

RELEVANT BUT NOT PRESCRIPTIVE?

SCIENCE POLICY MODELS WITHIN THE IPCC

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Founded by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988, the Intergovernmental Panel on Climate Change (IPCC) is engaged in a unique scientific assessment process. Not only is the IPCC explicitly tied to the United Nations Framework Convention on Climate Change (UNFCCC) as its policy audience, but it also incorporates political delegations from the UNFCCC into its internal assessment structure. Over the course of producing three multi-year assessment reports between 1988 and 2002, the IPCC has developed several innovative approaches to the science-policy interface, including the production of a summary for policymakers (SPM) and the use of policy relevant scientific questions (PRSQ) to structure the final *Synthesis Report* in the 2001 assessment. These are intended to facilitate interaction between science and policy communities and thus contribute to situating the IPCC scientific assessment process within an intergovernmental framework.

However, over the past decade, the science-policy nexus internal to the IPCC has sparked significant controversy and criticism with regard to the credibility of IPCC interpretations and products. The purpose of this paper is to examine these two innovations with respect to the way the interaction between science and policy is managed, in the expectation that such an analysis might shed light on what may be fruitful ways to think about the role and status of scientific information used for policy purposes and how the scientific and political communities can operate together to produce information that remains credible to both communities.

The IPCC as a Science Policy Forum

The creation of the Intergovernmental Panel on Climate Change in 1988 constituted a watershed in the scale and scope of international science assessment. Since then, the IPCC has issued three Assessment Reports

(1991, 1996, and 2001) each consisting of three volumes, amounting to thousands of pages, and involving the participation of thousands of experts around the world as authors and reviewers in the assessment process. The three volumes of the 2001 Third Assessment Report, and the Synthesis Report, have been published by Cambridge University Press, under the title *Climate Change 2001*. (The full text of each report and the various special reports can be found on the IPCC website at www.ipcc.ch.) The mandate of the IPCC has been to produce “policy relevant” but not “policy prescriptive” assessments of the science of climate change, including physical, technical, and social scientific knowledge.

The existence and development of the IPCC in its three iterations since 1988 provides a powerful case study of the way science has been used in support of the policy process. While much work has been conducted on substantive climate research and its use (Schneider, 1989; Shackley and Wynne, 1995, and 1996; Shackley et al., 1998; van der Sluijs et al., 1998; Sarewitz and Pielke Jr., 2000) little analysis has been done on what constitutes “policy relevant scientific information,” the processes that create it, and the implications of this overarching type of mandate for understanding science in the international policy sphere.

The role that science has played in society has been influential and dominant in social and institutional decision-making structures (Gieryn, 1999; Jasanoff, 1990, and 1991; Jasanoff and Wynne, 1998), due to the prevalence of what might be called a “truth speaks to power” view of the science-policy relationship. Public issues regarded as controversial or problematic in politics are often put into what is perceived as the objective and rational hands of scientists and scientific inquiry. Indeed the phrase “truth speaks to power” was coined (by Price, 1965) to indicate unidirectional flow of information from the autonomous scientific community or “truth” through to the political

or “power” communities. However, in scientific disputes “a fundamental dichotomy [exists] between the potential dispute resolution objectives of ‘truth’ and ‘justice’” (Salter, 1988). Due to the burden of proof, the scientific canon of hypothesis testing rests on the doctrine of “theory until proven fact” as a fundamental component of the truth-seeking process. This method makes it difficult for judgments to be based on principles such as justice or precaution. It is therefore difficult to connect science to the often strongly normative decisions required in a policy context.

Moreover, the conventional view of science underlying this approach to the science-policy relationship has itself subsequently come under critical investigation. Scholars working in the social studies of science have examined the ways in which the production of scientific claims made about the natural world is mediated through social relations and processes (Bloor, 1967; Collins, 1981; Latour and Woolgar, 1979; Latour, 1987, and 1993; Knorr-Cetina, 1992; Barnes and Bloor, 1996). Similar approaches have been applied to the IPCC process, in which the science involved in the IPCC assessments has been criticized for weaknesses in methodological rigor and integrity in scientific interpretation (Lindzen, 2001; SEPP). In this work, a sharp distinction between science and policy has been replaced by a more nuanced argument about the mutual interpenetration of scientific and political concepts and values.

