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Expert Advice in Global Environmental Decision Making:

How close should science and policy get?

Wolfgang Jung

Global Environmental Assessment Project

Environment and Natural Resources Program

Belfer Center for Science
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The Global Environmental Assessment project is a collaborative team study of global environmental assessment as a link between science and policy. The Team is based at Harvard University. The project has two principal objectives. The first is to develop a more realistic and synoptic model of the actual relationships among science, assessment, and management in social responses to global change, and to use that model to understand, critique, and improve current practice of assessment as a bridge between science and policy making. The second is to elucidate a strategy of adaptive assessment and policy for global environmental problems, along with the methods and institutions to implement such a strategy in the real world.

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Publication abstracts of the GEA Project can be found on the GEA Web Page at http://environment.harvard.edu/gea. Further information on the Global Environmental Assessment project can be obtained from the Project Associate Director, Nancy Dickson, Belfer Center for Science and International Affairs, Kennedy School of Government, Harvard University, 79 JFK Street, Cambridge, MA 02138, telephone (617) 496-9469, telefax (617) 495-8963, Email nancy_dickson@harvard.edu.

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FOREWORD

This paper was written as part of the Global Environmental Assessment Project, a collaborative, interdisciplinary effort to explore how assessment activities can better link scientific understanding with effective action on issues arising in the context of global environmental change. The Project seeks to understand the special problems, challenges and opportunities that arise in efforts to develop common scientific assessments that are relevant and credible across multiple national circumstances and political cultures. It takes a long-term perspective focused on the interactions of science, assessment and management over periods of a decade or more, rather than concentrating on specific studies or negotiating sessions. Global environmental change is viewed broadly to include not only climate and other atmospheric issues, but also transboundary movements of organisms and chemical toxins. (To learn more about the GEA Project visit the web page at http://environment.harvard.edu/gea/.)

The Project seeks to achieve progress towards three goals: deepening the critical understanding of the relationships among research, assessment and management in the global environmental arena; enhancing the communication among scholars and practitioners of global environmental assessments; and illuminating the contemporary choices facing the designers of global environmental assessments. It pursues these goals through a three-pronged strategy of competitively awarded fellowships that bring advanced doctoral and post-doctoral students to Harvard; an interdisciplinary training and research program involving faculty and fellows; and annual meetings bringing together scholars and practitioners of assessment.

The core of the Project is its Research Fellows. Fellows spend the year working with one another and project faculty as a Research Group exploring histories, processes and effects of global environmental assessment. These papers look across a range of particular assessments to examine variation and changes in what has been assessed, explore assessment as a part of a broader pattern of communication, and focus on the dynamics of assessment. The contributions these papers provide has been fundamental to the development of the GEA venture. I look forward to seeing revised versions published in appropriate journals.

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ABSTRACT

Large-scale environmental problems involve complex biophysical systems that are both poorly understood in scientific terms and subject to rapid—sometimes nonlinear—change over time. Decision makers respond to this challenge by pursuing a two-pronged strategy: On the one hand, they seek to reduce uncertainties by soliciting advice from experts in the respective field; on the other hand they create international institutions ('international environmental regimes') to deal with the problem. Due to this potentially important role of expert advice in regime development, it is not surprising that its institutionalization proves to be a highly political and contentious process:

Which degree of responsibility is delegated to what kind of advisory mechanism? Are linkages established to existing mechanisms and institutions, or do the cooperating parties prefer to establish new entities that better serve their needs?

But it is not only the decision makers who struggle with the question of how close they should tie the future course of the regime to the outcomes of advisory processes. The experts and scientific organizations themselves have stakes in the issue and often wrestle with the question whether they should become—at least partially—involved in decision making processes or better stay away from politics in order to preserve their authoritative status as 'independent' scientists. In the second part of this paper, I will define 'policy proximity' as a measure for the degree of integration of advisory processes and decision making processes. I will argue that the policy proximity of advisory processes (at a given point in time) can be described as a result of the two processes outlined above: the delegation of more or less responsibility (strong or weak mandate) to advisory processes by policy makers, and the interpretation of this mandate towards more or less policy involvement by the experts who were asked for advice. Furthermore, policy proximity is likely to be relevant for the potential of the advisory process to influence the policy process. The paper explores in which respect and through which mechanisms the policy proximity of advisory processes matters for decision making.

The research is conceived as a comparative analysis of the development of the advisory systems of two global environmental regimes—the regime on the protection of the stratospheric ozone layer (Vienna Convention 1985,Montreal Protocol 1987 and subsequent amendments), and the regime on climate change (Framework Convention on Climate Change, UNFCCC, 1992), and Kyoto Protocol 1997).

The main findings of the study are:

1. The mandate of advisory processes related to international environmental regimes is not a static variable, which is determined once for all during regime creation. Instead, it is subject to change and fine-tuning over time. The strength of the mandate is a function of the 'level of transnational political consensus on the need for and feasibility of meaningful action'. States are ready to confer authority to advisory processes only after their uncertainty about the future course of the regime has been reduced. Political consensus on the need for action (however achieved) determines the strength of the mandate.
2. The way managers and participants of advisory processes interpret their mandate is also subject to change over time: In the early stages of regime formation there is a tendency to 'policy activism', i.e. the experts tend to make policy statements which are not completely

based on scientific findings. Once the issue is on the political agenda and debated controversially, they turn back to a more 'conservative' approach.

3. The optimal level of the policy proximity of advisory processes has to be identified case by case. The two issue areas explored in this paper offer little scope for generalization. However, there was no clear evidence that expert advice was perceived as too close to policy. In some cases there rather seemed to be scope for a higher level of integration of decision making and advisory processes.

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While preparing this research I received valuable comments from Shardul Agrawala, Dr. Fank Biermann, Professor William C. Clark, Dr. Alexander Farrell, Aarti Gupta, Professor Peter Haas, Dr. Jill Jäger, Professor Sheila Jasanoff, Professor David Levy, Professor Ronald Mitchell, Professor Sandra Rothenberg and Dr. Eileen Shea.

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1. INTRODUCTION

Large-scale environmental problems involve complex biophysical systems that are both poorly understood in scientific terms and subject to rapid—sometimes nonlinear—change over time. Likewise, the degree of both human causation of the problems and their potential impacts on socio-economic systems are plagued by great amounts of uncertainty. Furthermore, the options to address the problem often require substantial restructuring of human activities—with uncertain consequences for individual and collective welfare.

Available experience suggests that decision makers respond to this challenge by pursuing a two-pronged strategy: On the one hand, they seek to reduce uncertainties by soliciting advice from experts in the respective field; on the other hand they create international institutions ('international environmental regimes') to deal with the problem. Due to the above uncertainties and the multiple stakes involved, the initial institutional response is usually weak and does not comprise binding commitments or even regulatory measures. Instead, these first acts of cooperation (e.g. in the form of a 'framework convention') often include mechanisms for self-correction and future adjustments (e.g. in the form of amendments or protocols to the convention). Most of the regimes on large-scale environmental problems can thus be described as intentionally open-ended decision making processes. In line with the tradition in liberal democratic countries—who dominate the process of regime formation in most cases—this process of self-correction is usually agreed to be based on new knowledge about the problem, its causes and consequences.

This general deference to expert advice[1] sets the stage for the internationally organized production of policy relevant knowledge in the respective issue areas. Given this potentially important role of expert advice in regime development, it is not surprising that its institutionalization proves to be a highly political and contentious process:

Which degree of responsibility is delegated to what kind of advisory mechanism? Are linkages established to existing mechanisms and institutions, or do the cooperating parties prefer to establish new entities that better serve their needs? In many cases, some kind of advisory mechanisms are already in place under the auspices of international organizations who often play important roles in facilitating regime building. However, how these 'services' should be used by or linked to the emerging environmental regime can be subject of controversies—among others because some regime members might consider them as dominated by particular countries (e.g. by the major donor countries of the international organizations). This struggle can lead to a situation in which more than one mechanism is mandated to produce regime relevant knowledge, raising the question of an adequate division of labor among them.

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1 I will use the term 'expert advice' to include all disciplines providing regime-relevant knowledge, among others the natural sciences, engineering sciences, social sciences, economics, etc.

But it is not only the decision makers who struggle with the question of how close they should tie the future course of the regime to the outcomes of advisory processes. The experts and scientific organizations themselves have stakes in the issue and often wrestle with the question whether they should become—at least partially—involved in decision making processes or better stay away from politics in order to preserve their authoritative status as 'independent' scientists. In this situation, managers and participants of advisory processes can make use of the interpretive latitude of their mandate, a typical feature of many agreements in the 'anarchic' international system. For example, they can reject demands of the policy makers to formulate response strategies as not scientifically answerable. On the other hand, they can frame and highlight 'scientific facts' in a way that suggests a particular course of action without making an explicit recommendation.

In the second part of this paper, I will define 'policy proximity' as a measure for the degree of integration of advisory processes and decision making processes. I will argue that the policy proximity of advisory processes (at a given point in time) can be described as a result of the two processes outlined above: the delegation of more or less responsibility (strong or weak mandate) to advisory processes by policy makers, and the interpretation of this mandate towards more or less policy involvement by the experts who were asked for advice. Furthermore, policy proximity is likely to be relevant for the potential of the advisory process to influence the policy process. The paper explores in which respect and through which mechanisms the policy proximity of advisory processes matters for decision making.

The research is conceived as a comparative analysis of the development of the advisory systems of two global environmental regimes—the regime on the protection of the stratospheric ozone layer (Vienna Convention 1985,Montreal Protocol 1987 and subsequent amendments), and the regime on climate change (Framework Convention on Climate Change, UNFCCC, 1992), and Kyoto Protocol 1997). The analysis seeks to find answers to the following three related questions:

1. When are states willing to delegate which degree of responsibility to internationally organized advisory processes (strength of mandate)?

   The two extreme hypotheses are that a) states are generally willing to defer to expert advice under conditions of uncertainty or that b) they are willing to defer only when they know what they want and seek for arguments justifying their already agreed upon goals.

