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Science-policy interaction in the global greenhouse

Institutional design and institutional performance in the Intergovernmental Panel on Climate Change (IPCC)

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Introduction

Research input constitutes a key component in the development of effective international environmental regimes. Scientific knowledge is called for not only in the design of policies that are effective in terms of solving the problems for which they were designed, but also (increasingly) in the identification of the problem itself. Scientific knowledge in its "original" form, however, is not readily available for policy-makers to "use" in a particular policy-making context. While relevant, scientific knowledge usually does not explicitly address the particular problems policy-makers struggle with. Scientific knowledge is also produced within a context; within structures of knowledge and theories that constitute the basis for the knowledge generated, and which implies that scientific knowledge is characterised by a certain context dependency. Also scientific knowledge is provided in a technical form which is not applicable in policy-making. Thus, for scientific knowledge to be applicable in policy-making, it needs to be interpreted and "translated" – *transformed* – into a form in which it may serve as a premise for policy choice.

In this process of transformation, the competence of both scientists and policy-makers is needed. Scientific competence is needed to ensure that the knowledge base provided is representative of state-of-the-art knowledge within relevant fields and disciplines. Policy competence is needed to ensure its relevance and applicability to the particular policy problem for which the input is sought and developed. Thus, scientific knowledge for policy-making is generated in processes of science–policy *interaction.*

Science–policy interaction is difficult and demanding because of its immanent tension between impartiality and disinterestedness on the one hand, and strategic behaviour and interest realisation on the other. This tension is generated by the interaction between two distinctively different systems of behaviour. While science (ideally) is conceived of as a truth-seeking endeavour – whose norms and guidelines for behaviour are directed towards the generation of "objective" and disinterested knowledge – politics constitutes a system for the generation of (collective) decisions, where behaviour is directed towards the realisation of (individual) rational interests in these decisions. In contrast to the ideal of impartiality characterising the scientific method, political behaviour is characterised by strategic reasoning where the instrumental utilisation – as well as manipulation and distortion – of knowledge may constitute central elements in political strategies whereby individual interests are sought realised. This tension is reinforced, moreover, by an image of the relationship between science and politics as one of opposite poles, where science is everything politics is not: pure, objective, subject to rational analytical reasoning and thus not hostage to manipulation tactics and coercive power – ingredients often associated with politics. While both theoretical analyses and experience show that the relationship between science and politics by far is as clear-cut as this image suggests, this image has a strong position in the public as well as among practising scientists and policy-makers themselves. Thus, any interactive dialogue between these two systems of behaviour takes place in the shadow of this image which suggests that the interaction itself implies a risk of political "contamination" of the scientific process and a serious loss of legitimacy.

In dealing with this immanent tension, processes of science–policy interaction face a difficult challenge which may represent a significant obstacle to their effectiveness. In this paper, we explore the nature and dynamics of science–policy interaction and the extent to which and

how *institutional arrangements* may be utilised as *instruments* for enhancing the effectiveness of the dialogue. Our analysis is premised on the assumption that processes of science–policy interaction take place within the framework of institutions that to a varying extent are capable of or designed for tackling the challenges science–policy interaction presents. Institutional arrangements are *social constructions* and may as such, in principle, be *designed* and manipulated to improve institutional performance. To the extent that institutions capable of handling these challenges may be developed by *conscious design*, therefore, institutional design may represent a potential instrument whereby the effectiveness of the process of science–policy interaction may be enhanced.

The analysis is divided into three parts: In the first part of the paper, the theoretical framework for the study is developed. The point of departure for the analysis is the internal dynamics of science and politics in their "pure" forms, and the nature of the dynamics that are generated when these two distinct systems of behaviour meet. On this basis, then, the question of which *functions* the institutional apparatus should be able to serve in order to enhance the effectiveness of the science–policy dialogue is addressed in part two. In part three, this approach is employed in an empirical case study of the Intergovernmental Panel on Climate Change (IPCC) from its establishment in 1988 until the provision of the Second IPCC Assessment Report in 1995: To what extent is the institutional apparatus of the IPCC process capable of serving the suggested functions and to what extent and in which manner has this contributed to enhance the effectiveness of the endeavour?

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1 The science–policy nexus

1.1 The internal dynamics of scientific inquiry

The traditional view of science portrays research as a rational, rule-governed process, in which the implementation of the scientific method is the main mechanism whereby *established* knowledge is distinguished from mere knowledge *claims*. "Knowledge" is what the community of scientists holds to be true on the basis of extensive scrutiny in accordance with demanding and discriminating methods. One important implication of this line of reasoning is that, in order to qualify as "knowledge", a proposition must be consensual or inter-subjective in the sense that any competent scientist, applying the scientific method correctly, will reach the same conclusion. Should scientific dispute occur, there are only two possible explanations; either, one of the dissenters is (value) biased (i.e., not genuinely seeking the truth), or the scientific method is applied erroneously (see, for instance, Collingridge and Reeve, 1986). Accordingly, ("true") knowledge can – with some reservations – be distinguished from mere knowledge claims by the operational criterion of *consensus* within the scientific community.

The traditional view of science – particularly the proposition that knowledge depicted in consensual terms carries more political weight than knowledge not depicted in these terms – has a strong position among political scientists who investigate the role of science in policy-making (see, for instance, E. B. Haas et al., 1977; E. B. Haas, 1980; 1990; P. M. Haas, 1989a,b; 1992a,b; 1993a,b). It has also been maintained, however, that consensus in science is a *political* invention alien to science itself and that the scientific community "…has no recognised process of consensus creation and would be shocked by the idea" (Boehmer-Christiansen, 1995: 2).