We examine three approaches to analyzing the IPCC scientific assessment and its connection to the policy process. Each contributes philosophical insights into the state of the global scientific enterprise, and the role that science plays and should play in the policy sphere. Each model therefore has implications for negotiating the science-policy interface in the IPCC. Three approaches can be found in the analyses of the Science and Environmental Policy Project or SEPP, Sonja Boehmer-Christiansen, 1994a and 1994b; and Simon Shackley and Brian Wynne, 1995 and 1997. For a summary analysis of the IPCC structure on which these analyses will be deployed, see the Appendix.

The Positivist Critique

IPCC attempts to provide “policy relevant but not policy prescriptive scientific informa-

tion” have steered the IPCC from a traditional “truth speaks to power” conception of the science-policy interface toward an institutionalized interaction between science and policy communities. These practices are quite different from dominant positivist traditions with regard to the practice, authority, and use of science and scientific information. It is not surprising, then, that the IPCC and participating scientists have been accused of performing “bad” or “co-opted” science. An examination of one controversy between positivist scientific traditions and the science policy innovations of the IPCC reveal some of the tensions involved in the models of science used to evaluate a scientific assessment of the IPCC-type.

Efforts to prescribe traditional values of objectivity, rationality, and autonomy or “high science” to the activities of the IPCC assessment are the focus of climate and atmospheric scientists organized around the Science and Environmental Policy Project (SEPP) (directed by the well-known climate change contrarian, Fred Singer) with the goal of ensuring the contrarian perspective is regularly reported. SEPP was central in writing and coordinating signatures for the Leipzig Declaration. (For a list of SEPP publications see www.sepp.org). The signing of the Leipzig Declaration, which is similar to the Heidelberg Appeal of the Rio Summit (1992), was an action taken by a small group of climate scientists against the IPCC consensus on anthropogenic-induced climate change, the Climate Treaty, and the Kyoto Protocol. The Declaration and its hundred signatories came out of the International Symposium on the Greenhouse Controversy, held in Leipzig, Germany, on November 9–10, 1995, and in Bonn, Germany, on November 10–11, 1997.

The Leipzig Declaration challenges the primary methods of observation and validation used in the IPCC, by stating:

We believe that the dire predictions of a future warming have not been validated by the historic climate record, which appears to be dominated by natural fluctuations, showing both warming and cooling. These predictions are based on nothing more than theoretical models and cannot be relied on to construct far-reaching policies.

Climate contrarians have long argued that the theoretical and simulated techniques used

to generate policy relevant information do not constitute valid and credible scientific inquiry. Familiar names such as Fred Singer (SEPP) and Richard Lindzen (2001) claim that models used in the IPCC have not been validated with real-world observations and are therefore not accurate sources of description and prediction for climate change and its causes. Lindzen (2001) argues that the reliance on inaccurate and uncertain theoretical models forfeits opportunities for science to reduce uncertainties and to strengthen scientific understanding of the global climate. In discussing the use and implications of theoretical models in the IPCC, Lindzen (2001) makes a distinction between “correct” and “possible” information. He charges that IPCC scientists have used predictive models to focus on the “possible” adverse situations in order for policy action to be taken. Moreover he states that this use of predictive models “effectively deprives society of science’s capacity to solve problems and answer questions” (Lindzen, 2001, 2).

The contrarian concern with the IPCC is two-fold. First, the contrarians believe it is necessary to patrol the boundaries between science and policy in order to ensure that the IPCC’s requirement for policy relevance does not contravene the criteria of scientific correctness and robustness. They argue, for example, that the significance of underlying uncertainties have not been sufficiently represented in the summary for policymakers (SPM) and suggest that this gives information greater authority in the user community. This leads to the contrarians’ second concern about the significant exposure and attention IPCC products and particularly the working group SPM’s have within the international policy audience. SEPP’s comment “we detect here a serious misuse of science and of scientists for political purposes” speaks to the perceived pressures exerted on scientists in a scientific assessment intended to derive policy relevant information. Within the IPCC the intergovernmental audience seeks information and recommendations from science and scientists. It is feared that by making the relationship between scientist and policymaker closer, a sense of policy urgency around climate change may lead to the premature use of insufficient and inappropriately validated information. The contrarians argue that scientific consensus in the IPCC creates a veneer of scientific robustness even where significant uncertainties exist (see Campbell,

1985, and Wynne, 1992, for discussions about uncertainty in areas of scientific controversy).