2. How and in which direction do managers and participants of international advisory processes interpret their mandate?

   Extreme answers are that they a) try to apply the same rules as in 'pure research' or b) actively engage in the elaboration of policy alternatives.

3. How does this play out dynamically? How is the way in which experts interpret their mandate perceived by decision-makers and other stake-holders? How does this influence the policy process?

   Is the advisory process perceived as beeing too close or rather not close enough to policy?

2. Theoretical Background and Methodology

There is a huge body of literature on the role of science and expert advice in policy making. In this section I will give a brief introduction to those three clusters of work I found most relevant for addressing the above raised questions: 1) work on the theory and analysis of international environmental regimes and the role of science therein; 2) work on 'science-policy boundaries' as part of the literature on the 'Social Studies of Science and Technology' (STS); and 3) conceptual work on the critical appraisal of science in policy contexts, among others the preliminary findings of the 'Global Environmental Assessment Project' (GEA 1997).

2.1 The Role of Science in International Environmental Regimes

Recent work on governance at the international and transnational level is focused on the study of *regimes*: "social institutions that consist of agreed upon principles, norms, rules, decision-making procedures, and programs that govern the interactions of actors in specific issue areas" (Levy et al 1995: 274). A considerable amount of empirical work in this field is dedicated to environmental issue areas, not least due to the continuous rise of the number of international environmental accords.[2]

There is a well established body of literature on regime formation, i.e. the question why and under which conditions regimes emerge in the first place. Earlier studies have pointed to the dominating role of power, for example the role of hegemons (Keohane 1984) and the interplay of interests in bargaining situations (Young 1989). The influence of science, or more broadly of knowledge and ideas, is emphasized most prominently by the 'epistemic community concept' (Haas 1992b). Acknowledging the constraints on state behavior imposed by power and interests, the concept claims a remaining 'wide latitude' of possible state actions and further assumes that networks of knowledge based experts (epistemic communities) help states to (re-) define their interests and appropriate actions (ibid: 2). There is an ongoing debate among regime scholars about the relative importance of power, interests and ideas in the process of regime formation. The preliminary result of this debate is, that the various factors play different roles in different cases and interact with each other in complex ways (Young 1997: 12/Young and Moltke 1994). One of the few general findings on the role of science is that its influence decreases along the stepwise process of regime formation: Its role for agenda setting is often decisive, whereas the negotiation and operationalization of regime rules seem to be dominated by structural factors (Andresen and Ostreng 1989/Young and Osherenko 1993).

Some authors have pointed to the importance of the ways in which expert advice is integrated in the institutional structure of regimes (Gehring 1994/Parson 1993), but so far only few systematic work exists on why particular institutional designs are chosen, if and how they change in the course of regime development and with which consequences.[3] In other words:

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2 For a review of the state of the art in the analysis of international environmental regimes see for example Young (1997) and Vogler (1995).

3 Fritz (1998) provides a synopsis and first steps towards a comparative analysis of some 15 advisory processes within the UN-System. The Science Plan for the Project on the Institutional Dimensions on Global Environmental Change indicates the need for further comparative research on the issue (IDGC, 1998: Section

The nature of the institutional linkages between advisory and decision making processes in environmental regimes has (so far) received little attention, be it as a dependent variable (i.e. something that needs to be explained) or an independent (explanatory) variable.

The epistemic community concept, for example, quite generally assumes that, in the face of uncertainty, decision makers are willing to defer to science and delegate authority to expert bodies (Haas 1992b: 14). It does not consider variations in the amount of conferred authority (strength of mandate for advisory process) across issues and over time. Furthermore, the concept presumes that the dominating pathway of influence of epistemic communities is the consolidation of their 'bureaucratic power' *within existing* national and international institutions (ibid: 4). It pays less attention to the potential role that changes in the international institutional settings could play in determining the nature and amount of epistemic influence.

A third element of the concept that needs to be qualified in light of the questions raised above is the presumption that the members of epistemic communities (as a defining feature) 'share a common policy enterprise' and engage actively in 'proposing specific policies' (ibid:2-3). Actually, there is some reason to assume that, within the group of 'professionals from various disciplines' that make up an epistemic community, at least the scientists should be rather reluctant to get involved in politics.

2.2 Social Boundaries between Science and Policy

The rationale for that reluctance is well established in the literature on 'science-policy boundaries' as developed under the larger umbrella of the (social) studies of science and technology.[4] In this line of work, scientific inquiry and the formulation of expert advice is first of all considered a social and purposeful activity (Gieryn 1995). Scientists who engage in the production of policy relevant knowledge may or may not have a stake in any particular policy outcome, but they do have a professional interest in protecting their claim to authority over fact making. This authority, however, depends critically on the perceived neutrality and objectivity of the produced knowledge. Scientists who lobby overtly for specific policy projects thus run the risk of loosing their authoritative status as independent scientists. In this situation, the task for the scientists is to 'get science close to politics, but not too close': Not too close, because of the above mentioned reasons, but still close enough, because the legitimation for research (and its public funding) in modern societies is increasingly based on its perceived relevance and utility for the solution of social problems in general and political decision making in particular. The policy makers face a similar task: They are interested to have science 'close' in order to be able to legitimate their decisions by attaching to them the cultural authority of scientific expertise; but not so close that choices become exclusively technical and thus dominated by experts (ibid: 436).

The slogan 'close but not too close (to policy)' could be read as a prescription for a potentially effective design of advisory processes. Indeed, most of the recent work on the institutional dimensions of science-policy interactions in international environmental regimes comes up

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4.3.2).

4 See Jasanoff et al. (1995) for a comprehensive overview of the field.

with similar findings: Fritz for example, in his synopsis of 15 advisory processes within the UN system, comes to the conclusion that "some of the most successful scientific advisory processes are those that are recognized as beeing *independent, but* are *not separate* from policy-making processes" (Fritz 1998:9). Skodvin's study on science-policy interactions formulates the (theoretically derived) proposition that "processes of science-policy interaction are most likely to succeed if they are organized within institutions capable of both *separating* and *integrating* science and politics" (Skodvin 1999: 11). In a similar vein, the authors of the Science Plan for the Project on the Institutional Dimensions of Global Environmental Change speculate about the relative merits of *autonomous* in contrast to *built in* advisory mechanisms in environmental regimes (IDGC 1998).

The implied importance of a 'mapping' of science and policy does not automatically mean, however, that the boundaries between the two territories can and should be clearly defined. Jasanoff's study of science advisers in the American federal government has demonstrated that these boundaries can not be drawn in a purely objective way, that they are subject to continuous negotiation, and (maybe most importantly) that intentionally blurred boundaries between science and policy can facilitate policy making (Jasanoff 1990).

2.3 Effectiveness of Advisory Processes

The discussion in the preceding section suggests that the effectiveness of an advisory process depends—among others—on the way it is both demarcated from and linked to the decision making process in the respective issue area.

The effectiveness of international institutions (like environmental regimes or advisory processes as 'subregimes') is an intensely debated issue among scholars of international relations. The first phase of the debate centered around the question 'if regimes matter at all' while recent work explored under which conditions and in which ways regimes make a difference.[5] There is a growing consensus on the causal basis of effectiveness: Empirical evidence suggests that endogenous (internal to institutions) and exogenous (external to institutions) factors interact in complex and multiple ways to cause observed outcomes: Endogenous factors are those concerning the institutional design and programmatic activities of regimes, exogenous factors involve—among others—patterns of interest, distribution of influence and coercive power, deployment of non-coercive power (for example in the form of 'epistemic communities') and the nature of the issue area (Levy, Young, and Zürn 1995: 290pp). Recent studies have identified groups of causal links between institutional facts and behavioral outcomes (Haas, Keohane, and Levy 1993/Young 1999).

The task to identify such causal links is even more ambitious when the focus of the analysis is shifted from the level of the entire environmental regime to the respective 'subregime' on expert advice. The preliminary findings of the Global Environmental Assessment project suggest that the influence of expert assessments on the policy process is most significant in the early stages of the policy cycle (issue framing, agenda setting, strategy development, etc.). The most effective assessments are those which are perceived

5 For an overview of recent research see Zürn 1998.

- technically *credible*,
- politically *legitimate*, and
- *relevant* or valuable for the policy process (GEA 1999)

Credibility, legitimacy and policy relevance can thus be considered as necessary (albeit not sufficient) criteria for assessment effectiveness. These three criteria are determined by the historical and political context as well as by characteristics of the assessment design. The project identified the following three design choices as particularly relevant:

- how *participation* in the assessment process is determined;
- how *uncertainty* and *dissent* are handled in the assessment report; and
- how the *science-policy interface* is structured (ibid).

The present paper picks up this model and explores the relevance of design choices regarding the science-policy interface. The focus of the analysis follows from our discussion in the previous sections, in which we assumed that the relation between science and policy is determined by at least two factors: First, by the willingness of the decision-makers to defer to science, i.e. to delegate a certain amount of responsibility to expert bodies; and second by the willingness of the experts to engage in the production of policy relevant knowledge.

To make the influence of these (and possible other) factors on the science-policy interface measurable, it is helpful to define a variable that describes the actual 'proximity' or 'closeness' of science and policy at a certain point in time. I will thus define the 'policy proximity' of an advisory process as a combination of the two following indicators:

- The *scope* of the advisory process: Is the assessment limited to the 'pure science' of an environmental issue or does it treat socio-economic issues as well? Does it evaluate or even formulate specific policy options to address the underlying problem?
- The *strength* of the *institutional linkage* to the decision making process (spelled out in the *mandate* for the advisory process): Is there an agreement among decision makers (here: the members of the environmental regime) to base future decisions on the outcomes of the advisory process or is the advisory process considered as only one among other possible sources of information? Is there a provision to solicit advice on a regularly basis, in clearly defined intervals or rather on an ad hoc basis?