The notion of consensus in science as an important feature of "established" or "core" knowledge seems, however, to be firmly embedded within both the philosophy[1] and the sociology[2] of science. Scientific inquiry is understood as being based on a framework of scientific theories and propositions – comprising the fundamental assumptions in the research field – that are generally accepted by the scientific community, and that this body of knowledge is distinguishable from the body of theories and propositions that are not endorsed and appraised by the community. It is also recognised, however, that these frameworks of corroborated theories and knowledge propositions are continuously changing, either as the result of an evolutionary process (Popper, 1970), or in abrupt "revolutions" (Kuhn, 1962/1970), implying that what constitutes generally accepted scientific knowledge at point T does not necessarily do so at point T_1.

While the notion of consensus is well established as the major criterion whereby scientists themselves distinguish between established knowledge and knowledge claims, disagreement is profound with regard to the mechanisms at work in processes of consensus formation (see, *inter alia*, Cole, 1992; Latour and Woolgar, 1979/1986). Positions on this issue may be conceptualised in terms of a continuum ranging from a view of the process of consensus formation as a process governed by norms and rules at the one extreme (Popper, 1963), to a

[1] See for instance, Kuhn, 1962/70; 1970a, b; Popper, 1968; 1970; Lakatos, 1970.
[2] See for instance, Ziman, 1968; Gilbert, 1976; Mulkay, 1978; Cole, 1992.

view of the consensus process as largely power and interest driven at the other (Latour and Woolgar, 1979/1986). Even in the latter case, however, it seems clear that the process whereby knowledge is produced is distinctively different from a political process.

Most importantly, sociological studies of science suggest that the road to consensus in science is not as straightforward, uncontroversial and transparent as one might assume on the basis of the traditional view in which science is portrayed as a "pure", "objective" and largely "value free" endeavour (see, for instance, Mulkay, 1978; Latour and Woolgar, 1979/1986; Cole, 1992). Policy-makers may thus be confronted by scientific dissent that may not simply be dismissed as value bias or incompetence on behalf of the scientists. Moreover, even "established" knowledge may be less robust and hence subject to interpretation, manipulation and distortion to a larger extent than the traditional image of science suggests (Mulkay, 1978).

1.2 The internal dynamics of negotiations

While the purpose of research is to produce knowledge, the purpose of politics is to produce authoritative decisions on behalf of a society or group. In international politics, the most common decision-making procedure is negotiation.

Negotiation is often defined as a decision-making procedure between two or more parties who have some interests that are shared and others that are opposed, and where the one party's utility in the outcome depends upon the other party's course of action (Fisher and Ury, 1981/87). Parties may have diverging preferences because their interests are in conflict. Preferences may, however, also differ because the parties have different information and/or opinions about the likelihood that a consequence (desired by all parties) actually will follow from a specific course of action. Parties may thus negotiate in order to co-ordinate not only their behaviour but also their expectations to alternative solutions. For there to be any point in negotiating, there has to be a potential joint gain, and at least partly diverging preferences.

Parties to a negotiation will choose negotiation tactics according to (their perception of) the nature of the issues at stake – whether the amount of the good in question is fixed or variable – and the extent to which their interests are in conflict with the interests of their opponents. By combining these dimensions Walton and McKersie (1965/93) have developed two models of bargaining. The *distributive bargaining model* tends to apply in situations where the amount of the good in question is fixed and the parties' interests are in conflict in the sense that what the one gains, the other looses. The *integrative bargaining model* tends to apply in situations where the opposite is the case; where the amount of the good in question is variable and the parties' interests are identical, purely coincidental or complementary.[3] In between these two extremes we find *mixed-motive bargaining* which captures the most common real-world situations where the agenda contains a mixture of conflictual and collaborative items and where actors are confronted by the dilemmas involved in the choice of complex combinations of distributive and integrative bargaining tactics.

[3] It should be noted, however, that distributive issues may in some cases be approached by integrative bargaining tactics. Midgaard points out that, "the possibility of identifying new outcomes within a 'distributive' framework (…) can call for a co-operative effort as well as for techniques specific to pure bargaining such as keeping back relevant information" (1976: 122).

Information plays a key role in all negotiations. The openness with which information and knowledge is exchanged may, however, vary significantly according to the nature of the negotiation dynamics. In distributive bargaining, information and knowledge become subject to strategic evaluation in terms of their value as tools for achieving political goals. Hence, parties may perceive their realisation of individual interests as inextricably linked to the concealment, manipulation and distortion of information and knowledge. In contrast, the extent to which parties are able to identify and fully exploit the integrative potential of bargaining problems, and thereby enhance their own individual gain, depends on an open information exchange whereby all parties have access to the best available information. Thus, while information and knowledge play an equally important key role in integrative bargaining, it is not subject to the same kind of strategic evaluation as in distributive bargaining.

Most real-world negotiations are characterised by mixed-item bargaining. In mixed bargaining, negotiators face difficult dilemmas that stem from the opposite nature of the tactics associated with the two modes of bargaining: The open information exchange associated with efforts to enhance the total joint gain may weaken the parties' position in the subsequent bargaining over the distribution of shares. Moreover, parties may be uncertain about whether their opponents pursue a distributive or an integrative bargaining strategy. In mixed bargaining, therefore, openness in the exchange of information is associated with a significant risk.