SEPP and the contrarian analysis depend upon a positivist model of science where the appropriate role of the scientist is to pursue “pure” scientific inquiry separate from the policy sphere. The positivist approach assumes that policymakers require robust scientific evidence in order to legitimize their decisions—where the rigor of science, when adequately translated, will inform the most appropriate policy decisions. The implicit suggestion is that good science translates into good policy. This interpretation relies on a particular view of an autonomous and objective science that is de-coupled from the normative protocols and decisions of the socio-political world. Of course, the positivist model of science underlying the SEPP analysis has been strongly challenged for some time in the science policy literature.

The two following analyses use constructivist approaches to analyze the social processes that underline climate science activities including the questions asked, methods used and the ways that information is negotiated for its sufficiency and adequacy. Constructivist approaches highlight the ways that science and policy communities are not as discrete in practice as they are in theory but instead expose the ways science and policy are interpenetrating forces.

From a constructivist point of view, the apparent transfer of value-neutral scientific information to legitimize the decisions of the value-laden policy world becomes problematic when assessing “policy relevant scientific information.” Latour (1993) asserts that the attempt to “purify” the domains of science and policy is a fruitless modernist project that denies the imbroglis that ultimately result in the “proliferation of hybrids” between science and the socio-political sphere. A constructivist approach examines the underlying values, prescriptions and processes involved in scientific practice that become removed from the formal representation of science.

Boehmer-Christiansen at the macro-scale and Shackley and Wynne at the micro-scale look to the influences, negotiations, and practices that construct scientific information and by doing so, challenge the discursive and prescriptive authority attributed to both science and scientists. These analyses reveal the contingency involved in the framing of scientific

problems, in claim-making and fact construction, and the pervasiveness of the policy interface in climate science. It is an open question, however, whether this contingency necessarily reduces the credibility or whether it enhances the usefulness of the science generated in the IPCC. The two approaches we examine seem to come to different views on this point.

A Contextual Approach

Boehmer-Christiansen (1994) traces the behaviors, alliances and economic ties of the leading climate scientists (those scientists already operating within prestigious institutions) to show how scientists have used ideological not scientific persuasion to establish climate change as a policy priority. She argues that the inception of the international climate research program (culminating in the IPCC) was motivated by two incentives—the ability to secure funding and the ability to coordinate and promote an environmental policy agenda. In the First Assessment Report (FAR) scientists aligned themselves with an environmental agenda of “action now” supported by a small yet significant group of upper level bureaucrats. Yet according to Boehmer-Christiansen, this changed in the Second Assessment Report (SAR). Greater significance was attributed to scientific uncertainties in the SAR, which promoted a “wait and learn” approach to policy. Boehmer-Christiansen suggests that, “faced with the complexity of environmental science researching at the frontiers of knowledge scientific advocacy can *honestly* switch from emphasizing certainties to uncertainties, from the advocacy of ‘action now’ to a ‘wait and learn’ approach” (1994b, 197; emphasis added). In other words, climate science is sufficiently uncertain that different, legitimate interpretations are possible.

Boehmer-Christiansen’s (1994) actor-network approach relies heavily on an assumption of social agency. Similar to Latour and Woolgar (1979), Boehmer-Christiansen (1994a) takes as a point of departure the ways that scientists produce public meaning through their ability to enroll allies and through the manipulation of resources. She concludes that the preservation and enhancement of scientific careers and the desire to secure future funding is the interest of scientists. Latour and Woolgar (1979) refer to this as the “credibility cycle” around which scientists revolve in an endless