In this definition, an advisory process is 'closest' to policy making when it includes the evaluation or even recommendation of policy options and when there is a strong agreement among decision makers to make use of the assessment outcomes.

In the following two chapters I will explore how, why and with which consequences the 'policy proximity' of advisory processes related to the two global environmental regimes on the protection of the ozone layer and on climate change evolved over time.

3. THE ADVISORY SYSTEM OF THE OZONE REGIME

3.1 Regime Formation: 1982-1985

The problem of stratospheric ozone depletion was placed on the international policy agenda as early as three years after the publication of the 'Molina-Rowland hypothesis'[6], when UNEP and WMO convened a "Meeting of Experts designated by Governments, Intergovernmental and Nongovernmental Organizations on the Ozone Layer" in Washington (March 1-9, 1977).

The meeting agreed on a 'World Plan of Action on the Ozone Layer' with the primary goal to coordinate international research activities. The plan reflects a predominantly technical framing of the issue. As will be shown below, this technical frame has remained stable in the development of the regime over time and is still dominant today. The twenty-one items considered important for further research by this early meeting in 1977 can easily be grouped to clusters matching the agendas of the assessment panels to the Montreal Protocol as agreed 10 years later (see following section):

- The meteorological and chemical aspects of the atmosphere ("Science");
- The Impacts of anticipated decrease in the ozone shield on human health and on ecosystems ("Impacts"); and
- The socio-economic impact of the use as well as the substitution of CFCs ("Technology/Mitigation options and their socio-economics") (UNEP/WG.7/25/Annex III).

The UNEP Governing Council adopted the World Plan of Action at its 1977 session and—as suggested therein—founded the "Coordinating Committee on the Ozone Layer (CCOL). The CCOL was composed of representatives of countries with major scientific programs, international and non-governmental organizations[7] and met annually until the mid-1980s to assess the available knowledge in the above fields of the issue. In these annual meetings, states could exchange their views about possible regulations. The meetings were also open to business representatives presenting the view of the CFC-producing and consuming industries.

With these activities, UNEP, and more specifically CCOL emerged as the primary forum for the synthesis of knowledge *and* for the discussion of internationally coordinated action, i.e. the committee served both scientific and political purposes. The driving actors for that move towards internationally coordinated assessment activities were UNEP and the United States, the latter having a strong interest in internationalizing domestic regulation which started in 1977 with the ban of non-essential aerosol uses and—at that point—was likely to be extended due to

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6 The paper of Molina and Rowland (Molina and Rowland 1974) warned about the potential of Chlorofluorocarbons (CFCs) to destroy the stratospheric ozone layer and received an enormous amount of attention, particularly in the United States and in the UK. It triggered some early political measures in the US and is commonly considered as the birth of zone depletion as a political issue.

7 Participating countries: Australia, Canada, Denmark, West Germany, France, India, Italy, Japan, Kenya, The Netherlands, Norway, Sweden, USSR, UK, USA, Venezuela. Participating International and Nongovernmental Organizations: ESA, WHO, ICAO, WMO, UNEP, EEC, OECD, CMEA, ICSU, CMA (see Gehring, 1994: 200).

strong domestic pressure. In these early days of regime formation, with no binding commitments or even regulatory measures looming on the horizon, neither the mandate of the CCOL nor its interpretation by participants were contentious issues. Neither the fact that government experts (and not independent experts) evaluated the available knowledge nor that factual and normative aspects of the issue were debated in the same body were subject of controversies. Instead, this first step towards institution-building turned out to be crucial for keeping the issue on the international agenda in the early 1980s, a time when issue attention declined, particularly in the United States where three National Academy of Science (NAS) reports between 1979 and 1984 had downplayed the threat of ozone depletion (Breitmeier 1997: 99).

While UNEP and the United States were the drivers for the early internationalization of assessment activities it was the Scandinavian countries that assumed a leadership role in creating a forum for political negotiations on a global regime. Upon their initiative the UNEP Governing Council in 1980 adopted a decision calling upon countries to reduce their emissions of CFC 11 and CFC 12 and only one year later established an ad hoc working group of legal and technical experts nominated by interested governments and intergovernmental organizations "aimed at the elaboration of a global framework convention" (UNEP Governing Council Decision 9/13 B, 1981).

At a UNEP meeting on international environmental law in Montevideo in November 1981, Sweden, Finland and Switzerland submitted a 'draft recommendation' for the institutional structure of a global convention (UNEP/GC.10/5/add.2/Annex/Appendix II). This proposal is interesting in the context of the present paper because its basic ideas survived the negotiations of the coming years and formed the core of the eventually agreed Vienna convention. Explicitly referring to the Geneva Convention on Long-range Transboundary Air Pollution from 1979, the sponsors of the initiative argued for an adaptable institutional structure comprising a general framework (overall objectives of the convention) and a part containing the detailed provisions which were suggested to be "easily adaptable to changing circumstances as new scientific evidence becomes available" (ibid, para 2).

At the first session of the Working Group in January 1982 in Stockholm, Sweden, Norway and Finland submitted a'Draft convention' building on the Montevideo-proposal (UNEP/WG.69/3). Besides the duties of the parties which were drafted in rather general language, the proposal included the following four elements describing the institutional structure of a potential accord:

- The Conference of the Parties as the major policy-making organ of the regime
- A scientific-technological committee performing functions similar to those so far performed by the CCOL: coordination and promotion of research, organization of the monitoring of the ozone layer, synthesis of information on impacts of increased UV radiation on ecosystems and human health and finally, preparation of mitigation measures,
- A secretariat with an active role and autonomous position toward the member countries, including among others the mandate to conduct scientific and technical studies, and
- a simplified procedure for the adoption of amendments.

This proposal of the proactive/leader countries clearly aimed at shaping the institutional structures of the looming regime in a way that would later on facilitate the subsequent

formulation and adoption of regulatory measures. In tune with preceding environmental accords (eg. the whaling regime and LRTAP) the proposal assigned expert assessments a crucial role in shaping and legitimizing those measures.

The initial reaction to and further negotiation of this proposal suggests that the level of political consensus on the need for action is an important factor for how expert advice is institutionalized in international environmental regimes. In early 1982 the negotiating parties were divided in two camps: One group finding that "the present evidence of risk warranted early regulatory and preventive measures" (Nordic countries, Denmark, The Netherlands and Switzerland) while the second group held that "the present evidence of risk did not point to the need for such action". They supported only moderate measures based on new scientific findings (Japan, UK, France, Germany, Italy and the United States). (UNEP/WG.69/10, para 9), i.e. at this stage, there was a consensus on the need to address the problem on the international level but there was no consensus on mitigating measures of any kind.

The proposal in general was received favorably by the first session of the working group. The emphasis on process and flexibility (instead of concrete measures) was acceptable to both camps. Likewise, the establishment of a conference of the parties as a permanent and principal policy-making body and a supporting secretariat was well received. However, all those elements aimed at facilitating subsequent adaptive rule-making were disputed and stepwise[8] diluted in the course of the negotiations leading to the Vienna Convention in 1985:

- There was no agreement on the proposed scientific-technical committee, because it was not clear how the already existing CCOL, which performed similar functions could be integrated into the structure of the convention. In a 1982 draft, the UNEP secretariat noted that CCOL "had no experience in socio-economic and technological fields" which were considered necessary for the operation of the regime. It was considered probable that such a broadening of the responsibilities and alteration of the membership would not be welcomed by the majority of its present members. At its third session the working group decided to leave the whole question to the conference of the parties.
- The idea of a semi-autonomous secretariat was rejected. Its role was reduced to a mere servicing body in the course of the negotiations.
- The suggestion to circumvent protracted deliberations by a simplified amendment procedure were dropped and replaced by the framework convention – protocol approach, i.e. protocols as separate legal instruments would be the substance of self-adaptation.

In sum, the negotiating parties, due to a lack of political consensus on the future course of the regime, tried to keep full control of the policy process by rejecting proposals for mechanisms with the slightest prescribing/prejudicial qualities.

The rather moderate level of political consensus on regulatory measures and the reluctance to create a strong advisory mechanism as an integral part of the regime were reflected in the final text of the Vienna Convention:

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8 Following a recommendation of the First Session of the working group, the UNEP Governing Council authorized the UNEP secretariat to come up with a draft convention, which was revised five times between 1982 and 1985.

Nations agreed to take "appropriate measures...to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the Ozone Layer;" but they did not specify those measures. There is no mention of any substances that might harm the ozone, and CFCs only appear towards the end of the annex to the treaty, where they are mentioned as chemicals that should be monitored. The main thrust of the convention was to encourage research, cooperation exchange of information among countries and, probably most important to establish a permanent deliberation process to facilitate the adoption of substantive norms. But particularly the provisions for the integration of expert knowledge left wide room for interpretation of the eventual institutional design (see Annex I).

3.2 From Vienna to Montreal: 1985-1987

The scientific and political context of the negotiations changed rapidly after the adoption of the Montreal Protocol.[9] For the purpose of this paper I will focus on those aspects of the story dealing with the institutional aspects of expert advice in the just founded international regime.

The Vienna convention defined which kind of advice the implementation process needed, and the bullets of Article 3 actually reflect the four years later agreed mandates for the assessment panels of the Montreal Protocol. But the provision to leave the related institutional questions to the conference of the parties implied that—due to the protracted process of ratification —it would take at least three years to arrive at a decision about how this advice would be politically authorized, legitimated, and through which procedure it would be brought to bear on the policy process.

On the other hand, the participating countries of the Vienna Conference—per resolution—expressed the ambition to continue the negotiations on regulatory measures and adopt a protocol, if possible not later than 1987 (see Gehring 1994: 234). Consequently, the negotiation process resumed, for the time being, without the establishment of formalized international assessment processes.[10] This did not mean, however, that science did not play a role in the protocol negotiations. It implied however, that a) in absence of *one* authoritative knowledge source, scientific findings would be used in a rather ad hoc and strategic way; and that b) in absence of a clear international mandate, the scientific community, in collaboration with international knowledge brokers had room to foster consensus building (and thus policy relevance of their results) within their own ranks.