Accurate and reliable information is thus crucial in all negotiations. Information and knowledge may, however, become subject to strategic evaluation in terms of their value as tools for achieving political goals. Thus incentives to distort and manipulate information is inherent in the strategic logic of distributive bargaining. Even in integrative bargaining, an open information exchange can be associated with a serious risk, at least if parties are uncertain about the true bargaining strategy of their opponents.

1.3 The dynamics of science–policy interaction

The image of science as objective and value-free, de-linked from social and political controversy has a strong position in the public, among practising scientists and among policy-makers. Thus, science has acquired a very powerful cultural role as a key source of legitimisation for policy choice (Litfin, 1994). Litfin directs our attention to the effect this may have on the dynamics of policy debates: Each new policy argument is introduced with a scientific justification, which leads to efforts on the part of opponents to de-legitimise the scientific justification of the argument (1994:14).

An explanation and a proposed resolution to this problem has been suggested to lie in the distinction between core and frontier knowledge introduced by Cole (1992). It has been argued that when looking at the role of science in policy-making contexts, one has to take into account the distinction between "facts" and "hypotheses".[4] According to this view, science can only play a constructive role in policy-making when it consists of established facts as

[4] This argument was, for instance, put forward at the Conference "Governing Science" held in Oslo, 17. - 18. November 1995.

opposed to controversial hypotheses. Controversies in science and the inability of science to generate political consensus in policy-making contexts, as discussed by Collingridge and Reeve (1986) and Jasanoff (1990), therefore, may be explained simply by the fact that one is trying to "apply" knowledge which *not yet* has attained the status of core knowledge; that is, knowledge which merely consists of (controversial) hypotheses or frontier knowledge. If one were willing to wait for the arrival of consensus in the scientific community, this problem would not arise.

This line of argument, however, does not confront the real dilemma of the situation: To what extent can "science for policy" be anything *but* frontier knowledge? First, in many, if not most cases, if policy-makers were to "wait for" the arrival of consensus in the scientific community, it would be too late to solve the problem with which they were confronted. Politics, then, would merely be *re*active rather than *pro*active. Second, and more importantly, science used in a policy-making context, no matter how "consensual," would be taken out of its original context and placed within a new framework; within the framework of a specific problem situation not considered in its making. Science for policy will always be an *interpretation* of a knowledge base, "core" *or* "frontier". The nature of science implies that it has a certain indeterminacy attached to it. Very few pieces of (core) knowledge are readily available for policy-makers to "apply", giving unambiguous answers of what to do in a specific situation in order to mitigate or avoid specific problems. Mulkay, for instance, has found that "...members of the same specialized and mature research community frequently reach different conclusions when they try to apply their expertise in practical situations" (1978:118). This indicates that "...intellectual consensus in science is relatively loose and flexible, and that its content is open to interpretation in numerous directions" (Mulkay, 1978: 118). In order to be useful as a premise for policy-making, therefore, knowledge has to be *transformed* into policy advice (see also Litfin, 1994; Jasanoff, 1990; Sundquist, 1978). This implies that scientific knowledge in a policy-making context will always have the character of "frontier" knowledge, with the vulnerability this implies towards efforts of manipulation and distortion.

The combination of these features – the legitimising power of science in policy-making and the indeterminacy of scientific knowledge, especially in combination with political conflict – may give rise to a rather perverse dynamics in processes of science–policy interaction. On the one hand, policy-makers will be engaged in a strenuous attempt to find a manner in which to couch a policy argument in scientific terms and to de-legitimise the scientific justification of the arguments of their opponents. Given the indeterminate nature of scientific knowledge, science is very susceptible to this kind of manipulation. Scientific communities may become involved in disputes of method and interpretation (referred to by Collingridge and Reeve (1986) as "endless technical bickering") often not realising the political role of such disputes in processes of policy-making. Or, when realising the political role of such disputes, scientists may become tempted to conceal points of disagreement within the scientific community and exclude (from the science–policy interaction process) members of the community which hold opposing views, thus acquiring a role as advocates rather than scientists and thereby also reducing the legitimacy and scientific authority of their advice. Although a basis of core knowledge to some extent may place constraints on the free play of such mechanisms, the existence of core knowledge cannot entirely prevent their operation in the process.

Scientific knowledge may thus play several roles in policy-making; it may serve as a guide to policy choice, but it may also serve as an instrument of deception and legitimisation to support policy positions into which the parties already are deeply entrenched. Moreover, the features of scientific knowledge which makes it qualified as a guide to action are also source to its potential as an instrument of deception and legitimisation. The multiple role of science in policy-making is generated by the immanent tension of science–policy interaction between impartiality and disinterestedness on the one hand, and strategic reasoning and interest realisation on the other. This tension thus represent a difficult challenge and a potential obstacle to the effectiveness of the process.

One manner whereby this challenge may be dealt with is to establish institutional structures within which a *common* understanding, interpretation and diagnosis of the problem – within its *political* context – may be developed and negotiated. By co-ordinating their knowledge, information, perceptions and interpretations, scientists and policy-makers can endeavour to negotiate a "new" consensus whereby the problem is defined and diagnosed in its scientific and its political terms. A *problem diagnosis*, which is consensual among scientists as well as policy-makers, may be defined in terms of two constitutive elements:

i) A knowledge base which describes the basic cause-effect relationships characterising the problem in question, whose representativity of state-of-the-art knowledge in relevant fields of research is acknowledged by scientists as well as policy-makers.
ii) A consensus among both scientists and policy-makers on how this body of knowledge is linked to valued policy goals.

