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When does power listen to truth? A constructivist approach to the policy process

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When does power listen to truth? A constructivist approach to the policy process

Peter M. Haas

ABSTRACT While speaking truth to power has long been a major theme in political science and policy studies, commentators are increasingly skeptical about whether modelers and scientists are capable of developing truth, and whether power ever listens to them anyhow. This paper asks when does power listen to truth, and what lessons may be drawn from the last thirty years of multilateral environmental governance for improving the prospects for scientific advice for sustainable development? It focuses on the limited notion of truth called 'usable knowledge' and elaborates the political and institutional channels by which usable knowledge may be developed and better circulated and applied by policy-makers.

KEY WORDS Environmental policy; epistemic communities; multilateral governance; science policy; usable knowledge.

Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?
T.S. Eliot

While speaking truth to power has long been a major theme in political science and policy studies (Wildavsky 1979), commentators are increasingly skeptical about whether modelers and scientists are capable of developing truth, and whether power ever listens to them anyhow. Indeed, at the international level international relations (IR) scholars tend to be surprised by the occasions when it does. This article applies the political science literature to the related question of when power listens to science, particularly with regard to the management of complex environmental issues associated with sustainable development.

KNOWLEDGE AND SUSTAINABILITY SCIENCE

Sustainable development is now one of the major mantras invoked in the area of international environmental governance. Sustainable development was

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popularized in the seminal 1987 World Commission on Environment and Development report, *Our Common Future*. The report served as the justificatory document for the 1992 World Conference on Environment and Development, and put forward a new doctrinal approach to economic development that 'meets the needs of the present without compromising the ability of future generations to meet their own needs'. Sustainable development requires a reorientation of collective understanding and of formal institutions to focus on the key intersecting and interacting elements of complex problems. Technically, efforts to cope with environmental threats must be comprehensive if they are to address the complex array of causal factors associated with them. Yet comprehensiveness is difficult to achieve, because few governments or international institutions are organized to cope with the multiple dimensions of environmental problems, and many states lack the technical resources to develop and apply such efforts.

Sustainable development urges a simultaneous assault on pollution, economic development, unequal distribution of economic resources, and poverty reduction. It argues that most social ills are nondecomposable, and that environmental degradation cannot be addressed without confronting the human activities that give rise to it. Thus sustainable development dramatically expanded the international agenda by arguing that these issues needed to be simultaneously addressed, and that policies should seek to focus on the interactive effects between them.

This new policy doctrine – or consensual wisdom within the international community of environmental policy analysts (and at times advocates) – rests on two key foundations (Kates *et al.* 2001; Clark 2001; Ravetz 1986; National Research Council 1999). One is that procedurally policy should be participatory and transparent: in part to include new perspectives in the knowledge base brought to bear on understanding a particular problem, as well as to promote buy-in and the inclusion of stakeholders in the subsequent application of these policies, and thus to improve the prospects for more effective enforcement and compliance.

The second foundation is substantive: and involves more comprehensive and systematic approaches to planning and policy formulation, often through the technique of sustainability impact assessment and forms of interdisciplinary integrated modeling intended to bring together partial insights to sustainable development from different academic disciplines.

COMMUNICATING SCIENTIFIC CONSENSUS TO POWER

While sustainability science has been percolating in the various laboratories of environmental analysts for nearly twenty years, there remain few, clearly observable occasions on which there has been effective technology transfer from the laboratory to a government agency or international regime. Even when scientists think they have developed truths for power, power appears disinterested at best, and possibly even uninterested. Yet Sustainable Develop-

ment has gradually encroached on environmental policy-making worldwide, both in international regimes and in national legislation and practices. This article analyzes the conditions under which power does listen to knowledge, the characteristic forms of collective action that emerge when sustainable development is applied to addressing shared transboundary and global environmental threats, lessons for improving the process, and an application of these inductive insights to efforts to apply scientific understanding to combating global climate change. Analyzing sustainable development and environmental protection provides a sense of the circumstances under which knowledge and power can effectively interact. While this is a relatively rare phenomenon, it is too often entirely dismissed by science policy analysts and political scientists.

Many arguments are harnessed to account for why science seldom influences policy making. This is because science is seldom directly converted to policy. The path from truth to power is a circuitous route at best. Let me cluster the reasons for this under a set of convenient categories (for a recent summary of arguments about science policy and an argument for a pragmatic procedural approach to generating scientific knowledge for public policy, see Ziman 2000).

1 Science isn't wisdom (or true). Science studies scholars dismiss the prospects of objective knowledge about the world, and stress the political dimensions to science and science policy.
2 Science is politically tainted and suspect. Organized modern science embodies implicit values of control, so that decisions made with scientific warrants may unconsciously reflect such hidden values. In addition the distributional consequences of science-based advice are themselves political (Jasanoff *et al.* 1995; Miller and Edwards 2001). Science is political in its consequences, because some benefit and others suffer as a consequence of policy options that are supported by the application of scientific understanding. To the extent that those affected by the use of science in formulating policy are not consulted in its development and application, the use of science is potentially regarded by those affected as an illegitimate and exploitative set of discursive practices (Lidskog and Sundqvist 2002).
3 Power doesn't care about truth anyhow. Politicians don't want science; they want a justification for pre-existing political programs which are driven principally by political anticipations of gain (Miles 1998; Nelkin 1979).

Before discussing these reasons in greater detail, let me first dismiss the standard rationalist account that major problems create the incentives for their resolution, and thus modern bureaucracies (or bureaucratic institutions) either develop effective responses almost automatically, or are so powerfully constrained by the strategic interests of powerful member states or participants that institutional applications of knowledge are little different than the aggregate wishes of the more powerful members (for international institutions, see Koremenos *et al.* 2001; for domestic, see Moe 1984). I reject this proposition for two reasons.

