSTA. I attended meetings of the SBSTA plenary, special seminars held for government and NGO representatives, and one meeting of SBSTA's informal working group on methodologies. My interviews and observations focused on participants' expectations and understandings of SBSTA as an organization, as well as the history of its efforts to construct various institutional arrangements for science advice. In addition, I have also drawn upon two documentary records: the official publications of SBSTA and summaries of SBSTA deliberations reported in the Earth Negotiations Bulletin. The latter is a publication of the International Institute for Sustainable Development, a Canadian NGO. I document these records in the Appendix to this chapter.

Creating a Space for Deliberating About Science Advice

The creation of SBSTA and other international scientific advisory organizations such as the IPCC extends a long-term trend in the evolution of Western democratic forms of government. Over the course of the twentieth century, the world's liberal democracies have drawn increasingly heavily on science and other forms of expertise in the formulation and legitimation of public policy. Dramatic expansions of public support for scientific research and for the involvement of experts in public policymaking have come as Western governments have expanded their authority to regulate social welfare, environmental protection, and public health and safety. Scientific objectivity has come to represent, in Western democracy, an instrumentally effective force in the pursuit of public action, authority, and accountability, buttressing the authority of centralized regulatory institutions (Jasanoff 1996c, 1990; Porter 1995; Ezrahi 1990). Today, the creation of institutions like SBSTA and the IPCC reflects a growing effort to use science in a similar fashion in international politics, thus helping to legitimize a deepening and expansion of the role of international regimes in grappling with threats of environmental degradation around the world (see Chapter 6, this

volume, for a historical exploration of earlier postwar efforts to use science in the pursuit of particular models of world order).

Problems like climate change pose foundational questions about the future of such initiatives—how will countries learn to balance the high risks of action and inaction; to cope equitably with heterogeneous costs, risks, societies, and environments; to integrate national and international institutions; and to meld value commitments to environment, development, and human rights on planetary scales (Rayner and Malone 1998; Litfin 1998; Young et al. 1996; Chayes and Chayes 1995)? For many policymakers in the climate regime, science seems to offer important, and possibly unique, resources for helping policymakers to address these questions in ways that can secure worldwide public trust. Responding to these assumptions, governments have established a host of new scientific advisory processes to produce and validate knowledge related to the activities of the climate regime and to incorporate that knowledge into policy choices. Thousands of scientists, government officials, and representatives of non-governmental organizations from numerous countries have participated in these processes under the auspices of the IPCC and SBSTA.

SBSTA was created by Article 9 of the UN Framework Convention on Climate Change as one of three institutions jointly responsible for treaty oversight. The text of Article 9 reads, in its entirety:

Article 9: Subsidiary Body for Scientific and Technological

Advice

1. A subsidiary body for scientific and technological advice is hereby established to provide the Conference of the Parties and, as appropriate, its other subsidiary bodies with timely information and advice on scientific and technological matters relating to the Convention. This body shall be open to participation by all Parties and shall be multidisciplinary. It shall comprise government representatives competent in the relevant field of expertise. It shall report regularly to the Conference of the Parties on all aspects of its work.

2. Under the guidance of the Conference of the Parties, and drawing upon existing competent international bodies, this body shall:

(a) Provide assessments of the state of scientific knowledge relating to climate change and its effects;

(b) Prepare scientific assessments on the effects of measures taken in implementation of the Convention;

(c) Identify innovative, efficient and state-of-the-art technologies and know-how and advise on the ways and means of promoting development and/or transferring such technologies;

(d) Provide advice on scientific programmes, international cooperation in research and development related to climate change, as well as on ways and means of supporting endogenous capacity-building in developing countries; and

(e) Respond to scientific, technological and methodological questions that the Conference of the Parties and its subsidiary bodies may put to the body.

3. The functions and terms of reference of this body may be further elaborated by the Conference of the Parties (Mintzer and Leonard 1994, emphasis added).

While the creation of SBSTA might be taken as evidence of a shared understanding among negotiators of the role science should play in international politics, this conclusion is warranted by neither the history of SBSTA's creation nor a close reading of its authorizing text. SBSTA emerged as part of a wide-ranging reconfiguration of the climate regime between 1990 and 1995. From 1988 to 1990, intergovernmental discussions about climate change took place within the Intergovernmental Panel on Climate Change (IPCC). By 1990, however, many developing countries were dissatisfied with the IPCC. Whereas the IPCC represented climate change as a problem of global environmental limits (mirroring the view prevalent in most Western nations), most developing countries saw it as a problem of over-consumption in the North (e.g. Jasanoff 1993).

The IPCC's unresponsiveness to this alternate view of climate change led developing country governments to reject a request in 1990 by the UN Environment Programme that the IPCC open formal negotiations on the climate issue in early 1991. Instead, they voted overwhelmingly in the UN General Assembly to create a separate institution, the Intergovernmental Negotiating Committee, to house the negotiations. Later in 1991, scientists participating in the IPCC succeeded in internally reorganizing the IPCC into the form it takes today, focusing the panel's activities on providing assessments of the risks of climate change, establishing uniform rules of peer review and expert selection across the institution, and creating technical support units whose self-described function is to isolate the IPCC's participants from political interests who might seek to influence its findings. All of these changes were intended by the IPCC to strengthen its appearance as a scientifically objective body. However, the reforms had little effect on the IPCC's credibility with developing countries. Consequently, developing countries rejected efforts by the United States and the European Union to incorporate the IPCC into the institutional framework of the UN Framework Convention on Climate Change as it was being negotiated in 1991-92. Instead, a compromise led to the insertion of provisions for a novel Subsidiary Body for Scientific and Technological Advice (SBSTA) into the treaty's text to manage the regime's perceived need for expertise and its relations with "existing competent international bodies"—as close as the treaty text comes to mentioning the IPCC.

As can be seen in the treaty text authorizing SBSTA, however, the Framework Convention (as is typical for such documents) does little to specify exactly what SBSTA should do and how it should be organized to do it. The treaty establishes certain parameters of membership (italicized above, although even here countries have interpreted this phrase in a multiplicity of ways, sending delegates with a wide array of backgrounds to SBSTA; over time, most governments have tended to send the same delegates to SBSTA as they do to the Conference of Parties as a whole) as well as guidance on the tasks to be performed by SBSTA (paragraph 2). Other areas of potential interpretive flexibility, however, such as criteria for defining the competence of experts or the relevance of domains of expertise are left undefined. The phrase "drawing upon existing competent

international bodies” has been interpreted by many countries as implying that SBSTA should develop some kind of relationship with the IPCC. Again, however, the details of what this relationship should look like are not specified. From the treaty’s signature in 1992, then, until the formal constitution of SBSTA at the first meeting of the Conference of the Parties in Berlin in 1995, SBSTA remained a largely unknown factor in the climate regime. Evidence of whether and how shared understandings of the proper place of science in international politics have emerged in the climate regime can only come, then, from events subsequent to SBSTA’s creation.