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9 This stage of the issue-development is described in great detail in the comprehensive accounts of, inter alia, (Benedick 1991, 1998), (Haas 1992a), (Litfin 1994) and (Gehring 1994).

10 The Coordinating Committee on the Ozone Layer kept on providing assessments (as background documents) for the negotiations. They were generally perceived credible but at the same time of limited policy relevance, because-in absence of an appropriate mechanism—they were not able to present a consensus of the international scientific community. The main value of the CCOL was to provide unbalanced, credible information to those countries that did not have strong research programs of their own, i.e. particularly to developing countries (Litfin 1994: 81, 84).

In this situation, the single most important and commonly considered successful step to build international scientific consensus was the report "Atmospheric Ozone 1985: Assessment of our understanding of the processes controlling its present distribution and change", published in Summer 1986. This report, co-sponsored by several US and European agencies as well as international organizations, turned out to be an authoritative scientific base for the negotiations (Benedick 1991/Litfin 1994). In their analysis of the blue books, Clark et al. conclude that one important factor for the positive appraisal of the report was the fact that it was designed as a "purely scientific assessment" addressing the "single most politically important question of the day, namely whether human activities represent a substantial threat to the ozone layer" (Clark et al. 1996). Although being considered an explicit response to the Vienna Convention's call for coordinated research (Litfin 1994: 82), the assessment's scope was actually limited to the 'scientific' categories of the mandate (as spelled out in Article 3, see excerpts above) and did not contain discussions on either impacts or policy options. In other words, in absence of a formal order of the governments to conduct a particular assessment the designers of the assessment used this room for interpretation and addressed only those questions they considered answerable, practicably treatable etc. The result was a document which was technically credible and politically effective at the same time even though its technical language was incomprehensible to non-experts in the field and it neither included policy options nor a summary for policy-makers.

This general appraisal notwithstanding, it does not seem completely clear that the blue books were so effective *because* of their self-limitation to 'pure science' (Clark et al. 1996).

- First, including discussions on impacts and policy options need not inescapably lead to a 'contamination' and 'undermining' of the 'basic science'. The completely consensual political appraisal of the first synthesis report of the assessment panels to the Montreal Protocol, for example, suggests the contrary (see below).
- Second, it can be argued that the failure of the blue books to discuss the socio-economics of different scenarios for ozone depletion prevented the closure of even the scientific dimension of the issue. In the course of the negotiations, the wide range of predictions for future ozone depletion was interpreted as uncertain science and used as an excuse for action even though the science of the models largely converged and the uncertainty (range of prediction for ozone depletion) was grounded in different (and partly value-laden) assumptions on the socio-economic input parameters of the models. It was not before UNEP convened a meeting of the modeling teams in Wuerzburg, Germany in April 1997 that closure on the science of the models was reached.[11] It can thus be argued, that a treatment of the socio-economics of the different models in the blue books could have been of great value for the policy process and eventually lead to an even earlier adoption of the Montreal Protocol (and not to a contamination of ozon science).
- Third, it doesn't seem clear how "the perceived 'value' of the blue books to participants in the ozone debate may well have increased in proportion to the interpretive latitude induced

11 According to UNEP the report represented 'a turning point in the negotiations', because, 'it was no longer possible to oppose action to regulate CFC releases on the grounds of scientific dissent'. (UNEP/WG.172/2:2, quoted in (Litfin 1994: 112).

by the absence of a self-explanatory executive summary." As shown for the particular point of model predictions, this latitude was of 'value' for a continued strategic use of science in the negotiations as it provided support for the widest possible range of arguments, but then, 'value' should not be considered a meta-criterion of assessment effectiveness. Instead, the potential of an assessment to change agendas, perceptions, interests, behavior (measures of effectiveness) appears to be larger if executive summaries/summaries for policy-makers reduce the interpretive latitude by indicating issues on which 'closure' has been reached.

This is by no means to say that the blue books were not 'great work'. The point to be made here is rather to question if the 'pure science' approach really was an important factor for the assessment's effectiveness. The counterfactuals presented above rather suggest, that a step closer towards policy relevance probably would not have damaged the credibility of the blue books but might have accelerated policy progress by highlighting areas of scientific closure (models/predictions for ozone depletion), reinforcing areas of concern (health impacts of increased radiation) and enhancing the capacity for communication (inclusion of summaries for policy makers).

However, an ultimate proof appears illusive for either of the above hypotheses, as the actual effect of the blue books on the policy process is hard to disentangle from those of other factors. The well established literature on the negotiations of the Montreal Protocol generally acknowledges the importance of the blue books and the Wuerzburg-meeting but also emphasizes the crucial role of other—partly idiosyncratic—factors in eventually bringing about international agreement on CFC-regulation:

Richard Benedick, who led the US delegation at that time, emphasizes the role of skillful diplomacy in combination with US power and leadership (Benedick 1991, 1998); Peter Haas points to the influence of transnational epistemic communities (Haas 1992b/Haas 1993); Sebenius, in a critical response to Haas, claims that scientific evidence was important only in combination with I) prior statements by the main CFC-producing company DuPont to stop production if the Molina-hypothesis should be proven, II) the competitive dynamics regarding CFC-substitutes and III) atypical effects of a threat of domestic legislation that turned DuPont to break ranks. (Sebenius 1992: 359, see Jasanoff 1996 for a similar argument); Litfin (1994) further adds to this list by emphasizing the role of idiosyncratic context-factors like the 'antarctic ozone hole' which was discovered in summer 1985 and attracted wide-spread media attention, or the success of the German Green Party in the 1987 parliament elections which eventually led to a more cooperative stance of the European Union.

However, the main argument I put forward in this section is not one about the tricky ways how assessments affect the policy process but rather on how changes in the policy realm affect the way assessment activities are institutionalized internationally. The Montreal Protocol is not only significant in terms of far-reaching agreement on regulatory measures but also in the degree of authority it confers to an advisory mechanism in providing the basis for strengthening those measures in the future. Already the preamble reflects an unprecedented and unambiguous level of consensus on the kind of action to be pursued under the protocol ("elimination of ozone depleting substances"). The preamble's provision to led science guide this process is reinforced in Article 2, and put concrete in Article 6—in a way that endowed the advisory process with a considerable influence on future negotiations: assessment panels,

legitimized by the conference of the parties, would be convened in defined intervals (every four years) and report back to the parties to facilitate further adjustments (see Annex II).

The strong mandate for the assessment panels was strongly supported by the United States, but it was not an invention of creative circles within EPA as Litfin (1994) suggests. As described above, the idea to establish an advisory process endowed with a strong mandate was tabled by proactive European governments (Nordic countries, Netherlands and Switzerland) as early as 1981, stimulated by lessons from the acid rain/LRTAP regime—but there was no agreement at that time. Governments, uncertain about the future course of the regime, tried to keep full control of the process and refused to confer any kind of authority to new advisory mechanisms. This changed only after a consensus on regulatory measures and the principal course of the regime had emerged. This suggests that the strength of the mandate for expert advice is a) subject to change and b) determined by the level of political consensus on the need for action. In the following sections of the paper, I will collect supplementary evidence for this hypothesis.

3.3 From Montreal to London: 1987-1990

The Montreal Protocol included a strong mandate for expert advice, but the formal authorization of the assessment panels was left to the first meeting of the parties to take place only after entering into force of the Protocol which could not be expected to happen before early 1989. Interestingly, the scientific and political context developed so rapidly right after the adoption of the Protocol that the parties invented creative ways to bypass this protracted formal procedure.

Late in 1987, after the conclusion of the Montreal Conference, the results of a US sponsored international expedition revealed a high concentration of chlorine in the Antarctic stratosphere, corroborating the assumption that CFC-emissions were a major cause for the phenomenon. Only a few months later, in March 1988, the report of the Ozone Trends Panel (NASA 1988) demonstrated that the depletion of the ozone layer was also observable in higher, more densely populated latitudes and that depletion proceeded faster than expected. This new level of scientific consensus on the causes and the extent of ozone depletion was followed by an immediate response by DuPont, the then world's largest CFC producer, pledging to halt production of fully halogenated CFCs as soon as possible. Virtually the hole CFC industry engaged in a race for substitutes and gradually increased its support for further regulations. In the following months several countries committed themselves to a full CFC phaseout by the turn of the century (among others Sweden in June 1988, Canada in February 1989, the EU and the US in March 1989). Again, like in the time preceding the Montreal conference, a (complex) combination of new science, progressive business response and political factors (domestic pressure and first acts of national implementation) led to a new level of political consensus: With the explicit support of industry the consensus evolved from international to *transnational*, and with the emergence of technological alternatives it extended from the desirability to the technical and economic *feasibility* of regulatory measures.

In sum, this dynamic course of events led to the paradoxical situation that governments were willing to act and strengthen the Montreal Protocol before the institutional structure of the regime was ready to provide support. To overcome this technical hurdle to cooperation, the parties established a set of ad hoc mechanisms including such on international assessments on which adjustments had to be based (Article 6).

The first hurdle was the lack of a political forum to discuss the adjustment of the Protocol. Unlike the Vienna Conference, the Montreal Conference did not authorize an interim negotiation process but only a workshop on technology options and a working group on data reporting. On the initiative of the UNEP secretariat, the mandate of the Working Group was tacitly extended and it eventually "assumed the role of the interim supervisory body of the review process to be set in motion" (Gehring 1994: 266).

The second hurdle was the establishment of the assessment panels, the reports of which would have to be submitted one year before the first review and amendment of the Montreal Protocol, which was scheduled for 1990. The Working Group approved a proposal of the UNEP Secretariat according to which an "Intergovernmental Multi-Disciplinary Panel" to be attended by all parties, an International Steering Committee to supervise the review process, and four reporting groups on the issues specified in Article 6 should be established. This structure differed from the text of the Montreal Protocol because it consisted of one panel (serviced by the four reporting groups) instead of four panels directly reporting to the parties. This 'trick' allowed the early establishment of the four reporting groups and a timely expert input. As a consequence of this procedure, the official panel got a quasi-political function, as it was primarily to approve the information collected in the reporting group, i.e. an additional institutional layer was introduced between knowledge generation and decision making. The composition of the reporting groups and their terms of reference were largely predetermined by two meetings convened by UNEP and held immediately prior to the First Meeting of the Working Group (The Hague, Netherlands, October 1988).