One is that, particularly for sustainable development, the material incentives and the nature of the presumptive useful information are not in synch. Few

organizations, if any, have the available mission and resources to be able to address the full integrative range of issues encompassed by sustainable development. Yet there is an empirical record of shifts beyond what formal organizational assignments would predict (Haas and Haas 1995).

The second reason can be addressed by way of the historical analogy of scurvy. That is, we shouldn't assume that all organizations are rational and will automatically recognize and adopt what prove to be the appropriate policy responses with the virtue of hindsight or reflect the material needs of their most powerful constituencies. Arguably scurvy was the single most important limiting factor to the expansion of trade and geopolitical influence in the fifteenth and sixteenth centuries. Trade and exploration was significantly hampered because the mortality rate of sailors on long-distance expeditions was often in excess of 90 percent. Expeditions would return with far fewer ships not because of storms but because too many crew members died off to enable the entire fleet which had left to be served. And yet in the early 1600s scurvy was solved by Captain James Lancaster – bringing citrus trees along on ships – and the solution was forgotten for nearly 150 years, until Captain Cook rediscovered it in the 1760s (Milton 1999)! So much for rational societies responding effectively to important issues. So we should not expect a fully formed sustainable development science to be developed and applied in response to the presumptive need for such a view.

There is a well-developed literature that lays out a variety of arguments for the limitations of science for policy because many policy-makers do not view it as essential for policy-making or discredit science's impartiality. Ironically, those who do accept science's claims to impartiality may be particularly suspicious because science may undermine their political agendas.

Scientific consensus is often suspect because the scientists themselves are part of a broader cultural discourse, and thus lack autonomy or independent stature: in part scientific findings may reflect the bias of sponsors, but more deeply they may reflect the broader culture of the society from which they emerge and about which they may not be fully conscious. The universe of what is known or deemed knowable may be biased by the availability of funding resources for research, and thus reflect the conscious or unconscious bias of major public and private funding bodies. Public sources of research support tend to reflect the broad political mission of the funding agency, whereas private sources reflect short-term commercial concerns, and philanthropic funding generally tends to cluster around a small number of topics and shift in ways that are seen as capricious and cyclical by recipients.

Science has become extremely politicized. The use of science is mediated and thus possibly distorted by the political goals of potential users. Truth claims are politically suspect because of potential funding bias or participation exclusion. Science isn't pure in the area of sustainable development because scientists' contributions exceed their technical skills. In 1972 Alvin Weinberg observed that scientists were often asked to provide advice that exceeded their formal disciplinary training (Weinberg 1972).

Science may not be sufficiently simple for the needs of policy-makers. Harry Truman is supposed to have complained about his economist advisers who would say 'on the one hand' and 'on the other hand'. Truman said, just give me a one-handed economist.

Science may provide advice that is out of synch with the political plans of decision-makers or parliaments, and thus be dismissed. While in principle parliamentarians seek to pursue the goals which they think the constituency that elected them wants. Thus they will selectively cull advice to find material that will either help them to identify what their constituency wants, if there is a dominant constituency on an issue that could potentially unseat them if displeased, and how to achieve what the constituency already wants. Similarly, executive branch bodies solicit knowledge. But they are guided by a quest for information that will either help to pursue the traditional foreign policy goals of advancing material wealth and power, or the goals that will satisfy their parliamentary oversight committees. Either way the information heard by power is not the same as the truths that scientists think they are delivering.

USABLE KNOWLEDGE: WHEN KNOWLEDGE SPEAKS TO POWER

I take a late modern view of truth – the domain of science and its ability to confer truth is bounded, but we can talk of better and worse science (for an application to the study of international institutions, see Haas and Haas 2002). In the context of this discussion we can speak of **usable knowledge**. Several different schools of thought exist about usable knowledge, although the core insights are quite similar and complementary. In short, usable knowledge encompasses a substantive core that makes it usable for policy-makers, and a procedural dimension that provides a mechanism for transmitting knowlege from the scientific community to the policy world and provides for agency when theorizing about broader patterns of social learning, policy-making, and international relations.

Current research from comparative politics, IR, policy studies, and democratic theory suggests that science remains influential if its expertise and claims are developed behind a politically insulated wall (Botcheva 2001; Andresen *et al.* 2000; Social Learning Group 2001). Moreover, efficiency gains by relying on one single source of policy advice are more than offset by the loss of legitimacy, analytic blinders imposed by relying on just one institutional source for usable knowledge, and the political doubts of bias that are raised by narrowing the source of information. Studies of international environmental assessments and science panels suggest the need for fluid bodies that can bring together multiple sources of information and are not beholden to one single funder or political sponsor (Haas 2004; Siebenhuner 2002, 2003; Clark *et al.*, forthcoming; Farrell and Jaeger, forthcoming; Jasanoff and Martello 2004). Studies of national-level environmental policy processes have convincingly argued against relying on individual institutions for research and policy advice, because they may bias the information flow, and control resources (Skoie 2001;

Brown 1997). There are a larger number of national-level experiences both with establishing standing scientific panels, such as in the United States the National Academy of Sciences, the Environment Protection Agency Science Advisory Board, and the now defunct Office of Technology Assessment, among others. Each is regarded as generating usable knowledge for the government, and enjoyed sufficient autonomy to identify research questions and to convene panels to develop reports. Comparative studies with other countries would be valuable. There are also experiences with ad hoc bodies created to develop usable knowledge for particular issues, such as the German Enquette Commissions for Ozone and Climate Change (Morgan and Peha 2003; Carnegie Commission 1992; Smith 1990, 1992).