The development of a consensual problem diagnosis would require a high level of science–policy interaction and involvement. However, given that the process would operate in the shadow of the "public image" of science discussed above, this level of involvement could, by itself, imply a serious loss of scientific legitimacy. Also, policy-makers themselves are likely to have more faith in scientific conclusions generated in a process which is unambiguously "scientific" in nature. This implies that the process is most likely to fail unless the institutional structures within which the knowledge base is developed also are *separated* from the political sphere and acknowledged, by scientists, policy-makers as well as the lay public, as "scientific". Our discussion thus generates the proposition that processes of science–policy interaction are most likely to succeed if they are organised within institutions capable of both *separating* and *integrating* science and politics, with the provision of arenas for a close, interactive dialogue, among and especially between scientists and policy-makers, within the framework of institutions acknowledged as "scientific" (see Jasanoff, 1990; Gibbons et al., 1994).

This suggests a mode of knowledge production in which knowledge is generated in the context of its application in processes of continuous negotiation. This mode of knowledge production also places requirements to the inclusiveness of the process. Gibbons et al. (1994), for instance, maintain that,

> "Such knowledge is intended to be useful to someone whether in industry or government, or society more generally and this imperative is present from the beginning. Knowledge is always produced under an aspect of continuous negotiation and it *will not be produced unless and until the interests of the*

> *various actors are included*. Such is the context of application" (Gibbons et. al., p. 4, emphasis added).

Our discussion thus suggests that the likelihood that policy-makers accept the factual validity of and act upon research input may be enhanced through the development of a problem diagnosis which is consensual among and between scientists and policy-makers. Further, our discussion indicates that the development of a problem diagnosis may be facilitated to the extent that institutions for science–policy interaction are capable of both separating and integrating science and policy, and the process is representative of (conflictual) interests in the policy area. The requirements to institutional design to improve institutional performance in the context of science–policy interaction are thus challenging and demanding. Can they be delivered?

2 Developing institutions for science–policy interaction

While institutions may vary along a number of dimensions; functional scope, degree of formalisation, geographical domain etc., all institutions are nonetheless "social artefacts" that *consciously or unconsciously* are created by human beings (Young, 1994). While being socially constructed, however, they are not always the result of human design. The extent to which institutional arrangements may be employed as tools for guiding actor behaviour and thus improving institutional performance may be assumed to depend upon,

- the extent to which the institutional structures, constituted by the rules guiding behaviour and prescriptions of roles and role relations, are *deliberately designed* and *formalised*, and
- the extent to which actor *behaviour* is in fact *guided* by these formalised structures (Scott, 1981).

More specifically, the instrumental potential of institutional arrangements for science–policy interaction may be assumed to depend upon three main factors;

i) the extent to which formal structures designed for this purpose have been established;
ii) the extent to which these formal structures are compatible with participating scientists' overriding goal of maintenance of scientific integrity[5], and
iii) within the limits that may be caused by political conflict.[6]

We approach the question of how this potential may be realised by investigating which functions the institutional apparatus of the science–policy dialogue should be able to serve in order to facilitate the development of a problem diagnosis and thereby contribute to enhance the effectiveness of the process.

Policy-makers' acceptance of the knowledge base and the development of a problem diagnosis may be assumed to be linked to the extent to which;

a) the knowledge base is provided by scientists whose scientific authority and integrity they acknowledge;
b) channels for communication and dialogue between scientists and policy-makers are established;
c) all concerned groups and interests are represented in the scientific bodies, which is operationalised as the extent to which the knowledge base is provided by a group of scientists/experts with a geo-political composition which is representative of the composition of parties to the policy-making process in the issue area;
d) the knowledge base is relevant and applicable to the issues and issue areas of particular interest to policy-makers in their decision-making situation;

[5] We assume that participating scientists will be guided by the formal structures of the interaction only to the extent that the specified goals and procedures to achieve these goals are compatible with the overriding goal of "survival" (see Scott's discussion of natural organisations (1981)). Survival in this case, is assumed to be associated with a concern for maintaining their scientific integrity and authority.
[6] Given that institutional arrangements are also a negotiated outcome, we may assume that a high level of political conflict may restrict the availability of institutions as instruments.

e) arenas for communication, interactive dialogue and negotiations among and especially between scientists and policy-makers are established, and,
f) formal and/or informal mechanisms are developed whereby possible points of conflict or strong disagreements among and between scientists and policy-makers may be handled and resolved.

These six factors may be summarised into four functions the institutional framework should be able to serve in order to enhance the effectiveness of the science–policy dialogue:

I. Maintain the scientific autonomy and integrity of participating scientists;
II. Ensure a certain level of involvement between science and politics;
III. Ensure the geo-political representativity of the process;
IV. Provide mechanisms for conflict resolution.