This formally vague procedure was legitimized ex post by the First Meeting of the Parties to the Montreal Protocol in Helsinki, May 1989), including the establishment, composition and terms of reference of the four reporting groups. The reporting groups were renamed 'panels' and an 'Open-ended Working Group' was established to take over the function of the 'Intergovernmental Panel'. The new Working Group was mandated to integrate the four panel reports into one 'synthesis report' and, based on this, prepare draft proposals for amendments to the protocol (UNEP/Ozl.Pro.1/5).[12]

The panel reports were submitted in July 1989, only a few weeks before the first meeting of the Working Group (late August 1989, Nairobi). They had been drafted and reviewed by several hundred (largely western) scientists and experts. Like the blue books discussed above they comprised many hundred pages of information which were impossible to review in the time available to the Working Group. It was thus agreed that the Working Group should consider only the draft Synthesis Report prepared by the chair of the panels, Robert Watson and discuss it point-by-point. Additional information would have to stem from one of the panel reports. The

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12 In the climate regime, these two functions are performed by separate institutions: The synthesis of science is conducted by the IPCC, the suggestion of proposals for action is left to SBSTA (see below).

second meeting of the Working Group adopted and approved the Synthesis report without any further amendments (UNEP/Ozl.Pro.WG.I(2)/4 and II(1)/7) and thereby accepted a wide range of scientific and technical assertions for the ensuing political negotiations, all of which could have been disputed (cf. Gehring 1994: 275). Among others, the Synthesis report states, that the reduction scheme of the Montreal Protocol is by far insufficient to stop further depletion of the ozone layer, that the expected losses in ozone would result in a considerable increase of eye cataracts and non-melanoma skin cancers, that reductions by the year 2000 of 95% CFCs, 90% methyl chloroform and 100% carbon tetrachloride were technically feasible, and that "the monetary value of the benefits of safeguarding the ozone layer is undoubtedly much greater than the costs of CFC and halon reductions."[13] (UNEP/Ozl.Pro.WG.II(1)/4).

The section building on the economic assessment was the only one to encounter some reservations, namely on the part of the developing countries, who otherwise showed virtually no interest in the report. Most importantly, they achieved that the notion of a 'joint responsibility' mentioned in the draft report was replaced by a paragraph emphasizing the responsibility of the developed countries.

The most important element of the Synthesis Report was the discussion of five alternative control options, ranging from the reduction scheme of the Montreal Protocol to a phaseout of CFCs, halons, methyl chloroform and carbon tetrachloride and to limit HCFCs to a share of 20% of the original CFC market. The report made clear that only the most stringent option would lead to long term reductions in atmospheric chlorine concentrations. In the introductory note to the report, UNEP Executive Director Tolba explicitly pointed to this option as the only possible choice for a "meaningful internationally coordinated action". Indeed, the revised control measures agreed upon at the London Conference of the Parties in 1990 largely reflected the most progressive control option suggested in the Synthesis Report.

The dynamic process of stepwise adapted control measures continued in the following years and the assessment panels kept their high profile and influence. For the first update of the reports requested by the Third Meeting of the Parties (1991), the technological and economic assessment panel had been merged. The findings of the TEAP, in which industry played an extremely important and proactive role, were a driving force of the accelerated phase out of ozone depleting substances witnessed in the 1990s (Parson 1993/Parson 1996).

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13 Compare that easily reached closure on the economics of CFC regulation to the controversial and protracted debates in IPCC WG III on costs and benefits of mitigation and adaptation measures. (see below).

4. THE ADVISORY SYSTEM OF THE CLIMATE REGIME

4.1 Regime Formation: 1988-1992

The issue of climate change acquired the status of an international policy issue in the mid 1980s. A very active and well coordinated international scientific community, in cooperation with international organizations (UNEP, WMO) had placed the issue on the agenda by a set of activities, starting with the World Climate Conference (1979) and a subsequent set of three international workshops in Villach, Austria (1980, 1983, 1985) (cf. Franz 1997). The 1985 workshop triggered the establishment of the first notable international advisory panel on climate change, the Advisory Group on Greenhouse Gases (AGGG), comprised of altogether seven members nominated by UNEP, WMO and ICSU. The panel was explicitly built to promote international negotiations on a climate convention, but insufficient funding and—most importantly—the absence of a political mandate set sharp limits to its influence.

Parallel to this set of events, UNEP's executive director Mustafa Tolba tried to convince the United States to take the lead and initiate international action. His letter to then Secretary of State George Schultz was discussed in an interagency process and finally led to a US recommendation submitted to WMO to set up an 'intergovernmental mechanism' (in addition to or even as a substitute for AGGG, which was considered too weak a mechanism) to conduct more assessments on the issue. This proposal eventually led to creation of the Intergovernmental Panel on Climate Change (IPCC) under the auspices of UNEP and WMO in 1988. As Agrawala (1998a) in his comprehensive account of the IPCC origins points out, the intergovernmental nature of the IPCC was suggested by the US because of sharply differing views on climate change amongst various US government agencies and it was welcomed by member governments of WMO and UNEP because the issue was already politicized at that time, political stakes were high (considerably higher than in ozone) and countries were aware of the potential influence of international assessments. "The ad hoc, low key, science-driven nature of the early ozone assessments which led to the Vienna Convention could not be duplicated in climate change. This is because while 'politics caught up with ozone, climate change was born in politics'" (Usher, quoted in Agrawala 1998a: 614). In absence of a consensus on the need for internationally concerted action and in light of the experience with the ozone regime, governments tried to keep full control of the process.

The general mandate of the IPCC was negotiated largely between WMO, UNEP and the US. The fact that the work of the IPCC would represent the first officially sanctioned assessment of the issue together with strong advocacy on part of the US scientist at WMO Sundararaman led to the proposal that IPCC should conduct comprehensive assessments, including the science of climate change, its socio-economic impacts and policy responses. The inclusion of policy responses was further supported by a draft resolution introduced by Malta at the UN General Assembly, calling on the IPCC to deliver a comprehensive review and recommendations, including legal instruments as well as possible policy responses and elements of a future convention. The first IPCC plenary in late 1988 eventually adopted a proposal of Mostafa Tolba, to organize the work in three parallel working groups: Working Group I on science, Working Group II on impacts, and Working III on response strategies, including the discussion

of legal instruments and aspects of a future convention. Bert Bolin, an eminent Swedish meteorologist was elected as the first chairman of the IPCC.

Building on the rather general mandate for the assessment process, the IPCC bureau (comprised of the IPCC chair and the chairs of the three working groups) started to develop a set of rules of procedure to organize the process. Placed into an already politicized environment and being ordered to address policy options and even recommendations the IPCC managers aimed at ensuring the scientific profile of the panel and getting the most eminent scientists involved. Based on an initiative of Working Group I, the bureau decided that the draft reports of WG I and WG II should undergo peer review but did not define the specifics of the review system. Peer review was deemed inadequate for WG III, because the group was dominated by legal experts and negotiators and dealt with policy issues not amenable to traditional scientific peer review. The bureau further agreed on 'summaries for policy-makers' to be produced by all three working groups and subsequently submitted to governments for review and approval (Agrawala 1998).

The mandate of the IPCC process was further strengthened by the adoption of Malta's draft resolution in the UN General Assembly in January 1989. The resolution formally charged the heads of UNEP and WMO working through the IPCC to provide a comprehensive review and recommendations, including possible elements of an international convention. UNEP and WMO responded to the resolution by creating the 'WMO/UNEP Task Force on a Convention on Climate Change', consisting of two representatives each from WMO and UNEP and three legal experts from IPCC WG III. As Agrawala (1998b: 634) points out, the task force was an attempt of Mostafa Tolba to keep the negotiations of a climate convention low key as long as possible, a strategy that worked very well in ozone, where the Vienna Convention was negotiated by the "Ad-hoc group on Legal and Technical Experts" (see above). But the political context of the upcoming negotiations of the climate convention was different and eventually did not allow deliberations to proceed in such an exclusive circle. Particularly some developing countries, due to their initially low level of participation in the IPCC process, began to question the legitimacy of the panel as the major source of input to the negotiations. More importantly, and with far-reaching consequences for the further development of the regime and its advisory system, they did not agree to frame climate change solely as a technical issue but emphasized its development aspects. They were therefore not willing to let UNEP again (as in ozone) play the role in promoting environmental aspects at the expense of economic development and resource transfers (Victor and Lanchberry 1995: 33). As I have shown above, this emerging change in the stance of developing countries in the early 1990s already played a measurable, though overall minor role in the ozone assessments: In the synthesis of the 1989 reports of the assessment panels to the Montreal Protocol, developing countries insisted on the notion of a special responsibility of the North instead of a 'joint responsibility' (see above). In the climate regime, the new self-confidence of the South was first expressed at the Second World Climate Conference (SWCC, Geneva, November 1990).

"..The SWCC was marked by one important development: for the first time, developing states participated as equal partners in the discussions and made clear, to a much greater extent than previously, that North-South issues would play a prominent role in any future convention negotiations" (Bodansky 1994: 58).

This new situation lead to the creation of the Intergovernmental Negotiating Committee (INC) under the auspices of the UN General Assembly as the high-level successor of the WMO/UNEP task force in early 1991. IPCC chair Bert Bolin addressed each of the INC sessions to deliver an update of IPCC's work but the 'burden' to formulate policy recommendations (as part of the mandate of WG III) was eventually removed from the panel.