I call the relevant body of scientific knowledge 'usable knowledge' (see Clark 1990 for an earlier, and slightly different, usage; Dimitrov 2003 also has a slightly different usage). Usable knowledge is accurate information that is of use to politicians and policy-makers. It must be accurate and politically tractable for its users. It frequently exceeds the mastery of any individual disciplinary approach. Recent studies of global environmental assessments apply the criteria of credibility, legitimacy and saliency (Siebenhuner 2003, 2002; Clark *et al.*, forthcoming). Credibility means that the key knowledge producers and their consumers believe that their product is true. Legitimate means that the claims are believed to be legitimate, that is developed through a process that minimizes the potential for bias and is more equitable in terms of participation by those who are dependent upon the information. Finally, saliency means that such information is provided in a timely manner and contains information that is useful for making public policy by decision-makers: that is, that in practice it arrives in conjuncture with the policy process and provides advice which can be converted into laws or decisions by decision-makers. In practice credibility and legitimacy are mutually reinforcing, as a procedural approach to developing consensual knowledge is likely to generate both accurate and acceptable knowledge. Yet saliency and credibility may be at odds, as the long time often necessary for developing credible knowledge may interfere with the short-term needs for applying the knowledge to making policy. In practice, then, existing knowledge is more likely to play a role in usable knowledge than is knowledge being developed concurrently with the policy process.

This articulation of usable knowledge builds from prior efforts to formulate a sense of what kind of technical information is likely to be useful for policy-making relating to matters of complexity, which is also likely to be used by decision-makers.

Clark and Majone offer four criteria of usable knowledge: its adequacy, value, legitimacy, and effectiveness. Adequacy relates to including all the relevant knowledge or facts germane to the matter at hand. Value has to do with contributing to further understanding and meaningful policy. Legitimacy relates to its acceptance by others outside the community that developed it. Effectiveness relates to its ability to shape the agenda or advance the state of the debate, and, ultimately, improve the quality of the environment (Social Learning Group 2001: 15; Clark and Majone 1985).

The Center for International Climate and Environmental Research in Oslo applies three requirements for a solution design model to be considered adequate (CICERO 1999: 8):

- It must be capable of mobilizing sufficient political support to produce agreement.
- It must be capable of generating solutions that can be implemented.
- It must be capable of generating solutions that are instrumental towards solving the problems for which they were designed.

In short usable knowledge, even, or particularly when it is expressed in the form of a model, must be seen as accurate, accessible, and contribute to the achievement of collective goals. It must represent consensus, and be provided through a medium that is politically palatable.

A new consensus is emerging amongst social scientists who study the use of science in international regimes that a procedural or discursive model of the policy process is normatively superior and is growing in frequency of its application, as against the former policy analytic approach associated with cost–benefit analysis and analytic efforts to identify the best policy solution. Policy analysis is a process of exchange and mutual learning between policy-makers and policy analysts. Policies themselves are experiments that participants monitor and about which they reflect in order to improve them over time (Ascher 1986; Lindner and Peters 1995; Lee 1993; Funtowicz and Ravetz 1991, 2001). Consequently, policy-making is a process rather than a fixed set of analytic techniques. Language may play a role (Fischer and Forester 1993; Hajer and Wagenaar 2003) but the constructivist argument pursued here stresses the political parameters within which debate occurs rather than the connotations generated by the language that is used.

Constructivists argue that under conditions of uncertainty – such as are associated with contemporary globalization and highly technical issues – it is impossible to create ex-ante sufficient information to follow the policy analytic model (Adler 2002; Checkel 1998; Christiansen *et al.* 1999; Guzzini 2000; Haas 2001b; Hopf 1998; Kubalkova *et al.* 1998; Ruggie 1998). Alternatively, the key is to design policy analytic processes from which actors learn about the world and about each other. This view is anti-rationalist in the sense that the process model entails path dependency and uncertainty assumptions that presume that outcomes, and indeed preferences, are often underspecified or indeterminate, and thus that regimes and political interactions can best be appraised in terms of process rather than outcome. All outcomes will be sub-optimal in some sense as compared to the ex-post ideal outcome; but one can just hope that by an open discursive process better outcomes may result (Dryzek 1997).

Constructivist approaches to policy analysis suggest that science must be developed authoritatively, and then delivered by responsible carriers to politicians. Doctors, scientists and engineers remain the most esteemed professions in Europe, and thus command the greatest social legitimacy and deference when providing policy advice (Drori *et al.* 2003; Jasanoff and Wynne 1998).

The transmission belt of like-minded scientists is called an 'epistemic community' (Haas 2001a). The more autonomous and independent science is from policy the greater its potential influence (Andresen *et al*. 2000; Botcheva 2001; Haas 2001b). Consensus in isolation builds value and integrity, and then its consequences should be discussed publicly. Measures of autonomy and integrity include the selection and funding of scientists by international organizations rather than by governments, their recruitment by merit on important panels, and reliance on individuals whose reputation and authority rest on their role as active researchers rather than policy advocates or science administrators. Accuracy can be achieved via peer review, interdisciplinary research teams, and independence from sponsoring sources. Increasingly, sustainability scientists, themselves an epistemic community, argue for the need to include local knowledge with the more formally technical understanding of traditional disciplinary élites associated with formulating sustainability policies (Haas and Haas 2002; Jasanoff and Martello 2004). However, the criteria for participation remain loosely defined, but perhaps no more so than the broad injunctions for multidisciplinary participation that do not clearly identify which disciplines need to be consulted for which types of questions.

Political legitimacy rests on a process of knowledge development and diffusion that is scrupulously free of political interference. International institutions can help to foster and disseminate information, and sanitize it so that it is not seen as compromised by potential users who may fear that the information is controlled by one country.