Deliberating About Science Advice Within SBSTA

The sense of uncertainty surrounding SBSTA has largely continued unabated since its inception. Implicitly and explicitly, participants in SBSTA have struggled to find generally acceptable criteria and procedures for selecting experts, weighing evidence, establishing institutional mandates, and conducting reviews. Frequently, however, this has proven difficult. (Pace theories of international regimes, which have tended to emphasize the development of convergent norms and practices as a necessary condition for effective environmental protection, cultural anthropologists have argued that an explicit recognition of the heterogeneity of discourses that underlie these disagreements is essential to achieving sustainable development; see, e.g., Rayner and Malone 1998; Thompson, Rayner, and Ney 1998a, 1998b). The initial effort to create two new Technical Advisory Panels (TAPs) illustrates these difficulties. At the first meeting of SBSTA in Berlin in 1995, a proposal was introduced to supplement the IPCC (which supporters argued should continue to conduct risk assessments for the climate regime) by constituting two additional technical advisory panels to address questions related to standard methodologies and technology transfer. Over the course of several SBSTA meetings, however, deep-seated divisions emerged among participants over how to organize these panels. Issues on which participants differed included the following:

- Expert affiliation: Would experts on the panels be invited from governments, the private sector, non-governmental organizations, international organizations, or universities?
- Method of appointment: Would experts be appointed by governments, nominated by governments and appointed by the Framework Convention Secretariat, or nominated by governments and appointed by SBSTA?
- Balance of experts: Would experts from any country be allowed to participate (in an open-ended structure) or would there be a regional/geographic balance, a balance between Annex I (industrialized) and non-Annex I (developing) countries, or a balance of disciplines?

- Method of review: Would the TAPs use formal scientific peer review, formal review by SBSTA, or no review at all?
- Committee structure: Would the TAPs have a fixed number of members or a fixed steering committee with flexible ability to create sub-panels? Or, would the number of TAPs be flexible so as to accommodate new questions that might arise? Further, how many members would the TAPs have?
- Duration: Would the TAPs be permanent, have a fixed duration, or be of contingent duration depending on periodic SBSTA review?
- Line of authority: Would the TAPs report to SBSTA through the IPCC or would they report directly to SBSTA?
- Terms of reference: Would SBSTA establish a fixed terms of reference or would the TAPs determine their own terms of reference?

These issues encompassed a wide array of divergent expectations about what makes for credible knowledge and what makes for legitimate policy. Not all of these issues carried equal weight. Some were merely raised as organizational possibilities during SBSTA deliberations. Others achieved the status of formal proposals. Over time, a few alternatives coalesced into a small number of competing proposals. Among contested issues, the most prominent—that of membership—separated many Western countries, who favored membership based on demonstrated disciplinary achievement, from many developing countries, who favored establishing a fixed membership of government-nominated experts with explicit geographic representation and explicit balance between developed and developing country representatives. Although both sides offered strong rationales for their positions, and a number of compromise proposals were put forward, no resolution of this division was ultimately achieved. Negotiators eventually shelved discussion of TAPs for future consideration and turned to an alternative approach to the production of expert advice.

The failure to constitute two new TAPs left participants in SBSTA in a quandary. They were not, in general, willing to abandon the possibility of deriving expert input for the decisions of the climate regime. Nor did they prove willing to revert back to the IPCC as the sole source of scientific and technological advice. Instead, negotiators' deliberations about the organization of expert advice turned in new directions. First, at SBSTA's third meeting, in conjunction with the second meeting of the Conference of the Parties to the Framework Convention in July, 1996, participants agreed to establish a "Roster of Experts." The purpose of this roster was to establish a pool of experts on which SBSTA could draw to answer particular questions, should it so choose. The roster works as follows.

Governments nominate experts to the roster. No limit has been placed on either the number of experts a government may nominate nor the areas of expertise a government's nominations may cover. Once SBSTA participants have identified an issue of interest, the Framework Convention Secretariat then selects "appropriate" experts to constitute a panel and prepare a response to SBSTA's questions. To date, SBSTA has received reports from five such panels: three on issues of technology transfer, two on issues related to methods for accounting for national emissions of greenhouse gases.

The second response to the demise of the TAPs proposal was to establish two "informal working groups" on methodologies and technology transfer. These working groups hold no formal authority but bring together government representatives interested in the particular issues at hand for informal (i.e. off the record) discussions. These groups meet frequently during regular SBSTA meetings (which occur two to three times per year) but are typically attended by only a small fraction of the governments attending SBSTA. Under the auspices of these informal working groups, SBSTA participants have continued to pursue ongoing deliberations and have succeeded in moving forward on several proposals to constitute new scientific advisory arrangements in three important areas of expert involvement in international environmental policymaking: risk assessment, standard methodologies, and technology transfer.

Risk assessment

Since their failure to establish a common approach to TAPs, SBSTA participants have pursued separate agendas for risk assessment, standard methodologies, and technology transfer. With regard to risk assessment, negotiators have primarily sought to work out an appropriate relationship between SBSTA and the IPCC. In 1991, as described earlier, after the creation of the Intergovernmental Negotiating Committee as the institutional home of the climate negotiations, the IPCC reorganized its activities around the provision of periodic climate risk assessments. However, the creation of SBSTA by the Framework Convention raised a barrage of questions about the ongoing status of the IPCC within the climate regime. Would SBSTA organize its own risk assessments with an eye to competing with the IPCC? If not, what would relations between the two organizations look like? Would the IPCC remain independent of SBSTA or would it become subsidiary to it? Would IPCC reports retain any formal authority within the climate regime? If so, would they be subject to review by SBSTA or not?

These questions led to extensive debate within SBSTA about the process for producing and validating risk assessments within the climate regime. Many governments, largely from the North, viewed the IPCC as the most authoritative, international expert body on climate change and insisted that it continue to produce risk assessments for the climate regime unhindered by interference from SBSTA. However, other governments, predominantly of developing countries, continued to view the IPCC as inattentive to their concerns and as overly dominated by Northern experts and their regionally-biased interpretations of

climate change. They wanted answers to questions such as the regional distribution of climatic changes about which the IPCC seemed unwilling to make clear statements. Still other governments, mostly from oil-producing states, questioned the validity of the IPCC's conclusions regarding the existence of climate change at all.

The ensuing compromise with regard to the IPCC contained several parts. The IPCC would continue to provide risk assessments of the climate issue every five years. Technical advice in other areas, however, particularly as regards technology transfer (which has always remained a prominent agenda item of developing countries), would be dealt with through alternative, SBSTA-based processes. SBSTA would act as the interface between the IPCC and the climate regime, with the IPCC submitting its reports to SBSTA. SBSTA participants would then decide whether to recommend the reports to other international institutions, in what form to pass them on, and whether or not they wished to supplement the IPCC reports with their own interpretations and conclusions or with reports from other bodies. Finally, SBSTA and the IPCC would establish a joint liaison group, composed of representatives from the Secretariat of the IPCC, the Bureau of the IPCC, the Secretariat of the Framework Convention, and SBSTA. This group would be responsible for establishing working arrangements between the two organizations.

Standard methodologies.

The UN Framework Convention on Climate Change mandates that all signatories compile “national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of Parties (Mintzer and Leonard 1994).” In addition, in pursuing their objectives under the climate regime, countries have identified a wide array of other areas in which cooperation would be facilitated by common standards or approaches to technical analysis. These include methods for: assessing climate impacts and vulnerability, assessing climate-friendly technologies, assessing the effectiveness of national policies to reduce greenhouse gas emissions, compiling national communications to the Framework Convention process, assessing activities implemented jointly under emissions trading projects, and several others.