sequence of producing work, receiving recognition, and getting support. Boehmer-Christiansen’s (1994a, and 1994b) analysis reveals the roles of funding circles, epistemic networks, and an established credibility cycle where scientists adhere to underlying policy commitments in order to secure interest and funding for their personal research. There is the implicit suggestion that where epistemic consensus exists, scientists have unilateral and persuasive authority within the policy sphere. Yet where controversy and uncertainty pervades environmental science, scientists can “honestly” shift from one interpretation to a different one (by focusing on questions of adequacy of knowledge and sufficiency of information) (Campbell, 1985). In this way, Boehmer-Christiansen argues that the authority of science has been used to legitimate both strong policy (FAR) and status-quo policy (SAR) in the IPCC. She reveals the contingency of scientific interpretations in policy and suggests that the “ad-hoc arrangements” and the blurring of the roles between scientific and bureaucratic institutions have decreased the legitimacy of IPCC information.

The implications of Boehmer-Christiansen’s analysis for our purposes is that it goes beyond the positivist critique to reveal the degree to which the “front end” of the scientific process is itself already connected in strong ways to the policy process. This suggests that the SEPP critique of the IPCC process is misguided since it ignores the degree to which this front-end connectivity already compromises a unidirectional “truth speaks to power” model of the science-policy relationship. Boehmer-Christiansen’s arguments are useful in showing how the positivist ideal of an autonomous and objective science is unattainable.

A Situated Science—Looking to Science in Practice

Policy-oriented research is the result of complex forms of communal work between scientific and bureaucratic institutions that can share in the mutual legitimation of ideas, discourses, practices, and goals (Jasanoff and Wynne, 1998). The situational approach has as its foundation the assumption of a strong form of engagement between scientists and policymakers. This approach suggests that social influences involved in science and knowl-

edge creation not only exist in ties to the bureaucratic establishment, but also are more implicitly defined by a shared social environment and the cognitive commitments that act to define that environment. This is known as the co-production of scientific information, where social and cultural commitments are built into every phase of knowledge production and consequent social action (Jasanoff and Wynne, 1998).

In the IPCC context, Shackley and Wynne (1995, and 1997) use a situational model to investigate the development of technical knowledge in the IPCC and the social queries involved in determining the adequacy of knowledge. The situational approach assumes that science is situated and practiced in contingent scientific cultures that operate under different expectations and constraints and where judgments of rationality and irrationality are made in particular practice settings and structures. Shackley et al. (1998) look internally to scientific practice and its substantive content in the IPCC to expose how the development, construction, and interpretation of global circulation models (GCM) is implicitly influenced by ties to the policy realm.

Shackley and Wynne (1995) take as their point of departure the way scientific interpretations construct (and limit) the climate science research agenda. They claim that the GCM literatures used in WG I establish a “knowledge net” where the indeterminacy of the climate system is constructed into a “doable” research agenda and is therefore considered knowable through the use of GCM technology. They argue that this generates a “knowledge pyramid” whereby a relatively small or core-set group of WG I climate scientists and modelers, establish conceptual hegemony over climate research and analysis as well as over the entire IPCC process (Shackley and Wynne, 1995; Shackley et al., 1998). They find that the compilation, construction, and interpretation of these models is dominated by a small number of scientists who, based on original estimations and assumptions, tacitly influence what information becomes tangible, relevant, and knowable both in the natural and the social worlds of investigation and response. Determinations of adequate and acceptable approximations and uncertainties involved in the model construction remain the domain of scientific judgment despite the strong heuristic implications for the policy community and the

influence on their ability to consider responses (Oreskes et al. 1994).

Shackley and Wynne’s (1995) analysis does not attempt to undermine the use of general circulation models (GCM’s) or the scientific and technical assessments of the IPCC. Instead, they demonstrate the nuances of the science-policy interface that is internal to the construction of climate models. They argue that the construction and interpretation of GCM’s often is based upon “implicit assumptions about the user world, its needs and capabilities, and its structures of agency and decision-making” (1995, 120). This argument returns to the concerns expressed by SEPP about the internal working of science. Like SEPP, Shackley and Wynne paint a picture of science as influenced by the conceptual judgments of scientists structured in a way that colors the kinds of conclusions reached both in future research efforts and implicitly in the exploration of policy options. But unlike SEPP, Shackley and Wynne do not see this picture as problematic in principle. An awareness of such processes does not weaken or invalidate science but allows a richer and more nuanced view of its benefits and limits. By exposing areas of negotiation, approximation, and uncertainty, and divisions amid a specialized scientific core, Shackley and Wynne suggest that scientific contestation is not just the result of science being translated into the policy realm but is instead an intrinsic part of scientific inquiry. They reveal the ways that scientific practitioners implicitly negotiate judgments that influence the conceptual territory of the policy “user” community.