Usable knowledge is developed by international and transnational networks of scientists. It is heeded, to the extent that it is, after widely publicized shocks or crises. While usable knowledge contributes to broader patterns of social learning, the delivery of knowledge and its application are often by different communities. I am not talking of reflective learning by decision-makers. Rather, I am talking about the recognition by decision-makers of the limits of their abilities to master new issues and the need to defer or delegate to authoritative actors with a reputation for expertise. In the aggregate, social learning and human betterment emerge when the experts have been able to develop usable knowledge, and the decision-makers feel compelled to apply it (see Haas and Haas 2002).

EMPIRICAL RECORD OF USABLE KNOWLEDGE IN MULTILATERAL ENVIRONMENTAL GOVERNANCE

Over the last thirty years there has been a massive surge in the adoption of international treaties and regimes to address many aspects of transboundary and global environmental threats (Tolba and Rummel-Bulska 1998; Haas 2001b; Miles *et al*. 2002).

When regimes are negotiated with the involvement of epistemic communities and strong international institutions they develop through a process of 'social learning.' Negotiations occur within a scientific discourse, in which political

debate and compromise reflect expert consensus on the behavior of ecosystems and their ability to sustain stress. The substance of regimes reflects scientific consensus about the most important environmental threats, and negotiated standards reflect consensus about the degree of environmental stress the target environment can sustain. Social learning generates treaties with differentiated national obligations and substantive commitments, based on expert consensus on causes and environmental effects. For instance, the 1980 Land-Based Sources Protocol for the Mediterranean requires more stringent emission controls on the industrialized countries than on the developing countries because the magnitude of degradation of the northern coast of the Mediterranean was much more severe than it was on the southern coast (Haas 1990).

Other regimes developed through social learning include the stratospheric ozone protection regime, the 1979 Geneva Convention on Long-Range Transboundary Air Pollution (LRTAP), and subsequent treaties addressing European acid rain, and pollution control efforts for the Mediterranean, Persian Gulf, South Pacific, and South East Pacific.

Maurice Strong, Secretary General of the United Nations Conference on the Human Environment (UNCHE) and the United Nations Conference on Environment and Development (UNCED), and the United Nations Environment Programme's (UNEP's) first executive director, helped to design the outlines of this process of social learning. Strong believed that 'the policy is the process': that is by generating an open political process in which states are exposed to consensual science, government officials may be persuaded to adopt more sustainable policies, and individual scientists may gain heightened political profiles at home which may ultimately increase their effectiveness as well. Most social learning treaties have standing environmental monitoring and research committees, to provide timely warnings of new problems, monitor achievements of regime goals, and educate politicians and policy-makers on environmental issues.

However, social learning takes time. Substantively they are more comprehensive, and attuned to the emergent sustainable development doctrine's sensibility and injunctions. Comprehensive treaties are slower to negotiate than others, because they require persuasion and consensus rather than mere compromise. From a policy perspective, though, comprehensive regimes are likely to be superior in their ability to protect the environment in a cost-effective and politically acceptable manner. Moreover, treaties developed with help from the scientific community typically enter into force more rapidly than without it, presumably because of the weight that involvement of scientists carries in the ratification process.

Regimes that were built with usable knowledge appear to be more effective at inducing states to achieve their intended goals of improving environmental quality. For instance, stratospheric ozone, and European acid rain efforts are widely hailed as some of the more successful and effective international environmental governance efforts of the contemporary era (Miles *et al.* 2002; Andresen *et al.* 2000; Haas 2001b).

Epistemic communities often work in conjunction with broader policy networks, functional bureaucrats, transnational scientific organizations, non-governmental organizations (NGOs), and international civil servants. A small number of international institutions have supported the development and transmission of usable knowledge. UNEP has played a powerful role in environmental protection over the last thirty years. With a staff of less than 200 professionals and a budget now in the order of $150 million a year, UNEP has led global environmental monitoring efforts, catalyzed environmental protection activities in other UN bodies, served as the environmental conscience of the UN system, and sponsored the conclusion of dozens of international environmental treaties. The UN Economic Commission for Europe (UNECE) and the International Institute for Applied Systems Analysis (IIASA) helped to develop and circulate usable knowledge for the effective management of European acid rain.

LESSONS FOR GENERATING AND MOBILIZING USABLE KNOWLEDGE

Given our thirty-year experience with addressing transboundary and global environmental threats, what lessons are available about developing and mobilizing usable knowledge for sustainable development? The following lessons can be drawn, based on comparative case studies of multilateral environmental regimes with and without usable knowledge, and based on process-tracing studies of efforts to institutionalize usable knowledge (Andresen *et al*. 2000; Haas 1991, 2000a, 2000b, 2004b; Miles *et al*. 2002; Reinecke and Deng 2000; Victor *et al*. 1998; Weiss and Jacobson 1998; Young 1999). Thus, the conditions are found in effective regimes and are absent in ineffective regimes.

Lessons about mobilizing networks of scientific expertise for sustainable development

1 Create standing international interdisciplinary scientific panels or committees to address specific topics.
2 Multilateral Environmental Agreements should create and rely on separate subcommittees responsible for different functions of governance, such as basic research, environmental monitoring, policy analysis and policy verification and evaluation.
3 Carefully survey the population of scientists to identify a core group sharing values and causal beliefs. For instance, in the Mediterranean a UNEP consultant spent nine months visiting national laboratories to inventory national capabilities and to personally build the scientific network.
4 Ensure that networks and international panels have interdisciplinary representation, including the social sciences. Individuals should have high regard in their own disciplines as well as be able to talk to experts from other disciplines.