Debates within SBSTA over the development of international standards have encompassed a variety of different issues. Participants have disagreed over the content of specific standards, the means by which standards would be created, the institutions which would be delegated the task of standardization, the prioritization of standards development, and the degree to which governments would be legally bound to specific standards—i.e., would standards be for informational purposes only, would they constitute defaults to be used in the absence of alternative choices by individual governments, or would they be binding on parties?

One of the most advanced, and also contentious, areas of standards development has been how to assign responsibility for greenhouse gas emissions. The negotiation of the Framework Convention itself settled numerous issues for these standards. As the passage quoted at the beginning of this subsection suggests, the Framework Convention establishes several principles to guide methodology development: (1) it assigns responsibility to nations, as opposed to individuals or firms; (2) it establishes that governments will assess their own national emissions, as opposed to an international body assessing each nation's emissions; (3) it assesses responsibility on the basis of sources and sinks of greenhouse gases, not just sources; (4) it establishes that only anthropogenic sources and sinks, not those seen as natural, will count towards national responsibility; (5) it requires assessing emissions of all greenhouse gases, not just carbon dioxide, except for chemicals already covered by the Montreal Protocol; (6) it requires that countries use comparable (and, hence, not necessarily identical) methodologies; (7) and it requires that standard methods be established by the Conference of the Parties (and not some other international body).

However, many debates remained to be sorted out by SBSTA. Participants have agreed that the IPCC will be responsible for constructing (and continually updating) a default set of methods which must be ratified by the Conference of Parties. These methods need not be used if a government determines that it has a more accurate method and can specify adequately how its method differs from the IPCC's. However, no criteria has been established for judging either the relative accuracy of methods or the adequacy of documentation provided by a government. In practice, these judgments are left up to the governments themselves. Although SBSTA participants have decided that national inventories will be subject to international review, that review is facilitative and not binding on governments. Several questions directly related to the content of the emissions inventory standards, such as how to deal with bunker fuels from transnational air and sea transport and harvested wood products, have also been included on SBSTA's agenda. The former raises questions about who will be assigned responsibility for emissions that do not occur inside the territory of any particular country. The latter raises questions about who will be held accountable for emissions that result from deforestation in cases in which the actual emission of carbon dioxide into the atmosphere takes place in a different country than the original deforestation. In these cases, negotiators have agreed that important value choices are at stake and that SBSTA, and not the IPCC "technical" groups working out the details of the standards, is the proper forum in which to address them. However, no criteria for determining whether future value choices are sufficiently important to be shifted from the IPCC to SBSTA have been established, leaving resolution of this issue to an ad hoc, case by case basis.

Technology transfer

Finally, debates within SBSTA have addressed a number of issues around technical assistance and technology transfer, although technology transfer has dominated most of the discussions. These issues constitute one of the most difficult topics under deliberation by SBSTA. Technology is considered essential to solving the public policy challenges created by climate change. Establishing effective means of promoting the creation and adoption of new technologies is difficult, however, and particularly so when what is entailed is the transfer of technologies from one country to another. How can technology transfer be carried out effectively? Whose norms will govern technology transfer? Will such transfers take place in the public or the private sector (and whose definitions of public and private will govern policy development)? How will the effectiveness of transfer be assessed, and at what point in the transfer will this be done? How will technology transfer be embedded in wider questions about distributing the costs and benefits of climate change?

Debates over technology transfer have addressed a number of these important underlying issues within the context of more specific proposals: for example, providing information to developing countries about the availability of greenhouse-friendly technologies, assessing the effectiveness and appropriateness of technologies for specific localities, and determining how much credit countries will receive under the treaty for technologies transferred through joint implementation and emissions trading projects.¹¹ Debates have also taken place over questions such as how countries' needs for technology transfer would be determined.

Over time, SBSTA participants have reached agreement on a number of fronts. A Dutch NGO was contracted to conduct a survey asking developing countries to identify what they believed were their technology needs. This survey has recently been completed, and SBSTA participants are now working on what to make of the data compiled. An internet database of industry contact points is in the process of being set up to make information available to developing countries about greenhouse-friendly technologies. SBSTA participants were also able to reach agreement on the desirability of a report detailing current trends in both government-to-government foreign aid related to technology transfer and foreign direct investment. This report was produced by six experts from developing countries selected by the Framework Convention Secretariat from the "Roster of Experts" described earlier. Finally, SBSTA participants have recently agreed to recommend to the Conference of Parties the creation of a new technology information center for climate-friendly technologies.

Coproducing Science and Politics

Debates within SBSTA over risk assessment, international standards, and technology transfer exemplify three challenges that are inherent in any effort to

mobilize science to support public policymaking, which can be loosely categorized as those of contingency, trust, and moral order. This categorization stems from recent work in the field of science studies. The contingency of science advice has been most fully explored in adversarial political and legal systems such as the United States. Studies of expert knowledge in US policymaking have frequently observed the deconstruction of scientific evidence in the course of contests over planned government action. In such contexts, which share many similarities with the contentious negotiations that have taken place within SBSTA, efforts to highlight discrepancies and inconsistencies, emphasize uncertainties, and challenge the adequacy of experimental techniques or the motives of expert advisors are commonly used to discredit scientific testimony and to point out the indeterminacy of scientific findings (Nelkin 1992; Jasanoff 1990).

Although, in principle, science depends on data and models to definitively establish the truth of particular scientific knowledge claims, detailed, empirical studies of the conduct of scientific research have found that, in practice, scientific claims in the making are inevitably subject to varying interpretation. While much science is never subjected to the rigorous public questioning common in organizations like SBSTA, these studies suggest that grounds for skepticism about particular knowledge claims can almost always be found. For example, participants in scientific and public controversies often criticize evidence from experiments and models on grounds of either the validity of the assumptions that go into their interpretation or the skill of the practitioner in carrying them out (Collins 1985). More recently, Miller et al. (1997) have argued that, in addition to scientific data and models, the organization of science and its place among broader institutions in public life are equally subject to the problem of contingency. Policy-analytic tools and methods, information on public values and perceptions, rules of participant selection among experts, policy elites, and the public, and boundaries between disciplines, between science and politics, and between expert and lay domains of authority are all open to multiple interpretations and conflict (see also Gieryn 1999). Certainly many of these subjects have proven contingent within SBSTA's debates.

Likewise, science studies research has shed light on the varying means necessary to secure trust and credibility among expert communities, between experts and policy communities, and between elite institutions and lay publics. Scientific knowledge is commonly assumed to derive its credibility from its objective or universal validity. Empirical studies of scientific and political controversies have demonstrated, however, that the credibility of scientific claims often differs across audiences, is interactionally constituted in particular contexts, and frequently depends on reference to deeply-embedded cultural norms and practices for securing trust and warranting truth (Shapin 1996, 1994; Jasanoff 1986). Credibility, then, is something which can be achieved only in relevance to particular circumstances and particular expectations regarding the trustworthiness of expert knowledge.