The situational approach reveals the ways that normative decisions and judgments made by scientists become entrenched in the design, formulation, and interpretation of information. Shackley and Wynne’s analysis exposes the science-policy nexus that is implicit in scientific assessment and within most scientific deliberations over the relevance and adequacy of information.

Comparing the Three Approaches

The three approaches for the use of science described here paint quite different pictures of both the actual and ideal nature of the relationship between science and policy. In the positivist analysis of IPCC scientific information, SEPP paints a picture of scientists as, in principle, autonomous from the socio-political

sphere in which they operate. In contrast Boehmer-Christiansen and Shackley and Wynne apply constructivist methods in their analyses of the IPCC. Constructivist studies investigate science as a social process and reintegrate the social dimensions involved in all science, whether applied or pure, which are often erased from scientific representations (Latour 1987). These two studies taken together provide an understanding of the underlying conceptual, ideological, and social processes involved in scientific inquiry rather than an idealized picture of science based on an ethos of objectivity, autonomy and accuracy pursued in the positivist approach.

Scientific judgments about what questions to ask, methodologies to use and what interpretations are made are imbued with technical, social, political, and economic considerations, and generally remain unexamined (Shackley et al., 1998). These judgments therefore involve more than just the scientific community and at their most basic form are hybrid judgments that straddle the worlds of the social and natural. The critical point, however, is that these judgments remain hidden under the guise of objective, autonomous scientific inquiry.

Negotiating the Boundary

Comparing the three analyses discussed here provides a useful way to consider new approaches to a philosophy of science/policy. However, the focus on climate science and the substantive products generated by the IPCC in these analyses may deflect attention from what could be the most novel, innovative, and pertinent aspect of the IPCC—the IPCC as process—as a means in and of itself. Understanding the ways that credibility and legitimacy are formulated both within scientific process and in science-policy interactions may be a useful way to develop meaningful “policy relevant not policy prescriptive scientific information.” “Meaningful,” in this sense, denotes a distinction between the values associated with traditional discourses of credibility and legitimacy and the possibilities for the credibility and legitimacy of information that is neither pure science nor pure policy but some hybrid of the two.

Two IPCC instruments—the summary for policymakers (SPM) and the synthesis report (SYR)—mediate the interaction between sci-

entists and policymakers (see Appendix). The question is whether these procedural instruments represent a place where the credibility and legitimacy of information can be enhanced through the science-policy interface. Such a procedural point of connection may provide the opportunity for science and policy communities to transfer information, values, and discourses in both directions. Rather than accepting the unidirectional flow of information posited by a positivist framework, assessments produce “policy relevant scientific information” that require input by both knowledge producers and knowledge users about key scientific findings and about what is policy relevant. Guston (2001) highlights the important role for increased interaction between science and policy in order to recover the borderlands that exist between these discrete and binary categories. Yet he cautions that it is not clear to what extent the blurring of boundaries is productive and at what point it becomes destructive (2001, 400). Working from Shackley and Wynne’s investigation, we are interested in extending the situational model to the *procedural level* where underlying judgments, assumptions, approximations, and uncertainties in scientific information can be assessed and negotiated through a managed science policy process.

In order to understand how credibility and legitimacy are developed and maintained in the SPM and the SYR processes, an understanding of boundary objects becomes salient. Boundary objects manage and maximize both the autonomy and communication between worlds where heterogeneous economies of information and materials are required (Star and Griesemer, 1989, 404). Similar to “boundary objects,” the SPM and PRSQs coordinate two divergent worlds while maintaining the identity of each. Boundary objects enable ambiguous and multivalent information to travel across boundaries and represent different meanings to different communities. According to Star and Griesemer (1989) standardization of methods (discussed by Shackley and Wynne 1995; 1997) and monitoring of process make information compatible, allowing for a longer reach across divergent worlds. Investigating the latter will lead to an analysis of how these instruments can contribute more effectively to the advancement of policy relevant scientific information that is transparently co-produced.