5 Recruit carefully for national and regional institutions. Base judgements on professional credentials and networking ability.
6 Avoid relying on one national institution to provide or sponsor research and training.
7 Provide professional outlets for members through conferences and publications in refereed professional journals. This also elevates the domestic profile of individual scientists in the community of expertise who may then be recruited to fill positions in national administrations.
8 Promote scientific discussions on topics that are likely to lead to consensus, i.e. ripe research topics.
9 Avoid government designation of scientists to international meetings.
10 Try to make use of joint international panels for environmental risk assessment rather than relying on national assessments. Avoid capture by one scientific discipline or school of expert analysis.
11 Assure the timely submissions of scientific advice in advance of meetings. The timely submission of reports according to the legislative cycle in the major countries is also key.
12 Arrange for focused interactions between scientists and policy-makers to discuss the technical substance of the issues. For instance, in LRTAP the IIASA arranged for two-day sessions to familiarize policy-makers with acid rain transfer and deposition models developed by scientists.
13 Maintain momentum within the community by continuing to have projects and research opportunities so those members don't drift away. This avoids having to reconstitute the community each time a new problem emerges.
14 Seek funding for studies from multiple sources in order to avoid budgetary shocks if money is withheld from a principal funder. Thus economically inefficient redundancy is politically warranted.
15 Construct models so that effects are calculated at meaningful political scales, i.e. corresponding to significant political divisions that are relevant in developing policy applications. For instance, at the international level this means that models should explicitly identify effects by country, and even, if possible, by domestic districts (at least in countries without proportional representation). So far climate change models have only yielded effects at a scale of resolution sufficient to demonstrate to countries able to vote in the General Assembly that they are likely to suffer, and thus they keep the issue on the international agenda.
16 Train or recruit scientists who have a high profile within their own discipline and who are able to effectively communicate with counterparts from other disciplines, as well as with the media, politicians and popular audiences.
17 Try to recruit networks from as broad a national basis as possible, as governments are nore likely to rely on experts who share their nationality than on foreign experts.

Broader considerations of the proper institutional design of science policy entail timing: when consensus has been achieved before an issue reaches the agenda

and policy discussions begin, scientists can merely be introduced as experts, following the lessons above. However, at times it is necessary to simultaneously develop scientific consensus and advance policy debates. For such issues, such as was the case in the Mediterranean and ozone regimes, the parallel development of science and policy must be kept insulated from ongoing policy debates, with the two streams united only when consensus has been achieved. In other cases, where consensus remains elusive and policy debates have already attained their own momentum, as in climate change and biodiversity, it may be best if the two activities can be kept as separate as possible.

CLIMATE CHANGE, USABLE KNOWLEDGE AND THE LIMITS TO SOCIAL LEARNING

Internationally, states are increasingly relying on this procedural approach to the development and application of truth to power. The European Commission developed a set of guidelines and proposals for the collection and use of expertise by the Commission that is very similar in orientation (Commission of the European Communities 2002; European Commission 2001).

The climate change regime, the focus of the majority of global environmental diplomatic efforts during the 1990s, has also developed through a deliberate effort by diplomats to base policy on strong scientific foundations through its Intergovernmental Panel on Climate Change (IPCC). The IPCC is of interest because it highlights the way in which states may choose to shape the science advisory process. A closer look at the interplay of science and power in the IPCC reveals empirically how this dynamic interaction operates in this key contemporary issue, as well as analytically establishing the political limits to autonomous science and social learning. The scientific consensus is not yet strong, and thus the available scientific knowledge is not fully usable. Yet, in the case of climate change, the fact that usable knowledge is not yet available for climate change has much to do with the political choices associated with the design of the IPCC, and thus suggests the political limits to states' willingness to confer some degree of autonomy to scientific institutions and to defer to their guidance.

The IPCC is one of the most concerted efforts by the international community to harness usable knowledge for addressing transboundary and global environmental threats (Skodvin 2000a, 2000b; Agrawala 1998a, 1998b; Siebenhuner 2002, 2003; Kameyama 2004). The IPCC was established in 1988 as the principal international science policy advisory body for global warming, but is widely believed to have also been formed politically in order for governments to reassert control over the science process in an issue which was accelerating on the policy agenda more rapidly than most leaders in the North were comfortable with. The IPCC was the consequence of a General Assembly initiative for a climate change regime, and did not rely on UNEP as had most previous international environmental regime initiatives. The IPCC consists of three working groups, with members chosen by governments subject

to the scientific reputation of the candidates. Working Group One addresses questions of atmospheric science; Working Group Two assesses social and economic impacts and adaptation measures, and Panel Three looks at mitigation alternatives. Each working group is administered by a bureau composed of the IPCC bureau members, working group co-chairs, and vice-chairs and a technical advisory unit drawn from the country of the working group's chair, except for the Technical Support Unit of the scientific Working Group One, which has always remained in the UK. To date the IPCC has produced three three-volume assessment reports (1990 with 1992 revisions, 1995, and 2001, with a fourth assessment underway), each with a summary for policy-makers, as well as various ad hoc special reports and technical papers. The Working Groups report to a plenary composed of government delegates, who review the Summary Reports on a line-by-line basis, and also approve the Working Group Assessments and Special Reports in more block-like fashion. All reports other than the Summary Reports rely on extensive peer reviews, and the material presented must come from peer-reviewed journals or be in the process of publication in a peer-reviewed journal. The Summary Reports, which command the greatest publicity and hence public attention, are written by the Working Group leaders along with the lead authors and specially invited experts (Skodvin 2000a: 108; Swart *et al*. 2002: 155). The bureaus are responsible for drafting an initial table of contents and topics for each chapter. This agenda is then approved by the political plenary of the IPCC. The reports are drafted by the scientific committees, and are then approved subject to careful scrutiny by government representatives in the Plenary.