Interestingly, the role of IPCC's Working Group III—whose 1990 report had been delivered well before the INC was created—is perceived and appraised quite differently across actor groups: A retrospective of early IPCC days by Bert Bolin, for example, leaves no doubt that the IPCC managers wrestled with the 'politically contaminated' mandate of their First Assessment Report (FAR). They felt great relief when they were allowed to turn to 'scientific analysis' in the Second Assessment Report (SAR).

> "But Working Group III, in particular, had to fight a tough battle to keep scientific issues separate from political issues.....[In 1992] the task of Working Group III was changed to consider available *scientific* analyses of the socio-economic implications of climate change". (Bolin 1997: 101)

In the climate science (WG I) community the prevailing view was (and largely still is today) that the treatment of policy options (let alone recommendations) within WG III poses a huge risk to the authoritativeness of 'scientific' claims made by WG I and to the credibility of the whole IPCC. At the other end of the spectrum, environmental NGOs criticized the FAR for his lack of goal statements and called it a 'waste of time' (Shannon 1990). Most importantly though, the actual users of the assessment, namely the negotiators in INC valued the report of WG III an 'important substantive contribution to subsequent negotiations as it made the work of the INC more efficient than it would have been had they started from scratch' (Jean Ripert, INC chair, quoted in Agrawala 1998b: 635). Furthermore it helped to shape a common language and a network of individuals beyond the well established 'scientific community' (Vellinga 1999).

The role of the IPCC in the early phase of the negotiations of the climate convention shows some parallel to the role of the Coordinating Committee on the Ozone Layer (CCOL, see above). The yearly submitted CCOL reports moved from science summaries toward cautious calls for international regulatory action in the early 1980s, when negotiations of an international convention loomed at the horizon. After UNEP had established a working group to prepare a draft convention, CCOL returned more to the character of a purely scientific advisory body (Parson 1993: 37).

It is widely accepted that the IPCC First Assessment Report (1990) and its update 1992 just prior to the Earth Summit in Rio de Janeiro were necessary and important for the adoption of the United Nations Framework Convention on Climate Change (UNFCCC). The single most important statement of the FAR, namely that the world will be likely to warm in the next century at a rate greater than that seen over the last 10,000 years, unless action is taken, undoubtedly provided political impetus for the negotiations. But there is also room for speculation if the IPCC could have played a more active role in advising the INC negotiators. Victor and Lanchbery (1995), for example, argue that it 'would have helped the negotiations considerably if the IPCC had given an opinion.....about the likely extent of any climate change and what might be done about it'. They stress that the INC negotiators were generally scientifically literate and thus well aware of the involved uncertainties and the fact that the

level of possible commitments could not be derived from this knowledge alone. Comprehension gaps therefore, tended to exist rather between INC negotiators and their domestic political masters and not between IPCC and INC. More progressive statements of the IPCC, instead of its well-founded 'conservatism' thus could have helped the negotiators to prevail in their 'two-level game' without necessarily threatening the credibility of the IPCC process.[14]

At the United Nations Conference on Environment and Development (UNCED, "Earth Summit") in June 1992, more than 150 states and the European Community signed the United Nations Framework Convention on Climate Change (UN FCCC). The text of the convention expressed a broad consensus on the global nature of the issue and on the need for coordinated action, but the consensus on the course and extent of future action was extremely weak. During the negotiations of the convention in the INC fierce resistance against binding targets had emerged on part of some important countries (most notably the oil-producing countries organized in the OPEC and the United States) and industry in general (eg. organized in the 'Global Climate Coalition). As a result of this diverging views, the objective to stabilize CO2 emissions in the industrialized countries (Article 4.2a) was put in vague language and did not achieve the status of a binding commitment.

Although called a 'framework convention' the treaty provided more details as similar conventions like the Vienna Convention (see above). It established a number of new institutions, a task that was left to the meetings of the parties in the case of the ozone regime. Amongst those, the Subsidiary Body for Scientific and Technological Advice (SBSTA) was assigned a set of functions that at least partly overlapped with those of the IPCC (Article 9). Additionally, the treaty text does not explicitly mention IPCC as an important source of information, although the value of IPCC FAR was acknowledged by the negotiators (see above). The text further lays the foundation for reviewing national policies and the overall commitments of the convention in light of new information, but the mandates for both the review mechanism and the role of expert advice therein remained weak, much weaker than for example those of the Montreal Protocol. Governments did specify neither the sources of information relevant to the review nor the time interval in which the 'regular reviews' should be conducted (see Annex III).

Again, these institutional features of the advisory system can be largely explained by the (comparably low) level of political consensus on the course of future action: In order to keep full control of the policy process, governments (particularly those of major developing countries refused to a) confer any kind of authority to the at least partly independent IPCC process, and b) to establish any kind of automatism for the review of the adequacy of their commitments. An equally important reason to create SBSTA in the first place was the lesson gained in the INC negotiations that the IPCC process—for perfectly justifiable reasons—is often too slow to respond to the needs of the convention in a timely manner.

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14 Note for example that the 1987 Villach and Bellagio meetings, held under the auspices of AGGG, had come up with a policy proposal to set a maximum rate of sea level increase at between 20 and 50 mm per decade and a maximum rate of temperature increase at 0.1°C per decade (Jäger 1988). However, this 'mood of policy activism' began to fade from the moment science was moved to the center of the policy stage.

Most accounts of the Vienna Conference on the protection of the ozone layer agree that the failure of the conference to agree on regulatory action and the institutional details of the emerging regime turned out to be an important source of strength for the Montreal Protocol. It was easier to agree on progressive measures and institutions in 1987 without carrying the historical burden of an already reached consensus, however weak it had been. By the same token, the weak commitments and institutional structures of the UNFCCC provided little incentive for speedy adjustments after Rio.

4.2 From Rio to Kyoto: 1992-1997

In the months following the Rio Conference most aspects of international environmental diplomacy experienced depression and exhaustion. The Rio process had been so exhaustive in terms of time and resources that the characteristic mood of the INC in the immediate post-Rio phase was one of relief. Nevertheless, the INC negotiations continued up to the first conference of the parties in March 1995. In that phase governments tried to solve the questions left open by the UNFCCC in order to get off to a prompt start once the convention would enter into force. As SBSTA would not start to operate before that time, the INC had to rely on information from IPCC and other sources in that phase. Except the important work on methodologies for greenhouse gas inventories (together with the OECD), there were no major IPCC contributions in that phase, and some observers noted that 'IPCC and INC continue to drift apart' (Victor and Lanchbery 1995: 37).

While this is certainly an overstatement, the IPCC at this stage was indeed more focusing on the consolidation of its structure and procedures than on issuing un-requested policy statements. In June 1993, the IPCC plenary adopted a formal set of rules of procedure, involving a detailed review procedure, now applying to all three Working Groups. From that time on, governments would be involved in the second round of the review and, maybe most significantly, the summaries for policymakers would be subject to line by line approval at the plenary sessions of the working groups. Furthermore, the IPCC stepped up its efforts to enhance the participation of development countries with the goal to reduce their reservations to the process (cf. Agrawala 1998b: 625).

These rules of procedure, carefully prepared by a 'Task Force on IPCC Structure' can be seen as an attempt to optimize (and manage the trade offs between) the technical credibility, political legitimacy and policy relevance of the IPCC process and reports. But the ex-post appraisal of IPCC chair Bert Bolin leaves no doubt about primary and secondary goals of this process. He puts a clear emphasis on drawing sharp boundaries between science and policy in order to guarantee the integrity and authority of the former:

> "The Working Group plenary sessions become the occasions when the scientists engaged by the IPCC are confronted with political views and even attempts to clothe special interests in scientific terms. It is essential that the line between factual information and political judgement is upheld at that time.....Political negotiations should build on factual presentations of available knowledge" (Bolin 1997:102-103)

In the same year (1993) a new working group structure was agreed upon. As already mentioned, the mandate was 'depoliticized' by removing the formulation of recommendations from the agenda. Working Group II and III of the FAR (on impacts and response options,

respectively) were officially merged to a new Working Group II in the Second Assessment Report (SAR) which was to deal with impacts and mitigation options. Additionally, a new Working Group III was created to address cross cutting issues and the socio-economics of adaptation and mitigation (cf. Bolin, 1994: 28).

The creation of WG III was preceded by a controversial debate about the inclusion of economics/economic sciences in the IPCC. In Europe and in larger parts of the developing world main stream economics was (and still is) perceived as an 'American science' and those countries were thus reluctant to give it an important role in IPCC. On the other hand, after the Rio conference, public debates about climate change were increasingly framed in economic terms, in costs and benefits of unilateral or internationally coordinated action.[15] Therefore, an extended treatment of economic issues in IPCC was more or less unavoidable, though participants pointed to the difficulties of 'holding up the line between facts and values' in economics (see Bolin's statement above). In the end there was an agreement to clearly restrict the role of economic sciences on providing information and not policy recommendations (Hourcade 1999).

While the IPCC was completing its second assessment report, the first Conference of the Parties (COP 1) to the Framework Convention on Climate Change took place in Berlin (March 1995). The COP characterized the role of the SBSTA as "the link between scientific, technical and technological assessments, the information provided by competent international bodies, and the policy-oriented needs of the COP". The first meeting of the SBSTA in August 1995 agreed that SBSTA should not duplicate the IPCC but convert its findings into a form appropriate to the COP. As an "urgent matter" the meeting considered the establishment of intergovernmental Technical advisory panels on technologies (TAP-T) and methodologies (TAP-M).

However, the discussion of this matter caused a controversy that has not been resolved to date, i.e. in the nine following SBSTA meetings. It took the parties several meetings to agree at least broadly on the terms of reference of the panels but there is no agreement so far on their constitution. Developing countries insist on nominating the majority of the panel members which is not accepted by the industrialized countries emphasizing that they have more obligations under the convention.

Conclusion: Efforts of governments to keep control of the policy process prevail. Scientific advice is still kept at arm's length. The more active role of the developing countries (as compared to the negotiations in the ozone regime leading to the Montreal Protocol) prevents changes in the advisory system favored by the developed countries. Dissatisfaction with SBSTA ("Mini-COP", "pure political body") is growing.