These considerations suggest that the encouragement of certain forms of science-policy interaction may increase the ability to derive policy relevant scientific information without weakening or undermining the scientific process. We believe the degree to which the SPM and PRSQ processes act to (a) translate, simplify, and make complex and extensive scientific information relevant to a policy audience (SPM), (b) situate policy relevant science within an intergovernmental framework (SYR), and (c) manage science-policy interaction in unique ways, deserves further study and exploration. An investigation into the IPCC *process* has the potential to transform conventional commitments to the boundaries between the scientific and political worlds, to commitments that include new criteria and more contextualized protocols for the development of valid and useful knowledge.

Conclusion

“Policy relevant scientific information” may require that assessment science cease to be regarded as the culmination of a universal scientific method resulting in unified agreement. Rather, it may be more productive to understand assessment as a negotiation between scientists and the policy communities in the acceptance of problem definition, methods, the adequacy of information, and the significance of uncertainties. In this way, the information produced would be less likely to fall within the “truth speaks to power” (similar to SEPP) or “power speaks to truth” (similar to Boehmer-Christiansen) conception of science that transfers cognitive authority to either scientific or policy communities. A *process* that encourages science-policy interaction, and

manages the negotiation at the interface may (co-) produce better questions, formulations, assessments, and products than either independently. Perhaps explicitly including the user community in the process to negotiate what their own needs are and what is considered to be relevant will lead to a much more substantial form of policy relevant scientific information (Wynne, 1989, 1992, and 1992a).

In order to investigate this issue we need to look at questions like: How is the IPCC process dealing with the inherent assumptions, normative judgments, and ambiguities involved in constructing scientific knowledge? What types of expertise and which communities have the credibility to inform judgments involved in problem construction? How can knowledge claims and policy decisions be developed through procedures and practices considered legitimate? What constitutes credible and relevant information on an issue such as global climate change where everyone is a stakeholder? What role do the SPM and PRSQ processes play in producing relevant but not prescriptive information? Addressing these questions may provide significant insight into a more adequate philosophy of science policy in global environmental problems. Rather than seeing science as a unitary and transcendental description of the world “out there” and the international policy community as merely interest-based, an alternative view that acknowledges the contingent and hybrid nature of both scientific and political knowledge may be desirable. A view that recognizes the unique contribution each can make to policy problems may succeed in producing knowledge that is indeed relevant, but not prescriptive in undesirable ways.

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Appendix: An Analytic Description of the Intergovernmental Panel on Climate Change

The Intergovernmental Panel on Climate Change (IPCC) is best described in terms of its mandate, its process, and its special development of a "Summary for Policymakers."

The IPCC as Mandated Science

The IPCC was derived as a scientific advisory body to (a) assess available scientific and socio-economic information on climate change and its impacts and on the options for mitigating climate change and adapting to it and (b) provide, on request, scientific, technological, and socio-economic advice to the Conference of the Parties (CoP) to the United Nations Framework Convention on Climate Change (UNFCCC) (IPCC Third Assessment Report Working Group III). It represents a classic case of what Liora Salter has called mandated science. The IPCC is asked to determine the current state of knowledge with regard to climate research and information in order to provide relevant material to a policy audience.

Scientific assessments operate differently than traditional science in their methods of review and criteria for adequacy. For example, in the area of science assessment, scientists are encouraged to evaluate the overall state of knowledge on a given policy issue and to draw from multi-disciplinary literatures. This practice involves judgments about who is included in the assessment process, what information is considered acceptable and adequate for review, the negotiation of an appropriate interpretation among participating scientists, and the method for disclosing this interpretation to a policy audience. Judgments are made among a core group of climate scientists yet extend beyond the strict boundaries of scientific inquiry. Assessments have time-dependent and value-dependent aspects that force scientists to make tacit assumptions about the needs of the "user" audience (i.e., policymakers) as they contemplate and/or anticipate the ways information will be used in the non-scientific

sphere and the subsequent social and political implications of the information derived. Mandated science is thus "a hybrid activity in which scientific expertise is accompanied by a considerable amount of social and political judgment" (Farrell et al., 2001). Yet mandated science is accompanied by a strong belief that scientific contributions should nevertheless be objective and value-neutral (Jasanoff, 1990, and Salter, 1988).