Finally, the organization of scientific advisory processes also raises important issues of moral or political order. Science is value-laden in the sense in that it privileges certain voices, certain ways of knowing, and certain interpretations of nature over others. The very act of using science to inform public choices confers power upon some actors in the policy process while removing it from others. This empowering and disempowering function of science raises questions of equity, legitimacy, and authority as science becomes more central to shaping public policy and the organization of politics in democratic societies. Science studies research has revealed that questions often assumed to lie within the domain of inquiry into nature—e.g. questions regarding the kinds of evidence used to determine the validity of scientific knowledge claims or the expertise appropriate to the resolution of certain problems—often have significant normative dimensions (Jasanoff 1996b, 1990; Wynne 1995). Consequently, normative issues such as discretion, representation, participation, and transparency have emerged as central to the organization of scientific advisory bodies and the admission of scientific testimony in legal and administrative proceedings (Jasanoff 1996b, 1996c, 1990; Porter 1995; Ezrahi 1990).

Although problems of contingency, trust, and moral order are, in principle, intrinsic to all science-based policy enterprises, they have ceased to pose fundamental threats to political legitimacy in industrial countries. Government officials, scientists, and citizens in most Western nations—even when they disagree on the details of scientific interpretation—are able to draw upon culturally-specific systems of rhetoric and practice for warranting scientific knowledge in policy contexts, for securing the trustworthiness and credibility of institutions that use science, and for rendering the uses of political power consistent with norms of legitimate governance, such as transparency, openness, and public participation (Brickman et al. 1985; Jasanoff 1986; Shapin 1994; Wynne 1982). Meanwhile, public institutions have become active in setting criteria for legitimating scientific evidence, selecting experts, organizing review procedures, demarcating the mandate and authority of scientific and political institutions, and numerous other choices in organizing science advice (Jasanoff 1996b, 1990; Gieryn 1996, 1999). Ideas about the proper organization and evaluation of scientific advisory processes, in other words, have become through continuous use deeply embedded in many national political cultures.

What SBSTA provides is a forum in which participants in the climate regime have been able to overcome these challenges, however minimally. Over time, negotiators have reached a number of settlements that have established practical ground rules for instituting expert advisory processes in international relations. SBSTA's experiences thus illustrate one route by which the coproduction of science and politics occurs in contemporary international relations. The question remains, however, whether or not SBSTA's experiences provide a workable model for other international institutions searching for ways of incorporating science into their policymaking processes.

A Model for Future Global Governing Arrangements?

SBSTA's emergence as a novel kind of institutional space in international relations—one in which governments and NGOs deliberate about the proper organization of expert advisory arrangements in international institutions—raises important questions about how we should evaluate its design and performance. Does SBSTA provide a model for future global governing arrangements? Are policymakers evolving new, globally shared norms and ideas about international scientific advisory processes? Or is the effort to forge such processes simply reinscribing Western notions of science advice in international contexts, exacerbating tensions in international politics? Do some approaches to designing scientific advisory processes appear to generate more stable or effective institutions? Do others appear to lead more frequently to protracted controversies or poor policy outcomes?

If the global community is going to successfully delegate its problem-solving needs to a cadre of environmental experts, these delegates will have to walk a fine line between two countervailing tendencies: (1) promoting adherence to a broad normative commitment that science, in general, provides an important resource for pursuing the objectives of international regimes; while simultaneously (2) making it possible for participants from very different origins to critically examine specific arrangements for producing, validating, and using scientific knowledge against their own criteria of normative acceptability and instrumental rationality. To accomplish this balancing act, participants in international institutions—scientists, government officials, and citizens alike—need to be aware that expert knowledge and advisory arrangements embed tacit, value-laden assumptions about both nature and society, that the provision of science advice is contingent and often subject to multiple interpretations, and that trust and credibility are interactionally constituted, often according to different criteria among far flung public audiences. As Jasanoff and Wynne (1998, 77) have put it, the successful mobilization of science in the climate regime, in the face of the challenges posed by contingency, trust, and moral order, relies for its authority on “the patient construction of communities of belief that provide legitimacy through inclusion rather than exclusion, through participation rather than mystification, and through transparency rather than black-boxing.” Without these reflexive insights, integrating global scientific advisory processes into the norms and practices of policymaking will be made considerably more difficult. Does SBSTA offer opportunities for achieving this goal?

Examined individually, the policy resolutions achieved by SBSTA appear as no more than partial, often temporary, negotiated settlements, seemingly leaving little room for evaluation along these more general lines. Divergent national expectations and interests, perceived high stakes, weak global institutions, and rapidly changing global norms and practices all help render problematic the possibility of universally credible and authoritative approaches to science advice.

In such contexts, contingent compromises, reflecting no more than a sorting out of interests around a specific issue at a specific time, seem to be all that SBSTA has to offer. Examined collectively, however, SBSTA's deliberations illustrate several patterns of interaction that offer a more generalizable model for future institutional design.

Deconstruction.^{iv} Science advice, as we well know, cannot be wholly purified of embedded values. Normative concerns are always at stake in the mobilization of scientific knowledge in public policy contexts (Jasanoff 1996b, 1990). One criteria for evaluating SBSTA is the degree to which its institutional design allows participants to negotiate their tacit, often deeply embedded commitments to alternative models of the proper linkages between science and policy and competing interpretations of human-nature interaction. Does SBSTA help reveal underlying value choices? To whom? For what purposes? Does it help reduce controversy over particular proposals for advisory arrangements in ways that buttress the credibility of the resulting organizations?

SBSTA operates by consensus rules of procedure, effectively providing each participating government with veto power over any proposed arrangement for science advice. Tacit social conventions among diplomats discourage representatives of individual countries from openly opposing the will of the rest (unless, of course, one represents "the world's only superpower"). Yet, this veto power has substantially strengthened the ability of individual governments to make their preferences known, during SBSTA debates and behind the scenes, regarding the proper organization of science advice. During SBSTA's fifth meeting in early 1997, I witnessed the ability of representatives from several small developing countries and from the so-called small island states to oppose strategies for securing expert advice that did not meet their perceived priorities or normative perspectives. Numerous developing countries, for example, opposed creating technical advisory panels organized around well-defined areas of disciplinary expertise for fear that these bodies would come to be dominated by acknowledged Northern experts. Similarly, when the United States and the European Union wanted to move forward on developing a methodology for assessing joint implementation of projects under an emissions trading system and for verifying treaty compliance, the representative from the Marshall Islands objected on the ground that methods for assessing the risks of sea level rise were far more important for his country and that they must also receive a high priority.

The ability of individual governments to block the adoption of particular proposals in SBSTA proceedings facilitates their ability to open up discussions of specific expert advisory processes, e.g., to raise competing perspectives on how to such advisory processes should be structured to provide credible or authoritative knowledge. SBSTA's institutional design thus opens the possibility of exposing underlying value choices that might otherwise remain hidden. In short, SBSTA provides a forum in which countries that might not otherwise be involved in organizing scientific advisory processes can articulate publicly (backed up with

the force of their frequently non-exercised veto) just what kind of expertise would facilitate their own efforts to respond effectively to climate change. Ignoring their voices would weaken the legitimacy of the climate regime, even if the matter never came to a formal vote. At the same time, by helping to reveal important normative disagreements--over such issues as participation, transparency, and priority--earlier rather than later in the design of scientific advisory arrangements, SBSTA may help avoid subsequent losses of public trust and legitimacy.