In the mid-1990s the international consensus on the need for doing something serious about climate change made another incremental step: The Second Assessment Report of the IPCC (published in 1996) included a clear statement on the 'discernible human influence on the

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15 It was the growing concern about the competitiveness of European industries, for example, that stopped the proposal for a CO2/energy-tax in the EU. In the eleventh hour before the Rio Conference the proposal (at this point the key element of the EU climate strategy) was watered down from a unilateral measure to one that could be adopted only if the main EU competitors join the train. (cf. Jachtenfuchs, 1996).

global climate'. Despite a major dispute on this element of the report, the final effect on the public debate was positive. Among others, the Clinton administration used this finding to legitimate its turn towards a more proactive negotiation position (COP 2, Geneva, Summer 1996).

In 1996 the parties to the climate convention started negotiations on a protocol on quantitative targets for the emission of greenhouse gases. They were concluded with the adoption of the Kyoto Protocol at the fourth Conference of the Parties (COP 4) in December 1997 in Kyoto. However, the level of consensus on decisive action as reflected in the protocol text can by no means compared to that of the Montreal Protocol in the ozone case. Industry is still opposed to control measures and the protocol contains many 'loopholes' and other unfinished business (Ott 1998).

The parties established a separate review mechanism for the Kyoto Protocol (in addition to that of the UNFCCC), but the mandate for this mechanism remains weak: Neither the interval nor the sources of information for the (re-)assessment of the commitments are specified. As a small improvement, the IPCC is now explicitly mentioned in the protocol (as opposed to UNFCCC), but SBSTA is always listed as a complementary source of information, i.e. states tend to preserve their right to 'ignore' IPCC findings (see Annex IV).

4.3 Beyond Kyoto

Some developments since the Kyoto Conference in late 1997 indicate that the role of expert advice in the negotiations is slowly increasing. Governments begin to realize that the negotiations have reached a stage of (technical) complexity which makes direct expert involvement indispensable (Hourcade 1999). As a consequence, the number of non-government experts in the delegations begins to increase. Furthermore, the input of expert advice is enhanced through a large number of SBSTA-workshops, in order to get the 'unfinished business' of the protocol done before COP 6 in 2000 (This deadline was agreed at COP 4 in Buenos Aires in late 1998).

The increasing number of SBSTA-workshops can be seen as a substitute for the failure to establish expert panels (see above). The formal/legal status of the workshop outcomes is still unclear, but (if successful) the workshop process could pave the way for the establishment of the expert panels at some later point (Tirpak 1999).

Additionally the COP makes more use of direct input by the IPCC on specific but very important questions. The COP agreed, for example, to base the solution of the question about how 'carbon sinks' (forests etc.) should be integrated in the reduction commitment of a country on the outcome of the IPCC 'Special Report on Land Use, Land Use Changes, and Forestry' (to be published in 2000).

In addition to the slowly emerging willingness of the decision makers to delegate more authority to advisory processes, the managers of the IPCC process seem to put more emphasis on increasing the policy relevance of their advice. An illuminating example is the initiative to include answers to 'policy relevant scientific questions' in the synthesis report of the next major IPCC assessment. Governments are requested to tell IPCC their most pressing questions and IPCC tries to answer them in the synthesis report (based on findings of the reports of the

three working groups). There was a controversial debate about the issue but the new mechanism was eventually approved on a IPCC plenary in April 1999. This new element means an incremental strengthening of the IPCC's mandate and potentially increases the influence of the synthesis report on the policy process, because governments will find it difficult to ignore answers to questions they have explicitly posed themselves. An indication of the strategic potential of a newly designed synthesis report can already be found in the final chapter of the IPCC report "Synthesis of Scientific-Technical Information Relevant to Interpreting Article 2 of the UNFCCC", which was part of the Second Assessment Report (IPCC, 1995). Several IPCC participants admitted on request that the selection and framing of 'facts' presented in this chapter comes close to the implicit recommendation to 'mitigate now' (several interviews).

5. CONCLUSIONS

5.1 When do states confer which degree of authority to advisory processes?

- The mandate of advisory processes related to international environmental regimes is not a static variable, which is determined once for all during regime creation. Instead, it is subject to change and fine-tuning over time. The strength of the mandate is a function of the 'level of transnational political consensus on the need for and feasibility of meaningful action'. States are ready to confer authority to advisory processes only after their uncertainty about the future course of the regime has been reduced. Political consensus on the need for action (however achieved) determines the strength of the mandate. (The quasi veto-power of single states/groups of states in the anarchic international system is an important factor. The agreement on the mandate is usually a lowest common denominator decision.)
- In the ozone regime, for example, the integration of a permanent scientific-technological advisory body into the institutional structure of the regime posed considerable difficulties in the negotiations preceding the Vienna Convention. In the end, the task to design an advisory apparatus was postponed and assigned to the Conference of the Parties. At that stage, the political actors refused to create new semi-independent actors/institutions because they preferred to keep full control of the decision-making process. This stance changed dramatically from 1985-1987 when the above-described consensus reached a new stage: The Montreal Protocol included a clear commitment to action ("elimination of ODGs") and a strong provision to base the process on scientific input. This consensus gained even more strength when the parties jointly(!) allowed for creatively by-passing the agreed rules of procedure: They let Tolba/UNEP establish the expert panels before the first meeting of the parties in order to get timely advice for the London Amendments. -> panels were effective not primarily because of their strong mandate but because the parties were

willing to act, sought for a legitimacy, and thus turned to the experts to let them spell out the details.

- The climate regime evolves in completely different time scales: The step from the initial act of cooperation in form of a Framework Convention to a broad transnational (Governments and NGOs) consensus on the need and feasibility of meaningful action is not yet taken and probably will take one or two more decades. A break-through (in terms of consensus) like the Montreal protocol in the ozone case is not likely to be witnessed in climate. The process from COP 1 to COP 4 rather suggests that this consensus will develop in incremental steps. Supporting the above hypothesis, this very slowly evolving consensus is accompanied by an advisory process that (in comparable slow speed) 'gets closer' to decision making: The parties solicit more input from IPCC on key questions, SBSTA begins to let expert advice in (expert participation in SBSTA meetings begins to increase and a whole series of SBSTA-expert workshops is set up) etc.
- Furthermore, recent experience with the biodiversity regime, though not explored in this paper, seems to support the central role of the level of political consensus in defining the strength of mandates for advisory processes: Parties to the CBD rejected the (multi-year, multi-dollar and multi-national) Global Biodiversity Assessment (GBA), which was not mandated by the convention, because there was (and still is) no agreement that species conservation is a global issue in the first place and thus on what issues the CBD should work at all. Reactions to a new initiative ('Millenium assessment') to establish an IPCC-like process suggest that this has not yet changed (Masood 1999): So far, the (transnational) political consensus is insufficient to get any kind of intergovernmental mandate for assessments of conservation issues.

5.2 How do managers and participants of advisory processes interpret their mandate?

- IPCC's Working Group III is an illuminating example of how the dynamics between the mandate of an advisory process and its interpretation/resulting scope of the assessment process can play out: In the First Assessment Report (FAR), due to the absence of an international forum for negotiations, the group had a strong mandate (including the formulation of response strategies) but interpreted it in a way that was more in line with the science paradigm (the final report does not include explicit recommendations). The process management of WG III in the Third Assessment Report suggests the opposite: By opening the process to non-academic (partly non-peer reviewed) sources of literature and encouraging broader participation of stakeholders, the managers of the group (together with the IPCC chair) try to make the work of the group more policy relevant.

5.3 How does the 'policy proximity' of advisory systems affect the policy process?

- I have argued above that a) the strength of the mandate for advisory processes is largely a function of the political consensus on the need for action (5.1), and that b) advisory

processes are only one among other (interacting) factors relevant for the emergence and enhancement of this consensus. This leaves us with the question how the interpretation of the mandate by assessment managers and participants (towards more or less policy involvement) contributes to the strengthening of political consensus. However, the findings of the two case studies do not offer much scope for a generalizing answer to this question. The optimal degree of 'policy proximity' (one that achieves high values of policy relevance and preserves the credibility and legitimacy of the process at the same time) has to be identified case by case.

- Particularly interesting is the question whether value-laden mega-issues like 'equity' should be addressed in IPCC at all (as increasingly the case) or rather in a separate (new) mechanism in order to keep the authority of the IPCC as a whole (and of working group I (science) in particular). The entrepreneurs within IPCC seem to be willing to include these kind of issues, while the 'scientific community' in and around Working Group I as well as the group's economists warn of politicization. The debate comes down to the question whether the acceptance of blurred boundaries between science and policy is likely to undermine the credibility of IPCC as a whole, or if the potential to create mutual understanding and thereby facilitate subsequent negotiations is outweighing this risk. The positive experience with the rather technical nature of the ozone assessments does not seem replicable in the climate regime. In the ozone case it was possible to maintain a technical framing of the issue throughout the development of the regime. In the climate regime, however, due to issue characteristics and broader participation, 'economics' has become the dominating issue frame in the North, and 'equity' has become a competing issue frame advanced by developing countries. The debates about the right/most appropriate issue frame are likely to dominate the political debates about the future development of the regime ('meaningful participation of developing countries', 'convergence of emissions for developed/developing countries). It can be argued that policy relevance depends on the dominating issue-frame. Trying to keep difficult socio-economic issues low profile within IPCC could therefore lead to losses in policy relevance that are not compensated by gains in scientific credibility.