Thus governments have sought to exercise control over the scientific process, while also allowing for some degree of scientific latitude in order to generate accurate advice, even if the process is designed in such a way that the advice is unlikely to be particularly salient. Governments appoint the IPCC chair, and in 2002 the United States vetoed the appointment of the climatologist Robert Watson, a well-regarded American candidate, in favor of Rajendra Pachuari, an Indian engineer, based on the belief that Watson was too independent of the US administration. Politically charged language in the Third Assessment Report (2001) was criticized by the US government for containing language which the US claimed was stronger than had been approved by the Plenary, although the authors were able to subsequently prove that their draft was consistent with the IPCC's rules of procedure (Edwards and Schneider 2001; Seibenhuner 2002: 417). All individuals are nominated and chosen by governments, although there is little evidence of direct government manipulation in recruitment or the inclusion of material. The procedures are carefully designed to maximize the seemingly procedural scientific legitimacy and accuracy of the work, by stressing peer review and reliance on peer-reviewed material.

The degree to which the IPCC is capable of generating usable knowledge is largely politically circumscribed. The state of scientific understanding of the key global systems that affect global warming remains relatively immature. It

Table 1 Third Assessment Report: distribution of nationality of scientific participants

Nationality	*WG 1 lead authors (98)*	*WG 1 contributing authors (708)*	*WG 2 authors and expert reviewers (626)*	*WG 3 authors and reviewers (22)*	*Synthesis Report authors and expert reviewers (375)*
Industrialized countries	80%	97%	79%	75%	81%
Developing countries	20%	3%	21%	25%	18%
Technical Support Unit	UK		USA	Netherlands	

Source: http://www.ipcc.ch (retrieved January 7, 2004).
Note: Industrialized and developing country categories follow accounting scheme of the *2003 Human Development Report*.

is unclear to what extent funding and research choices have been shaped by political factors, but there is no strong evidence to assert that the state of knowledge about the phenomenon is directly biased or controlled by political influences. The accuracy of the IPCC science remains limited. The estimates of global warming and their effects are crude, and global carbon models are unable to account fully for the global carbon cycle.

The IPCC does not enjoy a high degree of legitimacy in the eyes of many science policy consumers (Biermann 2002). It suffers from the appearance of governmental control, because governments appoint the scientists and also vote on the reports. The distribution of scientific participants comes overwhelmingly from the North, despite the best efforts of the bureaus to increase participation from developing countries since the release of the First Assessment Report (Biermann 2002).

Table 1 shows the crude national breakdown of scientific involvement in the Third Assessment Report by country of origin of the scientific participants.

The IPCC is limited in its legitimacy through its seeming lack of equity in participation. While the IPCC has helped to pay for the participation of scientists from developing countries, it faces the deeper structural science policy issue that the overwhelming majority of climate change research is conducted in the North by northern scientists.

Its saliency is particularly poor. For one thing it has been unable to develop policy advice that resonates domestically in any of the major countries. To date the scientific work has narrowed the range of likely warming that will occur in 2100, and generated scenarios of what the global environmental consequences may be of such effects. However, the scenarios are sufficiently crude that they do not engage any significant political interests in any of the member countries,

other than reinforcing the prior knowledge of Egypt, Bangladesh and the small island countries that they may well be submerged. Thus the political effect of the new knowledge is only adequate for the aggrieved parties to continue to keep the issue on the General Assembly agenda, where they have sufficient votes, but not to directly influence policy outcomes. More salient science would present data at a level of resolution that corresponded to domestic political divisions (i.e. states or congressional districts in the US, and parliamentary districts in parliamentary systems). Some observers have criticized the IPCC Assessment Reports for focussing excessively on adaptive policies, which reflect the preferences of the industrialized countries historically responsible for GHG emmissions, rather than extensively addressing preventative or mitigating policies which would favour the developing countries.

The publication of the Assessment Reports did not fit in well with the negotiating cycle of the Kyoto Protocol and efforts to follow up the 1992 United Nations Framework Convention on Climate Change. A few of the special reports, such as the 2000 Report on Land Use, Land Use Changes and Forestry, corresponded to meetings of the Conference of the Parties, and thus were able to provide a timely submission of scientific policy advice to the actual negotiators. Otherwise, though, the reports have not coincided closely with the negotiation process, so have had little impact other than periodically reminding mass publics of the potential severity of global warming. IPCC scientists have not fared well at communicating their findings to the public and engaging in élite or public education.

In short, the IPCC is designed to keep science on a tight leash by controlling the selection and autonomy of individual scientists engaged in the assessment process. Consequently, the degree of usable knowledge generated by the IPCC has been limited. And not surprisingly IPCC scientists have been unable to exercise sufficient discretion to develop more politically tractable advice. In turn, negotiated treaties within the climate change regime have not reflected a strong degree of scientific basis, despite the ongoing IPCC efforts. The 1992 United Nations Framework Convention on Climate Change and the 1997 Kyoto Protocol (not yet in force) reflect broad rhetorical commitments or political compromises about target emissions, but do not reflect any scientifically grounded targets for specific atmospheric concentrations of greenhouse gases. Few governments outside the European Union (EU) have proven willing to make national decisions based on this collective enterprise, and EU greenhouse gas targets reflect political and energy policy realities rather than scientific justifications.