Maintenance of scientific autonomy/integrity is conceived of as a function of multiple factors, including; appointment, recruitment and funding mechanisms, the main function of the body, the operational autonomy of the body and its institutional basis. By combining these dimensions we may construct an index which suggests the relationship between these institutional devices and the capacity of the institutional apparatus to maintain the scientific autonomy of scientific bodies, as indicated in table 2.1. Similarly, the level of involvement and interaction between science and policy is conceived of as a function of; the main function of the body, the functional differentiation between research/research co-ordination and the provision of policy advice, formal links to the decision-making body and the provision of arenas for an interactive science–policy dialogue. Table 2.2. indicates the assumed relationship between these institutional devices and the capacity of the institutional apparatus to ensure a certain level of science–policy involvement and interaction. The table also illustrates the assumption that arenas for an interactive dialogue may be provided in manners representing a “medium” level of involvement.

The geo-political representativity of the process is primarily linked to the rules of procedure for participation. The geo-political representativity of the body can be assumed to be high to the extent that rules whereby a geographic balance is ensured guide the composition of participants in these bodies.

We consider mechanisms for conflict resolution to be established to the extent that; arenas for an interactive dialogue between scientists and policy-makers are provided; deliberations can be transferred to informal arenas without seriously jeopardising the scientific authority of the knowledge base provided; and that policy-makers acknowledge scientists’ authority as experts as an (informal) basis for resolving conflicts pertaining to the interpretation and presentation of research findings.

The two functions which intuitively seem to be the most difficult to combine – scientific autonomy and science–policy involvement – thus seem to be linked mainly to different institutional devices. In this regard, these functions are possible to combine, at least theoretically.

In the next section, we employ this theoretical approach in an empirical case study of the Intergovernmental Panel on Climate Change (IPCC). To what extent can the science–policy

dialogue of the IPCC be characterised as effective? To what extent is the institutional apparatus of the IPCC process capable of serving these functions? And, to what extent has this contributed to enhance the effectiveness of the process?

Table 1: Index of the autonomy/integrity of the scientific bodies of the interaction.

HIGH AUTONOMY/INTEGRITY	LOW AUTONOMY/INTEGRITY
Appointment by scientific organisations or IGO	Appointment by national governments or regulatory body
Funding by scientific organisations, regular channels for scientific funding at national level, or IGO	Funding by national governments, or allocation of funds from national governments via regulatory body
Recruitment based on scholarly merits or role in scientific community	Recruitment based on political or administrative position
Participants engaged in active research or co-ordination of research	Participants mainly concerned with policy implications or policy advice
High operational autonomy; sets its own agenda and organises its own work	Low operational autonomy; under instruction and control by governments
Independent institutional basis; internal co-ordination, all members are scientists	No independent institutional basis, includes also other professions than scientists

Table 2: Index of level of involvement between the scientific and the political bodies of the interaction.

HIGH LEVEL OF INVOLVEMENT	LOW LEVEL OF INVOLVEMENT
The functions of research/research co-ordination and formulation of policy advice are not separated, scientists formulate policy advice, or	The functions of research/research co-ordination are separated, scientists do not formulate policy advice
Alternatively: The functions of research/research co-ordination and formulation of policy advice are separated, but the bodies serving the functions are closely linked	The functions of research/research co-ordination are separated, and the bodies serving the functions are not closely linked
There are regular channels for communication between scientific and political bodies	There are no or only informal channels for communication between scientific and political bodies.
Arenas for an interactive dialogue among and between scientists and policy-makers are provided which are not clearly institutionally separated from bodies conducting research/research co-ordination and regulatory body.	There are no arenas within the formal framework for an interactive dialogue among and between scientists and policy-makers
"Medium" score: There are arenas for an interactive dialogue among and between scientists and policy-makers, but they are clearly separated from bodies conducting research/research co-ordination and regulatory body. Alternatively: there are *informal* arenas for an interactive dialogue among and between scientists and policy-makers, and they are thus clearly separated from bodies conducting research/research co-ordination and regulatory body.	

3 The scientific diplomacy of climate change

The science–policy dialogue on climate change seems to have been fairly effective. A problem diagnosis seems to have been developed in terms of both of its constitutive elements: A knowledge base, acknowledged as an adequate representation of state-of-the-art-knowledge in relevant fields by both scientists and policy-makers in IPCC plenary sessions, has been developed, and this knowledge has been linked to valued policy goals. This linkage is established by the attribution of (problem) cause to societal activities[7] and the suggestion of alternative pathways to possible solutions.[8] This high level of acceptance is also reflected in a moderate behaviour change. In the Kyoto Protocol of 1997, policy-makers have made obligations to reduce their greenhouse gas (GHG) emissions by a total of 5.2% from 1990 levels by 2012. This agreement, however, is likely only to have a marginal impact on the accumulation of greenhouse gases in the atmosphere (Bolin, 1998). Therefore, it does not qualify as an *adoption* of the scientific knowledge base in the sense that policy-makers have fully recognised the policy implications of the problem of a human-induced climate change and acted accordingly. The Kyoto agreement is, however, a strong indication of the extent to which a human-induced climate change has been *accepted* by the international political community as a political problem whose solution can only be found in concerted action. To what extent can this level of effectiveness be explained by the institutional arrangements of the IPCC process?

3.1 The institutional set-up of the IPCC

The IPCC constitutes the scientific body of the climate change regime, while the Conference of the Parties to the Climate Convention (CoP) constitutes the political or regulatory body. However, the Executive Council of WMO and the Governing Council of UNEP established the IPCC as an *intergovernmental* organisation under UN auspices. Thus, one main characteristic feature of the IPCC is that it has a scientific mandate, while it is organised within a *political* institutional framework. This is reflected in a distinction *within* the IPCC itself between bodies largely serving "administrative/political" functions and bodies constituting the "scientific/technical core" (Figure 3.1). The IPCC thus operates, in the most literal sense of the word, in the *interface* of science and politics. The distinction between science and politics within the IPCC constitutes a *zone* rather than a clear-cut border.