On the flip side, observers and participants have criticized SBSTA's consensus rules of procedure. SBSTA's "one vote-one veto" rule is largely responsible for its slow progress in establishing working scientific advisory arrangements.

Compared to its sister organization under the Convention on Biological Diversity, for example, which has an almost identical treaty mandate, SBSTA has moved at a glacial pace. An important upshot of participants' difficulties in constituting advisory arrangements under SBSTA has been that the progress of negotiations in some areas of the regime has slowed when countries have insisted on waiting for expert advice that SBSTA could not yet provide. However, in an issue area such as climate change in which the norms and practices of global environmental science and management are jointly contested, uncertain, and in rapid flux, forcing governments to address both the normative and the practical dimensions of science advice may have added to the overall credibility of the climate regime. Over the long haul, SBSTA can be accounted successful if its scientific advisory arrangements, although taking longer to get started, produce knowledge that is more widely credible among diverse populations around the globe.

Additionally, in some cases, the failure to submit questions about scientific advisory arrangements within the climate regime to SBSTA for resolution has carried important consequences. For example, on occasion, scientific and technical advisory groups have chosen not to submit difficult and contested issues to SBSTA, for fear of the stalemate that might result, only to have their decisions later come back to haunt them. One area where this has occurred is in the construction of methodologies for counting national emissions of greenhouse gases. Choices among competing methods typically have clear implications for the allocation of national responsibility within the climate regime. Consequently, they are understandably contentious. Participants in some of the IPCC working groups responsible for developing these methodologies have decided on several occasions not to submit questions about alternative methods to SBSTA out of a perception that such submission would entail onerous delays. In at least one case, however, this overly unreflective attitude toward SBSTA backfired when unresolved issues erupted into public controversy and damaged the IPCC's credibility in ways that might have been avoided by early negotiations within SBSTA.

Observers in other contexts have suggested that expert consensus in international negotiations is more easily obtained if expert agreement can be obtained prior to the politicization that occurs in high stakes policy decisions (Thacher 1976; Haas 1990a). This view privileges expert consensus too highly,

however, if that consensus is achieved by preventing scientific claims and arrangements from being subjected to sufficient critical scrutiny. Since scientific knowledge inevitably embeds tacit values and assumptions, too little politicization early on in the policy process will often mean that important potential fault lines among participants do not get identified and resolved. Occasionally, these fault lines may later emerge in contested form when political tensions do rise, potentially contributing to losses of public trust and credibility among certain audiences. Too much early politicization, however, can prevent the constitution of advisory arrangements and also potentially detract from the overall legitimacy of the climate regime. From a reflexive perspective which recognizes that expert knowledge and advisory arrangements are implicitly value-laden, SBSTA seems to offer a reasonable compromise between too little and too much politicization. This compromise allows many sources of disagreement to be identified and resolved through widespread and active government involvement in the process of organizing science advice but has not yet hamstrung the regime's activities.

If we accept that one of SBSTA's most important contributions is to help enable states to negotiate among tacit, deeply held commitments to alternative strategies for constituting scientific advisory arrangements, then we can propose further additional features of institutional design that might enhance this function. One suggestion would be to raise the number of developing country participants actively participating in all scientific and technical advisory panels constituted within the climate regime. In coming years, the climate regime seems likely to increasingly shift its focus toward socially and environmentally sustainable strategies for reducing the emission of greenhouse gases and adapting to the consequences of climatic variability. As it does so, local knowledge about heterogeneities in human values, social practices, and natural conditions from place to place will rise in importance relative to knowledge about global systems—for reasons of both effectiveness and legitimacy. Since SBSTA itself will never succeed in fully revealing even a small fraction of the tacit commitments embedded in climate science advice, it is also important that individual advisory arrangements adopt similar critical approaches that empower voices to speak to local heterogeneity in nature and society.

A second suggestion would involve improving the communication channels between SBSTA and the scientific advisory processes it constitutes and interacts with. When value conflicts arise in the context of scientific advisory choices, greater communication would allow SBSTA's participants to provide advice to experts about their needs and views, and even to make explicit political choices should those become necessary. A final suggestion is to continue to enhance the ability of developing countries to participate effectively in SBSTA. Important normative and political issues are at stake in SBSTA's activities, yet many developing countries continue to find participation difficult due to a variety of factors—e.g. the small number of representatives (often one) comprising their delegations to SBSTA; limited domestic expertise in important areas of scientific and technological research; and poorly developed channels of communication at home between citizens, delegates, and national expert and policy communities

around issues relevant to SBSTA deliberations (cf. VanDeveer 1998 on East European participation in the scientific advisory arrangements for the acid rain regime in Europe).

Learning and confidence-building.

The deconstruction of scientific advisory processes, if carried too far, can provide a basis for viewing science as inherently political and therefore render it untrustworthy in the eyes of some participants. To date, however, SBSTA appears to have managed to avoid this problem. Claims, for example, that Northern science represents a novel form of environmental colonialism—such as those made in 1991 by the Indian NGO, Centre for Science and the Environment, and picked up, in turn, in many developing countries during the negotiation of the Framework Convention—have been largely absent from deliberations within SBSTA. Although substantial debates have occurred over how to organize science advice, participants in SBSTA continue to express their support for the relevance of “neutral expertise” to the policy choices of the climate regime, and, as detailed above, they have achieved agreement on several arrangements for providing that expertise.

SBSTA’s principal counter to its critical tendencies has been to take recourse in scientific advisory arrangements over which SBSTA participants retain considerable authority. For example, the shift from TAPs to the “Roster of Experts” and “informal working groups” discussed earlier illustrates how SBSTA participants have opted to retain the bulk of deliberations about methodologies and technology transfer within SBSTA’s institutional procedures, rather than to delegate such deliberations to permanent advisory bodies which might be, to some degree, autonomous. Likewise, in using the “Roster of Experts,” SBSTA participants have decided to consult with outside experts only for specific, collectively agreed upon questions, narrowly delimiting the mandate of requests for information in scope and time. SBSTA participants have also agreed to thoroughly review the “Roster of Experts,” the activities of other expert working groups to whom SBSTA has delegated particular tasks (such as methodology construction or the conduct of surveys of technological needs in developing countries), as well as SBSTA’s own decisions, on a fairly frequent basis.

This contingent, incremental approach has allowed participants in SBSTA to move forward in providing expert advice in some areas relevant to the climate regime without being held hostage by disagreement in other areas or over the development of more permanent institutions. As a result, participants from various countries have been able to test proposed strategies for acquiring science advice on limited scales, learning which ones satisfy their own criteria of legitimacy and “neutrality” and building confidence in SBSTA and its various advisory arrangements. Through the Roster of Experts, SBSTA has been able to secure expert input on several important issues related to methodologies and technology transfer that participants have generally viewed as credible and reliable. Similarly, SBSTA has been able to work out several arrangements with

other international institutions to construct particular international standards relevant to the climate regime, including methods for counting greenhouse gas emissions, assessing climate impacts, and evaluating atmosphere-friendly technologies. Meanwhile, SBSTA's informal working groups have enabled government representatives to continue to deliberate about the need for more permanent arrangements, to present alternative proposals for such arrangements, and to negotiate settlements of contested issues.