The limits of the IPCC's ability to speak truth to power can be explained by principal–agent theory (Moe 1984; Koremenos *et al.* 2001; see Guston 1998, 2003 for an effort to capture science policy issues more generally within a principal–agent framework). The principals strategically design the institution on which they rely for information and advice (the agent) in order to minimize the surprises that the agent will provide and to ensure that the agent will provide advice that will run counter to the principals' ex-ante interests and

preferences. The principals here are the governments of the industrialized countries. In 1988 they were tired of being lambasted by UNEP in multilateral environmental negotiations, and were concerned that uncontrolled scientific panels may give rise to policies that they did not deem warranted. The Villach meetings from 1985 to 1988 had forcefully put the issue of global warming on the international agenda, and the 1988 Toronto conference, convened by non-state actors, had called for 20 percent reductions in greenhouse gas emissions; thus alerting foreign ministry officials of the political threats posed by non-state actors' potential control of climate change agenda. The recent lesson of the powerful influence of the Ozone Trends Panel on the rapid conclusion of the Montreal Ozone Protocol was also fresh in the minds of foreign ministries. Moreover, the short-term costs of addressing the problem for the industrialized countries appeared prohibitive (or even, one could say, the net discounted value of efforts for mitigation adaptation) so they wished to rein in any independent political pressure that would be generated from an organized scientific involvement in collective discussions on climate change.

The agents in this regard are the scientific community, who are recruited and organized in a way through the IPCC that assures governments that they will be able to exercise maximum control over individual scientists, as well as remaining able to shape the political agenda for climate change negotiations. Admittedly, by relying on extensive peer review some degree of control was lost, but in the end governments appoint the individuals and the reports are approved on a line-by-line basis by foreign ministry officials. Thus the principals establish and enforce the parameters within which the agents have to act, ensuring cautious outcomes by the agents.

But the IPCC is an extreme case. It is extreme in terms of the clarity with which the powerful industrialized countries recognized their material interests in the matter, and it is extreme in terms of the widespread transformations in industrial and individual behaviors that effective preventive policies were presumed to entail. In addition, the concurrent negotiations and science advisory process made governments extremely sensitive to the strategic implications that scientific assessments may have for national policies. In most other transboundary and global environmental issues the scientific consensus preceded active political discussions, so that governments were less acutely aware of the implications of their choice to delegate rule-making to scientists. Most other environmental and sustainable development issues do not share these characteristics, and hence there is greater potential for governments to create more legitimate and porous scientific processes to guide their policy work.

CONCLUSION

Thirty years of speaking truth to power have yielded tangible beneficial outcomes. Sometimes power listens. There now exist far more extensive legal commitments on environmental protection than ever existed before, and most areas of human activity in most countries of the world are now regulated as a

consequence. In the aggregate, major changes have occurred internationally in environmental governance. Many multilateral environmental regimes are more comprehensive than before science was systematically applied to multilateral environmental diplomacy, stronger national environmental protection commitments have been undertaken in compliance with international obligations, and green markets for cleaner technologies have grown as a consequence. Markets estimated at 600 billion dollars a year now exist for green technologies (Hoffman 2001; US OTA 1994). These markets were created in response to the regulatory obligations resulting from international treaties negotiated on the basis of the application of new scientific understandings of the behavior of ecosystems (Haufler 2001; Garcia-Johnson 2001). The protection of ecological integrity has become elevated to a state interest on a par with the pursuit of national wealth and power. Sustainable development is now the doctrine by which states seek to reconcile (or optimize) the pursuit of those three objectives.

This broad process of increasing reliance on sustainable development for environmental policy-making over the last 30 years can be explained by constructivism. Constructivism in the United States became a popular activity in the late 1980s. Constructivists soon responded to initial theoretical challenges calling for a more fully elaborated theory of the state and of their rationality assumptions (Keohane 1988: ch. 7, originally published in 1987; Milner 1992) with a richer, deductively derived set of propositions about social construction and the role of different forms of shared understandings (ideas) on IR and policy-making. A core set of assumptions emerged that most constructivist research now implicitly reflects (Checkel 1998, 2004; Christiansen *et al.* 1999; Haas 2001b; Hopf 1998; Ruggie 1998). States are functionally differentiated actors; states respond to threats under conditions of uncertainty; knowledge is asymmetrically distributed within and between states, and the most important independent variables that shape state behavior are distributions of power, knowledge, and formal institutional properties (although material capabilities play a very small role in multilateral environmental governance). The nature of responses is subject to the particular configuration of these variables in place at the time of negotiations. Behavior is path-dependent and reflects the decisions taken under the influence of the initial configuration of factors. States' perceptions of problems to be addressed, the nature of appropriate responses, and their willingness to adhere to commitments are all a function of the configuration of these factors. Non-state actors are important players in policy-making, and pressure states. The core insight is that the nature of external incentives for actors to behave is not obvious, and requires articulation for them. Many constructivist variables and actors have been put forward over the years.

Constructivist theorizing requires interactive theories that can look at institutional and knowledge-based influences at different levels of political analysis (Botcheva 2001; Zurn 1998). Most constructivists emphasize the role of agency and seek to develop causal theories about the role of ideas. Constructivist theories about patterns of policy-making have generated a

number of provocative propositions or hypotheses, including: (1) whether actors follow a logic of consequences or appropriateness (March and Olsen 1998; Searle 1995) is a function of how the issue is framed for decision-makers by knowledgeable advisers; (2) policies vary with issue-area because different arrays of policy communities and different degrees of technical understanding exist in different issues; (3) distinctive patterns of social learning are associated with configurations of strong institutions and usable knowledge; (4) over time institutionalized new understandings can lead to the transformation of state identities and patterns of practices; and (5) multiple ideational factors are involved in constructivism, including generative and constitutive norms, operational and aspirational norms, discourses, and causal beliefs. This article has focused exclusively on the role of causal beliefs.