[7] The combustion of fossil fuels and land-use changes causing deforestation.

[8] Options for reducing emissions of GHGs have been assessed by the IPCC (WGII). The Second Assessment of the IPCC (1995) includes the assessment of options linked to: i)Energy use; improved energy efficiency, ii) Energy supply; GHG reductions in use of fossil fuels, for instance through efficiency improvements in conversion of fossil fuels, a switch to low-carbon fossil fuels (such as oil to gas), as well as GHG reductions achieved by switching to non-fossil fuel sources of energy, iii) Management of forests, agricultural lands and rangelands; including sustaining existing forest cover and a slowing of deforestation

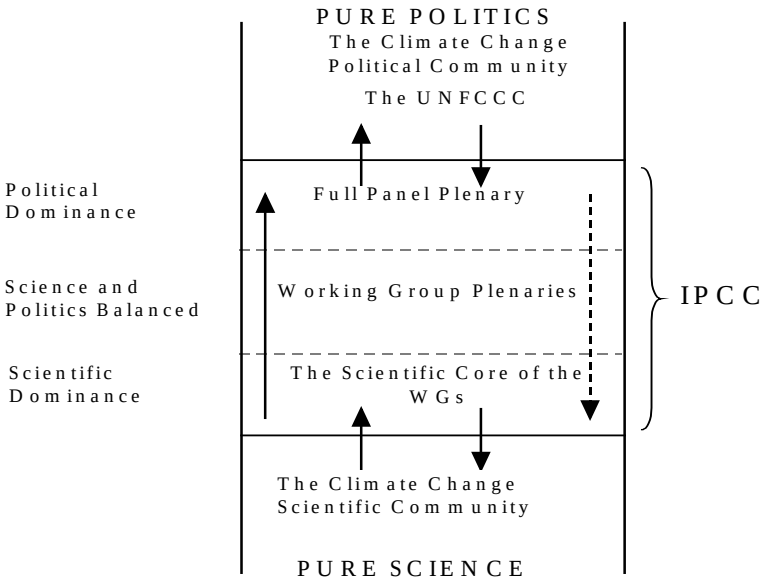

Figure 3.1. The institutional set-up of the IPCC. The arrows are rough illustrations of formal and informal channels of communication (See also Lunde, 1991).

The main decision-making bodies of the IPCC are the plenary, the bureau, three working groups (WGs) (some with ad hoc task force establishments on specific issues) and, from 1989 to 1992, a Special Committee for the participation of developing countries. The scientific/administrative distinction runs through the WG level, between WG plenary (as distinguished from panel plenary) and task force establishments and lead- and contributing author meetings, which constitute the "scientific core".

The main function of the IPCC is to provide scientific assessment reports of state-of-the-art knowledge on the various aspects of a possible human-induced climate change. WGI is responsible for providing assessments on the *science* of climate change, while WGII provides assessments on the *impacts* of climate change. Before 1992, WGIII was responsible for *formulating response strategies* to a human-induced climate change. In 1992 the IPCC was reorganised. WGs II and III were merged into a reorganised WGII, assigned the task of assessing *response options* in addition to its (continued) assessment of impacts, and a reorganised WGIII assigned the task of assessing the *socio-economic* dimension of climate change and other cross-cutting issues.[9] All IPCC assessments are to be based on available published literature. The IPCC provides a set of reports, distinguished by the procedures whereby they have been adopted as representing the IPCC view (see textbox 1).

Internally, the bodies constituting the scientific core are principally responsible for the provision of the assessment reports, while the WG plenary and the full panel plenary are responsible for accepting and approving the outcome of the work taking place in the scientific core.[10] The panel plenary also decides the rules of procedure guiding the work of the IPCC.

[9] The IPCC is currently undergoing a reorganisation in preparation for the Third Assessment Report. This reorganisation is not subject to study in this analysis.
[10] An "approved" report has been subject to detailed, line-by-line discussions in a plenary session of the relevant WG. Larger documents, such as the assessment report itself (which usually amounts to several hundred pages),

During the period from 1988–1995, the IPCC has produced two assessment reports (1990 and 1995), and several "special reports" – assessments of a limited range on special issues (1992 and 1994).

Textbox 1
IPCC reports

- *Supplementary material*: Scientific contributions to Assessments. Subject to discussions among lead authors and contributors in the scientific core.
- *Assessment Reports*: The full scientific assessment with status as "Reports accepted by WGs". Accepted by WG plenary, but not subject to detailed discussion.
- *Executive summaries and Summaries for Policy-makers*: Summaries of the full scientific assessment with status as "Reports approved by WGs and accepted by the Panel". Subject to line-by-line approval by WG plenary. Accepted by full panel plenary, and not subject to discussion at this decision-making level.
- *Synthesis Reports*: Synthesis of the reports of all WGs, developed by the WG leadership in co-operation with lead authors and specially invited experts with status as "Reports approved by the Panel". Subject to line-by-line approval by full panel plenary.
- *Special Reports*: Assessments on special issues. Subject to the review, acceptance and approval procedures of the assessment reports in general.
- *Technical Papers (since 1995)*: Reports on specific issues, based on existing assessment reports, not submitted to the acceptance and approval procedures of the assessment reports.