The creation of permanent, independent expert advisory institutions might, if achievable, carry certain advantages in terms of long-term consistency and capacity-building. The provision of strong, independent sources of action and authority within the climate regime might also diffuse the power of governments. This could, if carried out in appropriate ways, strengthen the voices of a variety of non-governmental voices. The danger of such institutions, however, particularly in clearly demarcated scientific domains, is that they will unreflectively reiterate narrow Northern perspectives due to the inhomogeneous distribution of scientific and technological capacity around the world. In an arena with widespread global economic and political implications, the world may thus be better served by a slower, incremental approach that ensures that developing country voices (and NGO voices, to some degree) are heard, however weakly. Over time, SBSTA has demonstrated that its relatively unwieldy approach can help governments to work out their differences. Permanent, semi-independent institutions seem likely to be much more difficult to change in response to evolving experience with their use or to changing circumstances than the kinds of arrangements SBSTA has generated so far. Given the rapid changes occurring in global governance, this flexibility may help SBSTA remain effective over a much longer time period and much broader range of responsibilities.

Warranting credibility

SBSTA's third strength is its ability to make use of a wide variety of systems of rhetoric and practice for warranting knowledge claims. As noted earlier, culturally-specific norms and practices for securing trust and warranting truth often vary considerably from country to country. If the provision of science advice in international institutions can draw on these national systems of warrant in appropriate contexts, and can find ways to accommodate or integrate them in international policymaking discourses, it may significantly enhance the credibility of their knowledge claims among diverse publics around the world. In general, Western analysts and policymakers have tended to assume that systems of warrant for scientific knowledge are (and should be) entirely internal to science. Research in science studies has revealed, however, that political norms and institutions may also play an important role in enhancing the credibility of policy-relevant expert knowledge. For example, the rise of social regulation in the US in the 1970s demanded not only that policymakers make more intensive use of scientific knowledge in public decisions but also that public institutions become involved in setting standards for science in policy contexts. In this way, political

institutions became responsible for deciding what would constitute legitimate claims to public knowledge (Jasanoff 1990).

Participants in SBSTA have structured its activities to draw upon at least three repertoires of rhetoric and practice for warranting knowledge. First, SBSTA's institutional design mobilizes the political norms of democratic participation and consensus rule-making to strengthen the credibility of those scientific advisory arrangements about which participants are able to secure collective agreement. SBSTA is open to the participation of any government which has signed the Framework Convention. It is also open to the participation of representatives of any NGO which has registered with the Framework Convention Secretariat. This openness, combined with the requirement that decisions in SBSTA be achieved by consensus among governments before any action is taken helps secure the organization's credibility, at least among governments. Proposed scientific advisory arrangements which are ultimately agreed upon thus enjoy strong political backing at the outset, although there is no guarantee that this backing will continue as their work proceeds.

Perhaps the most important example of SBSTA's ability to mobilize political norms to enhance the credibility of scientific advisory arrangements relates to the IPCC. Although it had brought together many leading climate experts to participate in its activities, the IPCC was, by 1993-94, on the verge of becoming irrelevant within the climate regime. Developing countries, distrustful of the panel's processes for including their participation, had led the move to create SBSTA and to oppose any future role for the IPCC in climate policymaking. By acting as a buffer organization between the IPCC and the Conference of the Parties, SBSTA has been able to temper criticism of the IPCC in two ways: (1) by enabling developing countries to pose questions to the IPCC through SBSTA, thus providing a space for developing countries to voice alternative views about the IPCC's choices about what areas of expertise to prioritize; and (2) by requiring that IPCC reports receive SBSTA approval before being brought to the attention of the Conference of the Parties. In this way, the IPCC's tendency to reinscribe Western ideas of nature and governance is diluted, while its authority to make claims about the need for international cooperation in working out new global governing arrangements is strengthened (see also Miller forthcoming).

Second, SBSTA has helped governments mobilize culturally-specific systems for warranting knowledge in several areas by devolving responsibility for knowledge production to individual governments. In adopting this strategy, SBSTA has faced an explicit trade-off between tight, uniform international standards, on the one hand, and divergent national expectations about the production of public knowledge on the other. The development of international standards has been credited with a variety of positive outcomes in international cooperation (Chayes and Chayes 1995). Standards can help harmonize state practices, potentially rendering state behavior more transparent and permitting easier and more efficient coordination in global policymaking. Standards can also help states build capacity to implement global agreements. At the same time, however, the use of

standards can also backfire. If standards come to be seen as resting on inappropriate assumptions or as reflecting inappropriate power relations, their use can damage the credibility of the regime. And, the misapplication of standards to domains where they do not apply can lead to policies that blatantly disregard aspects of perceived reality (see, e.g., Zehr 1994, describing how early satellite data illustrating the ozone hole was regularly ignored as spurious). Finding universally acceptable standards can also prove difficult, as SBSTA's experience has demonstrated, as deeply embedded values and interests shape countries' perspectives on ideas of great importance to standards development, such as causality, agency, and responsibility.

For these reasons, SBSTA has pursued the development of international standards but has opted in nearly all circumstances to avoid making those standards binding on national governments. In developing standards for measuring national emissions of greenhouse gases, for example, SBSTA, as pointed out earlier, adopted international standards developed by the IPCC as default guidelines only. In addition, national governments, and not the IPCC or any other international body, are responsible for compiling inventories of national emissions. Combined, these two provisions have allowed national governments to deviate dramatically from the IPCC standards, and many have subsequently done so where they believe they have a method which is more credible for their own national context. Similarly, although national inventories are subject to international review once submitted to the Conference of the Parties, participants in SBSTA have decided that the outcome of that review will be facilitative only and not legally binding. Consequently, national governments retain almost complete autonomy in the production of national inventories of greenhouse gas emissions. This could be read merely as an exercise of political control over potentially sensitive numbers (designed, even, to allow countries to fudge their data). However, the radically divergent approaches that states have adopted in preparing their inventories suggests that giving countries autonomy also allows them to compile their data in ways that are consistent with nationally-specific expectations for the production of public knowledge. Time, and concerted policy actions to hold countries uniformly accountable for their emissions, may enable the nation-specific approach to achieve an eventual and more trustworthy convergence. Or, they may reveal deep fault lines between national approaches that reflect important value commitments in need of negotiation.

Finally, SBSTA participants have also, in some areas, succeeded in mobilizing other systems of warrant by retaining a degree of flexibility in SBSTA's approaches to configuring scientific advisory arrangements. For example, as described earlier, the initial proposal to create two new technical advisory panels (TAPs) alongside the IPCC generated strong disagreement over the criteria to be used to determine their membership. Industrialized countries generally favored disciplinary balance. Developing countries generally favored regional balance. This disagreement ultimately proved to be fatal to the proposal. Participants responded by creating a "Roster of Experts" from which the Framework Convention Secretariat selects an "appropriate" panel of experts to address

particular issues questions agreed upon in SBSTA deliberations. This has created sufficient flexibility in the process to allow several different criteria (geography, area of expertise, developed/developing, etc.) to enter into the selection of experts depending on the circumstances surrounding each specific task. For example, for its report on current trends in technology transfer, six experts from developing countries were chosen. This flexibility helps to ensure an appropriate procedural response to contingency: committee membership can fluctuate from task to task and credibility for report conclusions can be flexibly promoted through the mobilization of political considerations such as involving representatives from specific countries or regions on the panel.