A number of important empirical results have been discovered as a consequence of the application of constructivist theory. In the environmental realm, new patterns of more comprehensive environmental governance have occurred at the international and national levels as a consequence of the dramatic transformation in the understanding of the behavior of natural ecosystems and their impact on human life. Studies of international political economy show, for instance, how Keynesianism spread internationally through a similar process of epistemic persuasion in a core set of countries, followed by the creation of international institutions to legitimate and create international rules based on Keynesian dictates. Keynesianism first caught on in England, then traveled to the US through academic networks of economists, and after its adoption at the highest levels in the two countries, provided the intellectual foundations for the Bretton Woods system, which provided for coordinated and institutionalized national trade, monetary and financial policies that persisted for decades (Colander and Coats 1989; Hall 1989; Helleiner 1994; Ikenberry 1993; Ruggie 1991).

Recently, many constructivist claims have been confirmed by constructivists and analysts from other research programs. There is growing appreciation of the role of ideas as informing formal institutions by rational choice theorists (Mantzavinos *et al.* 2004), and of the transformative influence of social communication leading to new political identities and communities extending the Deutschian liberal communitarian tradition (Adler and Barnett 1998). Studies suggest the analytic primacy of constructivism before the application of other approaches to understanding political behavior and collective action. Comparative policy studies have emphasized the role of institutionalized policy networks in transferring policy lessons from one country to another, and their contribution to policy convergence (Coleman and Perl 1999; Janicke and Weidner 1995; Rose 1993; Weidner and Janicke 2002). At the international level comparative environmental regime studies have confirmed that distinctive patterns of comprehensive environmental policy-making occur through a process of social learning (Miles *et al.* 2001; Andresen *et al.* 2000). Edward Miles observes: 'we may, for all practical purposes, consider a base of consensual knowledge about the basic characteristics of the problem to be a necessary,

though by no means sufficient, condition for achieving effective solutions to truly malign problems' (Miles *et al.* 2001: 470). Thus it is clear that knowledge plays a distinctive role in shaping multilateral environmental protection and sustainable development, and that knowledge in conjunction with strong international institutions yields the distinctive pattern of social learning. Mainstream traditions of IR scholarship that focus exclusively on material incentives, the exercise of power or of institutional incentives are incapable of accounting for this variation in regulatory forms, the variation in national behavior, or for the occasional autonomy and agency enjoyed by state-created scientific advisory bodies. With the presence of usable knowledge, regimes adopt policy instruments and rules that apply environmental standards involving command and control approaches with very few market mechanisms, contrary to the expectations of non-constructivist approaches. Arild Underdal writes: 'all cases where the predictions derived from [assumptions] ... based on rational anticipations of political difficulty ... proved too pessimistic are instances of institutional growth or improvement in the knowledge base' (in Miles *et al.* 2001: 440).

Knowledge can speak volumes to power. Current research from comparative politics, IR, policy studies, and democratic theory suggests that science remains influential if its expertise and claims are developed behind a politically insulated wall. Epistemic communities are the transmission belts by which new knowledge is developed and transmitted to decision-makers. Knowledge must also possess the substantive characteristics of usable knowledge: credibility, legitimacy, and saliency. Practical administrative lessons about generating and mobilizing epistemic communities and usable knowledge were presented in this paper.

Real limits to learning persist. National administrative design often inhibits learning and the diffusion of environmental lessons. Most learning remains highly localized: lessons are limited to changes in national policy with regard to one particular environmental medium, for instance air pollution or marine pollution. This limitation is due to administrative design in most countries. Epistemic community members' expertise is highly specialized, so their influence and involvement in agency choices are limited to a specific regime and environmental issue-area. Moreover, environmental responsibilities within governments vary by environmental issue, as different agencies are responsible for coordination of national activities in different areas. Thus the influence of epistemic community members in the short term is highly restricted. Few governments have the domestic potential for these lessons spreading within the governments, because the functional agencies have little influence over other agencies.

The prospects for improving national sensitivity to epistemic community influence rest on recruitment and retention patterns within national administrations. Environmental agencies often lack the ability to spread their influence within government administrations, since most environmental agencies are so specialized and the staff remain in position for limited periods so there is limited potential for individuals educating each other.

Scientific consensus is often poorly represented to decision-makers. There is a need for eloquent and articulate specialists from within scientific disciplines who are able to communicate across technical and cultural divides to policy analysts and politicians (Koehn and Rosenau 2002).

The IPCC made it clear that it is much harder to mobilize knowledge to address politicized and high-stakes issues, particularly when knowledge is being developed at the same time as policy debates are occurring. The future of effective scientific policy advice may also suffer from declining public faith in science as an institution that can contribute to public welfare. This is an increasingly common theme in the public discussions of science use in the US and in Europe, and leads public officials to become disillusioned with the technical and political utility of relying on science following from a decline in trust in scientists (Topf 1993: 109).

While in general constructivists are reluctant to rely on the rationalist assumptions of theories such as principal–agent theory, in the particular issue of global warming the material incentives to the principals are so clear that the principal–agent theory's rationality assumptions are warranted. It is only in cases with greater uncertainty about material national interests and national effects from environmental harm that more constructivist approaches are warranted, although some dimensions of the global warming issues are subject to fruitful constructivist analysis (Miller and Edwards 2001; Jasanoff and Martello 2004).

In conclusion, institutionalized knowledge has contributed to more effectiveness in multilateral environmental management. Further work can advance the understanding of the interplay between knowledge and power by studying when states are willing to create autonomous institutions and defer to their authority; the interplay between different ideational factors in shaping collective action; and the interplay between various non-state actors at and across multiple scales of multi-level global governance (Annan 1998; Camilleri *et al.* 2000; Kanie and Haas 2004).

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