3.2 The assessment process of the IPCC

The IPCC is constituted by three distinct decision-making levels – the scientific core (of each WG), the WG plenaries and the full panel plenary (see fig. 3.1.) – and the assessment process is also conducted in three stages. At the first stage of the process, the assessment and a draft Summary for Policy-Makers (SPM) is developed within the scientific core of each WG. At the second stage of the process, the assessment and the SPM is submitted to the plenary of the WG for acceptance (the assessment) and approval (the SPM). At the final stage of the process, the assessments and SPMs of the three WGs are submitted the full panel plenary for acceptance,[11] and a draft Synthesis Report (a synthesis of the assessments of all the three WGs) is submitted for approval by the panel plenary. A panel plenary called to accept an assessment report, usually also reviews and accepts the work-plans for the next assessment. Thus, the panel plenary marks both the end and the beginning of the assessment cycle of the IPCC (Agrawala, 1998).

are "accepted" en bloc by the plenary, "…signifying its view that a report presents a comprehensive, objective and balanced view of the subject matter" (IPCC, 1994, see also report of the 9th plenary session).

[11] The panel plenary can *not* make amendments to a report which has been accepted and/or approved by the WG plenary of the respective WG.

3.2.1 The assessment process in WGI

WGI is perhaps the WG in which the assessment process best has functioned according to the intentions. In many respects, the procedures gradually and incrementally developed throughout the IPCC's history may be regarded as a formalisation of the assessment process as it has functioned in WGI.

In WGI the assessments and their (draft) summaries are developed at workshops, conferences and, most importantly, in the contributor and lead author meetings held with regular intervals during the assessment process. Each chapter to the assessment report are penned by teams of lead authors appointed by the bureau of the WG on the basis of nominations provided by governments, and are intended to reflect the discussions and scientifically based viewpoints of the contributor- and lead author meetings. Lead authors and contributors are recruited on the basis of scholarly merit. The work within the scientific core of WGI seems generally to reflect the proceedings of a "normal" scientific process and adheres to the (informal) norms, rules and procedures that govern all scientific endeavour.

When a draft report has been developed, it is submitted to an extensive, two-phased review procedure, including both "expert" and "government" review. This procedure was, in a sense, introduced by WGI in their work with the First Assessment, at which time formal procedures for review were not yet established. The two-tiered review procedure was formally adopted in 1993. The selection of expert reviewers is mainly based on scientific merit. Lead authors bear the main responsibility for incorporating comments brought forward in the review process.

The revised draft of the assessment and its summaries are then submitted to the WGI plenary for acceptance and approval. At this level, the discussion takes on quite a different character. While the full scientific assessment report is accepted by the plenary *en bloc* and usually without further ado, the summaries – the Executive Summary (ES) and the Summary for Policy-Makers (SPM) – undergo a detailed and time consuming revision where the formulations of the documents are discussed and negotiated, line-by-line, during the course of the meeting.

The main bulk of participants to WGI plenaries are national delegations, comprising government officials, low-level policy-makers and/or scientists with governmental affiliations. At this decision-making level scientists are represented mainly by representatives of the teams of lead authors to each chapter of the assessment. Lead authors have acquired a special status as authorities in the debate, and substantive changes to the text of the summaries are not made without consent from the lead authors of the chapter in question. Thus, while scientists may be outnumbered by government officials at this level, they still have a significant amount of "control" over the documents.

In contrast to the scientific core, IPCC WG plenaries operate under a decision rule of consensus. The 1991 rules of procedure state that, "[i]n taking decisions, drawing conclusions, and adopting reports, the IPCC Plenary and Working Groups shall use all best endeavours to reach consensus." Furthermore, it is stated that, "[i]f consensus is judged by the relevant body not possible…for conclusions and adoption of reports, differing views shall be explained and, upon request, recorded." ("Principles governing IPCC work" from 1991, item 6).

The consensus approval of WGI summaries takes place in a highly politicised and polarised environment. The documents are exposed to efforts of both strengthening and watering down their substantive conclusions. The WG plenaries, therefore, are in many respects a peculiar performance, illustratively described by Agrawala as "…a fox-trot performed by a drunken couple: one lurch forward, followed by a sideways stagger, then a stumble backwards" (Agrawala, 1998). It seems, however, that the final product is usually not very different in substance from the drafts.[12] The polarisation in the "attacks" themselves contribute to a balance, since they usually somehow outweigh each other. The balance is also, however, the achievement of the lead authors and their persistent insistence that the formulations must be scientifically substantiated and corresponding the conclusions of the bulk report. The scientific authority of lead authors in this debate also seems to be respected by most delegations, and lead authors do get the final say in these discussions.[13] This is, moreover, critical for the scientific credibility and authority of the document.

The end result then, is a report with carefully hedged language usually approved by consensus by the WG plenary.[14] The development of consensus in the WG plenary may take at least two routes. First, the procedure encouraged by the leadership of the WG is to move discussions on particularly controversial issues out of the plenary to side meetings with fewer participants. When this procedure works, the side meeting develops a revised text on the sections in question which are then merely re-inserted in the document by the plenary. In some cases, however, delegations may choose not to acknowledge the text developed in side meetings and reopen disputes, settled in side meetings, in the plenary. In such cases, the WG plenary revision of the summaries becomes an extremely time consuming, exhausting and intensely political process.