Conclusion

Conflict and controversy over science are often viewed as manifestations of the introduction of political bias into the interpretation of scientific data and theories. SBSTA itself is often criticized along these lines by participants in its activities. The difficulty participants have had in reaching agreement on arrangements for producing, validating, and using scientific knowledge within the climate regime is frequently taken as evidence of the body's politicization and consequent lack of scientific authority.

To evaluate SBSTA solely in terms of its ability to avoid conflict and to produce uncontested advisory arrangements, however, is to misunderstand both the nature of science advice and SBSTA's significance within the climate regime. The application of science to global affairs cannot be understood as a mere exercise in "speaking truth to power." Rather, challenges of contingency, trust, and moral order pervade efforts to use science to generate shared understandings of global environmental risks and to underpin planet-wide arrangements for environmental management. The creation of SBSTA has led to an important innovation for dealing with these challenges within the climate regime by opening up a space in which issues related to uncertainty, credibility, and the politics of science can be debated and negotiated within the context of broader regime activities. Few if any participants in SBSTA's activities currently conceptualize SBSTA with this degree of reflexivity. Nevertheless, SBSTA has become a forum for negotiating temporary settlements of what will count as science, in practical terms, within the climate regime, and how science will relate to the formulation and implementation of global policy.

The detailed account of SBSTA's activities presented in this chapter thus illustrates the more general proposition with which I began the chapter: the principles and practices that define the meaning of concepts like "science" and "governance" are not shared widely around the world. Rather, to the extent that they come to be shared at all, it is as the upshot of ongoing negotiations over specific technical questions in particular institutional settings. Cognitive models of science and politics are thus coproduced alongside the specific institutional arrangements that link them to people's activities around the world. What

environmental science comes to mean in global society, and how it comes to relate to global governance, will be determined largely through the incremental progress of organizations such as SBSTA.

SBSTA's experiences demonstrate, more than anything else, that policymakers cannot afford to take questions of institutional design for granted when organizing global science advice. SBSTA has made strides toward the establishment of globally shared knowledge about the environment and about policy responses to it by incrementally and contingently working out ways for governments to sort out their often deep-seated political differences. This has been particularly important across North-South divides within the climate regime. SBSTA's (to date limited) successes in this regard stem from its development of institutional practices that facilitate the questioning of particular scientific advisory arrangements; that are incremental and responsive to a broad range of participants' views; and that allow science-based policy legitimation to take advantage of a wide array of alternative rhetorics and practices for warranting knowledge claims in public discourse. These approaches have all helped SBSTA achieve agreement on approaches for acquiring expert advice in the climate regime that are broadly credible among governments from around the world. In this regard, SBSTA is particularly notable for its success in avoiding an unreflective, unintentional re-inscription of Western ideas of both climate change and the right relations between science and governance in international institutions. These approaches might fruitfully be adapted in other, non-environmental regimes as well, such as the International Monetary Fund, whose dissemination of Western market-based models of financial exchange has achieved less than stellar success in integrating developing countries into the global economy.

SBSTA's institutional design is by no means perfect. However, as many of the examples described here indicate, choosing among scientific advisory arrangements always involves important trade-offs. Consequently, the kind of tentative, flexible, responsive, incremental approaches offered by SBSTA may very well be the best places to begin. This is particularly true in areas like climate change, for which the norms and practices of global governance are themselves contingent, uncertain, and in rapid flux and for which potential solutions will ultimately require commitments on the part of a significant majority of the world's inhabitants and a restructuring of some of the core functions of modern industrial economies. Western scientists and policymakers are familiar with the negotiated, partial, confidence-building approaches that have been necessary in addressing complex political problems like U.S.-Soviet arms control or Middle East peace. SBSTA's experiences suggest that similar approaches are equally, if not more, necessary for organizing science to address environmental policy problems on global scales.

SBSTA's activities can be improved, to be sure, through experience. For example, one clear assumption made in almost all of SBSTA's activities is that all national governments are as responsive to their citizenry as we expect governments in the West to be. In many countries, however, including many

Western countries, communication channels and lines of authority and accountability between government officials and various groups within the state vary dramatically in their ability to foster responsive governance. Whether it is through SBSTA or some other institutional process, the success of efforts to promote sustainable development and environmental protection worldwide will ultimately depend on being able to subject these relationships to the same kind of scrutiny that a body like SBSTA has enabled for science advice on climate change.

Appendix: Documentary Sources

UN Documents:

Documents of the Subsidiary Body for Scientific and Technological Advice, UN Framework Convention on Climate Change:

FCCC/SBSTA/1995/3 Report of the Subsidiary Body for Scientific and Technological Advice on the work of its first session held at Geneva from 28 August to 1 September 1995.

FCCC/SBSTA/1996/2 Establishment of intergovernmental technical advisory panel(s)

FCCC/SBSTA/1996/3 National communications from Parties included in Annex I to the Convention: Report on the guidelines for the preparation of first communications by Annex I Parties.

FCCC/SBSTA/1996/4 Initial report on an inventory and assessment of technologies to mitigate and adapt to climate change.

FCCC/SBSTA/1996/5 Activities implemented jointly under the pilot phase: Options for reporting guidelines.

FCCC/SBSTA/1996/6 Scientific assessments: Cooperation with the Intergovernmental Panel on Climate Change.

FCCC/SBSTA/1996/7 Scientific assessments: Consideration of the second assessment report of the Intergovernmental Panel on Climate Change.

FCCC/SBSTA/1996/8 Report of the Subsidiary Body for Scientific and Technological Advice on its second session

FCCC/SBSTA/1996/9 Communications from Parties included in Annex I to the Convention: Guidelines, schedule and process for consideration.

FCCC/SBSTA/1996/9/Add.1 Communications from Parties included in Annex I to the Convention: Guidelines, schedule and process for consideration, Addendum.

FCCC/SBSTA/1996/10 Progress report on issues in the programme of work of the Subsidiary Body for Scientific and Technological Advice

FCCC/SBSTA/1996/10/Add.1 Progress report on issues in the programme of work of the Subsidiary Body for Scientific and Technological Advice, Addendum

- FCCC/SBSTA/1996/13 Report of the Subsidiary Body for Scientific and Technological Advice on the work of its third session Geneva, 9-16 July 1996.
- FCCC/SBSTA/1996/15 Activities implemented jointly under the pilot phase. Uniform reporting format. Note by the secretariat.
- FCCC/SBSTA/1996/16 Methodological issues: longer-term programme of work.
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- FCCC/SBSTA/1996/Misc.1 Activities implemented jointly under the pilot phase. Views from Parties on a framework for reporting. Note by the secretariat.
- FCCC/SBSTA/1996/Misc.3 Establishment of intergovernmental technical advisory panel(s). Comments from Parties. Positions of the Group of 77 and China, and of the United States of America. Note by the secretariat.
- FCCC/SBSTA/1996/Misc.4 Scientific assessments. (a) Consideration of the Second Assessment Report of the Intergovernmental Panel on Climate Change. (b) Research and Observation issues. National Communications. Establishment of a roster of experts. Development and transfer of technologies. Comments from Parties. Note by the secretariat.
- FCCC/SBSTA/1996/Misc.5 Methodological Issues. Comments from Parties and an international organization. Note by the secretariat.
- FCCC/SBSTA/1996/Misc.5/Add.1 Methodological Issues. Comments from Parties and an international organization. Note by the secretariat.
- FCCC/SBSTA/1997/2 Cooperation with Relevant International Organizations. Progress report on research and systematic observation. Note by the secretariat.