The IPCC Process

The process of producing an IPCC assessment is long and complex. International teams of Lead Authors (LA), nominated by countries and selected by the IPCC Bureau (a group of experts chosen by the two sponsoring organizations (United Nations Environment Programme and World Meteorological Organization), are organized into Lead Author writing teams that spend several years preparing individual chapters in each of three Working Groups. In the 2001 report, these three reports examined the climate science (WG I), climate change impacts and adaptation issues (WG II), and strategies for mitigation (WG III). While WGI has focused on the science of climate change in all three assessment reports, the characterizations of WG II and WG III have changed slightly over the course of IPCC history. Upon completion of the chapters, collected into one volume for each Working Group, the coordinating lead authors (CLA) of each chapter synthesize the key findings of their chapter into an executive summary (ES). These executive summaries are collated into an overall technical summary for each working group report representing key scientific findings (see Figure 1).

During its preparation, each WG report undergoes two stages of review. The "first order draft" of the WG document prepared by Lead Author writing teams, is initially reviewed by experts external to the IPCC process for its technical information and consistency. Expert

Figure 1: The Structure of 2001 IPCC Reports

comments and changes are integrated into a “second order draft” WG document by the Lead Author teams and circulated for expert and governmental review. A final draft is then prepared by the Lead Author teams and submitted to the IPCC Plenary. No IPCC documents are official until they are consensually accepted, in the case of WG reports, or approved, in the case of the SPM, by participating governments. The initial draft of a “summary for policymakers” is written by the technical support unit (TSU), in combination with coordinating lead authors of the various chapters, for each working group. The purpose is to synthesize and simplify the thousands of pages of the underlying assessment reports into a draft that provides the most relevant scientific information for a policy audience. [In order to minimize bureaucratic costs, the IPCC rotates the coordinating responsibilities of various working groups to participating developed nations. The role of the TSU is to coordinate information and cover the operating expenses involved in preparing the documents and WG reports. The facilitator or co-chair for the WG is chosen from this country in combination with a co-chair from a developing nation.] The SPM undergoes expert and governmental review and, in a complex plenary process (described below), is negotiated by all participating governments and is consensually approved through a line-by-line process.

The Synthesis Report (SYR) is a synthesis of the three underlying WG reports. It is an attempt to transcend the disciplinary silos of the

WG’s in order to derive and integrate the key findings relevant for international policymakers. The Synthesis Report of the Third Assessment was organized in terms of nine (originally ten) policy relevant scientific questions (PRSQ) that define the chapters of the report. The nine questions were derived by the Bureau and negotiated and approved by COP delegations. This approach attempted to integrate interpretations of what is relevant to the international policy sphere at the front-end of the SYR drafting process. The SYR went through an expert and governmental review process and was also put through a line-by-line approval process similar to the SPM. The SYR is also accompanied by a summary for policymakers (SPM), a policy relevant synthesis of the synthesis, which undergoes the same line-by-line approval process.

The Summary for Policymakers (SPM)

While the initial draft of the summary for policymakers is written and reviewed by scientists, subsequent iterations are created through a process of negotiation between scientists and governmental delegates (hereafter these representatives will be referred to as policymakers) through what is called the Session of the Panel or IPCC Plenary. This refers to a series of meetings of the Bureau, lead authors, and governmental representatives held at the plenary level of the IPCC, and includes non-governmental organizations (NGO) as observers.