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ANNEX

Annex I:
'Vienna Convention for the Protection of the Ozone Layer' (March 1995)
(Excerpts, italization: WJ)

Article 2: General Obligations
... the Parties shall...co-operate in the formulation of agreed measures, procedures and standards for the implementation of this Convention, with *a view to the adoption of protocols and annexes*

Article 3: Research and Systematic Observation
The Parties undertake, as appropriate, to initiate and co-operate in, directly or through competent international bodies, the *conduct of research and scientific assessments* on:
(a) The physical and chemical processes that may affect the ozone layer;
(b) The human health and other biological effects deriving from any modifications of the ozone layer, particularly those resulting from changes in ultra-violet solar radiation having biological effects (UV-B);
(c) Climatic effects deriving from any modifications of the ozone layer;
(d) Effects deriving from any modifications of the ozone layer and any consequent change in UV-B radiation on natural and synthetic materials useful to mankind;
(e) Substances, practices, processes and activities that may affect the ozone layer, and their cumulative effects;
(f) Alternative substances and technologies;
(g) Related socio-economic matters,...

Article 4: Co-operation in the legal, scientific and technical fields
The Conference of the Parties shall.....*review the scientific information on the ozone layer*, on its possible modification and on possible effects of any such modification;

Article 9: Amendment of the Convention or Protocols
Any Party may propose amendments to this Convention or to any protocol. Such *amendments shall take due account, inter alia, of relevant scientific and technical considerations.*

Annex II:
Montreal Protocol on Substances That Deplete the Ozone Layer (September 1987)
(Excerpts, italization: WJ)

Preamble:
The Parties to this Protocol, ...determined to protect the ozone layer by *taking precautionary measures* to control equitably total global emissions of substances that deplete it, with the *ultimate objective of their elimination on the basis of developments in scientific knowledge, taking into account technical and economic considerations* and bearing in mind the developmental needs of developing countries,...

Article 2: Control Measures
Based on the assessments made pursuant to Article 6, the Parties may decide whether....further adjustments and reductions of production or consumption of the controlled substances should be

undertaken and, if so, what the scope, amount and timing of any such adjustments and reductions should be....

Article 6: Assessment and review of control measures

Beginning in 1990, and at least every four years thereafter, the Parties shall assess the control measures provided for in Article 2 and 2A to 2H on the basis of available scientific, environmental, technical and economic information. At least one year before each assessment, the Parties shall convene appropriate panels of experts qualified in the fields mentioned and determine the composition and terms of reference of any such panels. Within one year of being convened, the panels will report their conclusions, through the Secretariat, to the Parties.

Annex III:
Excerpts from the United Nations Framework Convention on Climate Change (June 1992)

Preamble:

..Recognizing that *steps* required to understand and address climate change will be environmentally, socially and economically most effective if they are *based on relevant scientific, technical and economic considerations and continually re-evaluated in the light of new findings in these areas,...*

Article 2: Objective

The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

Article 4: Commitments

4.1: All Parties...shall....formulate, implement, publish and regularly update national and, where appropriate, regional programs containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and measures to facilitate adequate adaptation to climate change,

4.2a: The developed country Parties and other Parties included in Annex I ...shall...adopt national policies and take corresponding measures on the mitigation of climate change...These policies and measures will demonstrate that developed countries are taking the lead in modifying longer-term trends in anthropogenic emissions consistent with the objective of the Convention, recognizing that the return by the end of the present decade to earlier levels of anthropogenic emissions of carbon dioxide and other greenhouse gases not controlled by the Montreal Protocol would contribute to such modification

4.2d:....The Conference of the Parties shall, *at its first session, review the adequacy of subparagraphs (a) and (b) above.* Such review shall be carried out *in the light of the best available scientific information and assessment on climate change and its impacts, as well as relevant technical, social and economic information. Based on this review, the Conference of the Parties shall take appropriate action, which may include the adoption of amendments to the commitments in subparagraphs (a) and (b) above. A second review of subparagraphs (a) and*

(b) shall take place not later than 31 December 1998, and thereafter at regular intervals determined by the Conference of the Parties, until the objective of the Convention is met;

Article 7: Conference of the Parties

The Conference of the Parties, as the supreme body of this Convention, ...shall

7.2a:..periodically examine the obligations of the Parties and the institutional arrangements under the Convention, in the light of the objective of the Convention, the experience gained in its implementation and the evolution of scientific and technological knowledge;

Article 9: Subsidiary body for scientific and technological advice

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

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

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

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

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

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

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

Annex IV: Excerpts from the Kyoto Protocol (December 1997)

Article 3:

3.4. Prior to the first session of the Conference of the Parties serving as the meeting of the Parties to this Protocol, each Party included in Annex I shall provide, for consideration by the Subsidiary Body for Scientific and Technological Advice, data to establish its level of carbon stocks in 1990 and to enable an estimate to be made of its changes in carbon stocks in subsequent years. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session or as soon as practicable thereafter, decide upon modalities, rules and guidelines as to how, and which, additional human-induced activities related to changes in greenhouse gas emissions by sources and removals by sinks in the agricultural soils and the land-use change and forestry categories shall be added to, or subtracted from, the assigned amounts for Parties included in Annex I, taking into account uncertainties, transparency in reporting, verifiability, the methodological work of the Intergovernmental Panel on Climate Change, the advice provided by the Subsidiary Body for Scientific and Technological Advice in accordance with Article 5 and the decisions of the Conference of the Parties.

3.9. Commitments for subsequent periods for Parties included in Annex I shall be established in amendments to Annex B to this Protocol, which shall be adopted in accordance with the provisions of Article 21, paragraph 7. The Conference of the Parties serving as the meeting of

the Parties to this Protocol shall initiate the consideration of such commitments at least seven years before the end of the first commitment period referred to in paragraph 1 above.

Article 5:

5.2. Methodologies for estimating anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol shall be those accepted by the Intergovernmental Panel on Climate Change and agreed upon by the Conference of the Parties at its third session. Where such methodologies are not used, appropriate adjustments shall be applied according to methodologies agreed upon by the Conference of the Parties serving as the meeting of the Parties to this Protocol at its first session. Based on the work of, inter alia, the Intergovernmental Panel on Climate Change and advice provided by the Subsidiary Body for Scientific and Technological Advice, the Conference of the Parties serving as the meeting of the Parties to this Protocol shall regularly review and, as appropriate, revise such methodologies and adjustments, taking fully into account any relevant decisions by the Conference of the Parties.

5.3. The global warming potentials used to calculate the carbon dioxide equivalence of anthropogenic emissions by sources and removals by sinks of greenhouse gases listed in Annex A shall be those accepted by the Intergovernmental Panel on Climate Change and agreed upon by the Conference of the Parties at its third session. Based on the work of, inter alia, the Intergovernmental Panel on Climate Change and advice provided by the Subsidiary Body for Scientific and Technological Advice, the Conference of the Parties serving as the meeting of the Parties to this Protocol shall regularly review and, as appropriate, revise the global warming potential of each such greenhouse gas, taking fully into account any relevant decisions by the Conference of the Parties.

Article 9:

The Conference of the Parties serving as the meeting of the Parties to this Protocol shall periodically review this Protocol in the light of the best available scientific information and assessments on climate change and its impacts, as well as relevant technical, social and economic information. Such reviews shall be coordinated with pertinent reviews under the Convention, in particular those required by Article 4, paragraph 2(d), and Article 7, paragraph 2(a), of the Convention. Based on these reviews, the Conference of the Parties serving as the meeting of the Parties to this Protocol shall take appropriate action. The first review shall take place at the second session of the Conference of the Parties serving as the meeting of the Parties to this Protocol. Further reviews shall take place at regular intervals and in a timely manner.

Article 13:

The Conference of the Parties, the supreme body of the Convention, shall... Periodically examine the obligations of the Parties under this Protocol, giving due consideration to any reviews required by Article 4, paragraph 2(d), and Article 7, paragraph 2, of the Convention, in the light of the objective of the Convention, the experience gained in its implementation and the evolution of scientific and technological knowledge, ...seek and utilize, where appropriate, the services and cooperation of, and information provided by, competent international organizations and intergovernmental and non-governmental bodies....

BELFER CENTER FOR SCIENCE AND INTERNATIONAL AFFAIRS

BCSIA is a vibrant and productive research community at Harvard's John F. Kennedy School of Government. Emphasizing the role of science and technology in the analysis of international affairs and in the shaping of foreign policy, it is the axis of work on international relations at Harvard University's John F. Kennedy School of Government. BCSIA has three fundamental issues: to anticipate emerging international problems, to identify practical solutions, and to galvanize policy-makers into action. These goals animate the work of all the Center's major programs.

The Center's Director is Graham Allison, former Dean of the Kennedy School. Stephen Nicoloro is Director of Finance and Operations.

BCSIA's International Security Program (ISP) is the home of the Center's core concern with security issues. It is directed by Steven E. Miller, who is also Editor-in-Chief of the journal, *International Security*.

The Strengthening Democratic Institutions (SDI) project works to catalyze international support for political and economic transformation in the former Soviet Union. SDI's Director is Graham Allison.

The Science, Technology, and Public Policy (STPP) program emphasizes public policy issues in which understanding of science, technology and systems of innovation is crucial. John Holdren, the STPP Director, is an expert in plasma physics, fusion energy technology, energy and resource options, global environmental problems, impacts of population growth, and international security and arms control.

The Environment and Natural Resources Program (ENRP) is the locus of interdisciplinary research on environmental policy issues. It is directed by Henry Lee, expert in energy and environment. Robert Stavins, expert in economics and environmental and resource policy issues, serves as ENRP's faculty chair.

The heart of the Center is its resident research staff: scholars and public policy practitioners, Kennedy School faculty members, and a multi-national and inter-disciplinary group of some two dozen pre-doctoral and post-doctoral research fellows. Their work is enriched by frequent seminars, workshops, conferences, speeches by international leaders and experts, and discussions with their colleagues from other Boston-area universities and research institutions and the Center's Harvard faculty affiliates. Alumni include many past and current government policy-makers. Libby Fellinger is BCSIA's Fellowship Coordinator.

The Center has an active publication program including the quarterly journal *International Security*, book and monograph series, and Discussion Papers. Members of the research staff also contribute frequently to other leading publications, advise the government, participate in special commissions, brief journalists, and share research results with both specialists and the public in a wide variety of ways.