- FCCC/SBSTA/1997/3 Activities implemented jointly under the pilot phase. Uniform reporting format. Note by the secretariat.
- FCCC/SBSTA/1997/4 Report of the Subsidiary Body for Scientific and Technological Advice on the work of its fifth session, Bonn 25-28 February 1997.
- FCCC/SBSTA/1997/6 Report of the Subsidiary Body for Scientific and Technological Advice on the work of its sixth session, Bonn 28 July-5 August 1997.
- FCCC/SBSTA/1997/8 Cooperation with Relevant International Organizations. Monitoring of greenhouse gases in the atmosphere. Note by the secretariat.
- FCCC/SBSTA/1997/9 Methodological issues. Progress report.
- FCCC/SBSTA/1997/10 Development and transfer of technologies. Progress report.
- FCCC/SBSTA/1997/11 Roster of experts. Experience of the secretariat in its use
- FCCC/SBSTA/1997/12 Activities implemented jointly under the Pilot Phase. Synthesis report on activities implemented jointly. Note by the secretariat..
- FCCC/SBSTA/1997/14 Report of the Subsidiary Body for Scientific and Technological Advice on the work of its seventh session, Bonn 20-28 October 1997.
- FCCC/SBSTA/1997/Misc.1 Technology and technology information needs. Comments from a Party. Note by the secretariat.
- FCCC/SBSTA/1997/Misc.2 Cooperation with the Intergovernmental Panel on Climate Change. Long-term emissions profiles. Comments from Parties. Note by the secretariat.
- FCCC/SBSTA/1997/Misc.3 Activities implemented jointly under the pilot phase. Uniform reporting format. Methodological issues. Comments from Parties.
- FCCC/SBSTA/1997/Misc.4 Cooperation with the Intergovernmental Panel on Climate Change. Structure and content of the Third Assessment Report by the IPCC. Note by the secretariat.
- FCCC/SBSTA/1997/Misc.5 Activities implemented jointly under the pilot phase. Submission by the Group of 77 and China. Note by the secretariat.

FCCC/SBSTA/1997/INF.5 Development and Transfer of Technologies. Proposal from a Party. Draft decision regarding the transfer of technology. Note by the secretariat.

FCCC/SBSTA/1997/INF.6 Roster of experts: Nominations to the roster.

Technical Papers:

FCCC/TP/1997/1 Trends of Financial Flows and Terms and Conditions Employed by Multilateral Lending Institutions First Technical Paper on Terms of transfer of technology and know-how.

FCCC/TP/1997/2 Methodological issues. Temperature adjustments. Technical Paper.

FCCC/TP/1997/3 Technological issues. Adaptation Technologies. Technical Paper.

FCCC/TP/1997/5 Methodological issues. Synthesis of information from National Communications of annex I Parties on sources and sinks in the land-use change and forestry sector. Technical Paper

FCCC/TP/1998/1 Technical paper on terms of transfer of technology and know-how Barriers and opportunities related to the transfer of technology

Earth Negotiation Bulletin:

The Earth Negotiation Bulletin provides summaries of ongoing international negotiations related to environmental issues. Copies of the Bulletin can be obtained at the website of the International Institute for Sustainable Development (<http://www.iisd.ca/linkages>). Individual authors and editors are listed in an appendix to each issue of the Bulletin. Negotiations related to the UN Framework Convention on Climate Change are summarized in Volume 12. Specific issues relevant to the activities of SBSTA include:

Volume 12. Number 23. 1st Session SBSTA & SBI. August 28 - September 01, 1995. Geneva, Switzerland.

Volume 12. Number 26. 2nd Session SBSTA & SBI. February 27 - March 04, 1996. Geneva, Switzerland.

Volume 12. Number 39. AGBM 5, SBI 4, SBSTA 4, AG13 3. December 09 - 18, 1996. Geneva, Switzerland.

Volume 12. Number 40. 5th Session SBSTA & SBI, AG13 4. February 25 - 28, 1997. Bonn, Germany.

- Volume 12. Number 46. 6th Session SBSTA & SBI, AG13 5. July 28, 1997.
Bonn, Germany.
- Volume 12. Number 47. 6th Session SBSTA & SBI, AG13 5. July 29, 1997.
Bonn, Germany.
- Volume 12. Number 48. 6th Session SBSTA & SBI, AG13. 5 July 30, 1997.
Bonn, Germany.
- Volume 12. Number 49. 6th Session SBSTA & SBI, AG13. 5 July 31, 1997.
Bonn, Germany.
- Volume 12. Number 56. 7th Session SBSTA & SBI. October 20, 1997. Bonn,
Germany.
- Volume 12. Number 57. 7th Session SBSTA & SBI. October 21, 1997. Bonn,
Germany.
- Volume 12. Number 58. 7th Session SBSTA & SBI. October 22, 1997. Bonn,
Germany.
- Volume 12. Number 60. 8th Session of the AGBM, SBSTA 7. October 23, 1997.
Bonn, Germany
- Volume 12. Number 61. 8th Session of the AGBM, SBSTA 7. October 20, 1997.
Bonn, Germany.
- Volume 12. Number 62. 8th Session of the AGBM, SBSTA 7. October 20, 1997.
Bonn, Germany.
- Volume 12. Number 63. 8th Session of the AGBM, SBSTA 7. October 20, 1997.
Bonn, Germany.
- Volume 12. Number 64. 8th Session of the AGBM, SBSTA 7. October 20, 1997.
Bonn, Germany.
- Volume 12. Number 66. 8th Session of the AGBM, SBSTA 7, SBI 7. October 20 -
31, 1997. Bonn, Germany.

Notes

ⁱ The word coproduction typically refers to the mutual construction and reinforcement of nature and culture or society. In this paper, I use coproduction to refer to the mutual construction and reinforcement of

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- ideas about the world in which people live (whether they choose to view that world in social, natural, or some other terms) and the organization and practices of institutions that enable people to act in that world.
- ⁱⁱ I use the phrase climate regime to refer to the institutions authorized by the UN Framework Convention on Climate Change and created to implement it: the Conference of Parties, Subsidiary Body for Implementation, Subsidiary Body for Scientific and Technological Advice, and the Advisory Group on the Berlin Mandate.
- ⁱⁱⁱ Joint implementation refers to projects carried out jointly by an Annex I (industrialized) country and a non-Annex I (developing) country for the purposes of reducing emissions in the developing country to offset obligations under the Framework Convention by the industrialized country.
- ^{iv} The term deconstruction, as noted previously, is frequently used to mean efforts to highlight discrepancies and inconsistencies, emphasize uncertainties, and challenge the adequacy of experimental techniques or the motives of expert advisors. These tactics are commonly used to discredit scientific testimony and to point out the indeterminacy of scientific findings. Here, I expand this use of the term to include efforts to challenge the adequacy or appropriateness of expert advisory arrangements.