The initial draft of the SPM is reviewed by experts and participating delegations for their

examination of the content, emphasis, and clarity of information, and for their comments on areas for revision. These expert and government comments are collated and accepted or rejected in a meeting of lead authors and a new draft is prepared. All comments that are rejected must be accompanied by a rationale for its exclusion in order to ensure consistency and fairness. This revised draft is then introduced into the IPCC Plenary, where policymakers and scientists are both present. The policymakers then follow a line-by-line review of the text of the draft SPM, in which they can object to text or propose new text. However, all proposed alterations of the report can only be justified if they are consistent with the underlying text in the WG reports. Lead authors attend the meeting to answer questions and to scrutinize the boundaries of science in order to ensure that the underlying working group reports are not misinterpreted or transformed (despite the many changes in emphasis and semantics) in the SPM document. Consistent with the requirement to be “policy relevant but not policy prescriptive,” much attention is paid to eliminating prescriptive wording or any prescriptive emphasis in the information.

It is typical for the original draft of the SPM to be significantly altered and transformed in order to meet the needs of participating delegations. This negotiation of the relevant scientific information by policymakers takes place within an overall consensus process where all proposed changes must be unanimously approved by the entire Panel. “Approval” in the SPM signifies that the material has been subjected to detailed, line-by-line discussion and agreement (see IPCC definitions, Appendix A, in the *Procedures for the Preparation, Review, Acceptance, Adoption and Approval and Publication of IPCC Reports*, 1999). Contentious issues are delegated to “contact groups,” consisting of representatives of those governments interested in the proposed text, together with the LA’s responsible for the underlying text, and then brought back to the full plenary for discussion and approval. Particularly “hot” topics thus tend to be debated and approved at the end of what is usually an extremely long and tiring multi-day meeting, where sessions often begin at 8:00 a.m. and end past midnight at times, for four or five days in a row.

What is constructed and produced by this process is a hybrid document that is intended to be both scientifically credible and politi-

cally approved or authorized. There are a number of problems of equity involved in this form of consensus negotiation. Discrepancies between developed and developing countries with regard to expertise, authority, and management are a systemic problem, despite efforts made by the IPCC for developing country involvement (Lahsen 2000; and Kandlikar and Sagar 1999). Robert Watson, the previous chair of the IPCC, sees this combined effort as a way to strengthen the process of international assessment (personal comm., 2001). He argues that by including the international political audience in the construction of a policy relevant scientific document, the process of international treaty making becomes a more efficient and unified experience. In the synthesis of the pertinent climate research, the SPM process provides a framework for nations to negotiate their particular concerns, reactions and interpretations of the same scientific information in an open forum.

The SPM process contributes to a translation and interpretation of relevant information within a governmental framework or authorizing forum. However, it is apparent that the content of the SPM is driven by a process that begins with the framing and articulation of key scientific findings by the scientific community. As a result, the information in the SPM may consist of key findings that are considered scientifically interesting but not necessarily the most useful for policy. In order to address this problem, in the Third Assessment Report (TAR) process, the IPCC Bureau introduced a new, more policy responsive approach in the organization of the Synthesis Report (a summary of all working group information from all three assessment reports as well as any IPCC special reports). The Synthesis Report represents an attempt to include policymakers in the process of deriving and framing relevant scientific information by having them articulate a set of policy relevant scientific questions (PRSQ).

Policy Relevant Scientific Questions (PRSQ)

Ten policy relevant scientific questions (PRSQ) (later consolidated to nine) considered important to international policymaking and requiring scientific assessment were drafted by the Bureau and negotiated and agreed to by the international policy commu-

nity in San Jose, Costa Rica in 1999. These questions determined the structure of the Synthesis Report (SYR) and acted to guide scientists in drafting its text. Their job was to synthesize the underlying Working Group reports, technical summaries, and SPM's as answers to the PRSQs, each of which defined a chapter in the SYR. The SYR process thus facilitated the front-end involvement of the policy community to frame the way scientific information was collated and defined the terms of what was presented. This allowed policymakers to play a greater role in the determination of policy rele-

vance. This report also allowed the IPCC scientific process to be integrated in a more explicit way with the concurrent political process of the COP.

These SPM and PRSQ approaches facilitate a negotiation of tasks and information that depends less on technical information and more on communication and coordination between the policy and scientific community. The SPM and the PRSQ can thus provide the basis for an exploration of the ways these instruments renegotiate the boundaries of and interactions between science and policy.