The point of this exercise seems to be that the WG plenary discussions represent the first step towards acquiring a political acceptance of the knowledge base and its substantive conclusions. Having undergone this thorough and detailed treatment, where alternative formulations and interpretations of the corresponding formulations in the bulk report have been discussed and negotiated, the substantive conclusions of the knowledge base are in a sense "tried out" and "digested" by policy-makers. Having survived this intense scientific and political scrutiny with their scientific credibility and authority intact, the substantive conclusions come out as more robust and are not easily deconstructed.

[12] One of the most controversial statements by WGI is the statement that "the balance of evidence suggests that there is a discernible human influence on global climate" (SPM of the Second Assessment of WGI, p. 11). The WGI plenary discussed and negotiated this formulation for almost three days. It is therefore illustrative that the corresponding sentence of the draft report, as it was formulated *before* the negotiations in the WGI plenary, reads: "Taken together, these results point towards a detectable human influence on global climate".

[13] At the Madrid meeting of WGI in 1995, there was for instance a lengthy discussion on the formulation, "More convincing recent evidence for the attribution of a human effect on climate is emerging from pattern-based studies,…". Kuwait and Saudi Arabia wanted the formulation to be either "Some preliminary evidence…" or "More convincing, but preliminary, evidence…". On this occasion the Chairman of the panel (Bert Bolin) ruled that given the unanimous support by all lead authors present for the original formulation, the conflict should be resolved by recording the dissenting views of these two delegations in a footnote.

[14] On one occasion, the approval of the SPM to the Second Assessment Report, Kuwait and Saudi Arabia requested that their dissenting view regarding a formulation in the report was recorded in a footnote. Due to some confusion on whether or not dissenting countries should be named or not, this question was left open for decision at the following panel plenary, at which the request was withdrawn (see also footnote 12).

The accepted and approved assessment report and summaries are then submitted to the full panel plenary for acceptance. A report which has been accepted or approved by the WG plenary can not, however, be amended by the full panel plenary. This institutional device, formally established in the 1993 revision of the IPCC rules of procedure, is important for ensuring consistency between the summaries and the assessment report upon which the summaries are based. As discussed above, lead authors' scientific authority is used at WGI plenary meetings to ensure this consistency and also to prevent scientifically unsubstantiated formulations from entering the summaries. While lead authors usually participate at the WG plenary level, they usually do not participate in the full panel plenary meetings. This institutional device also prevents the reopening in the full panel plenary of controversial issues already settled in the WG plenaries.

The panel plenary approves the Synthesis Report drafted by the leadership of each of the three WGs in co-operation with a specially invited group of scientists, lead authors and experts. The 1995 Synthesis Report was developed and discussed at several conferences with broad participation. The procedure whereby consensus on the Synthesis Report is developed in the panel plenary is, in form, similar to the negotiations taking place in WGI plenary meetings. A notable exception is the near absence of scientists at this decision-making level. This places a special burden and challenge on the members of the drafting team that are present and the scientific leadership of the WGs and the panel. In the development of the Synthesis Report to the Second Assessment (1995), conflicts over formulations were resolved by resorting to agreed upon language drawn from the SPMs. A more frequent recording of dissenting views as well as defining and qualifying statements in footnotes were also employed as tools for the development of consensus (personal observation).

3.2.2 The assessment process in the old Working Group III

The differences between the proceedings of WGI and the old WGIII are significant. Before 1992, WGIII of the IPCC was assigned the task of "Formulating response strategies" to a human-induced climate change. The old WGIII did not, therefore, conduct an *assessment* of existing and published literature within a specific field of expertise, as did WGs I and II. Rather, their task was more one of formulating more or less explicit advice – a task which was very closely associated with the politics of a human-induced climate change. Even more so, since the provision of their report took place simultaneously with the development of the knowledge base from which this advice was to be drawn, coupled with the fact that there did not exist a formally established political forum for climate change negotiations until the establishment of the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (INC) in 1991.

Given the nature of their task, the old WGIII could not draw upon a clearly defined scientific network or field of expertise in the provision of their report. The WG became dominated by (low-level) policy-makers and negotiators at all decision-making levels, with only a few independent legal and environmental experts, and the standard procedures for scientific peer review did not apply. Thus, the work of the old WGIII was not peer reviewed, although the Summary for Policy-Makers was submitted to a government review. The result was that the old WGIII experienced a significant politicisation of their work.

During this period (1988-1990), there were practically no formally established rules of procedure guiding the work of IPCC bodies.[15] When the task of the WG was firmly associated with a clearly defined scientific community, as was the case in WGI, this implied that the work could proceed in accordance with the rules and norms guiding scientific endeavour in general. When the task could *not* be clearly identified in terms of a coherent and well-organised scientific community, however, as was the case in the old WGIII, this lack of formal rules implied that there were *no guiding principles* for how the work was to be carried out. Thus, the lack of formal rules implied, in the case of the old WGIII, that there were no *instruments* by which to handle the very strong political pressures directed towards the WG during this phase. Rather, with informal rules as the only guide, the informal rules of *politics* were more "natural" as guides to the work of the old WGIII than the informal rules of science. Also, the lack of formally established political bodies, external to the IPCC process, to which strictly political issues could be redirected, seems to have reinforced the vulnerability of this WG towards a substantial politicisation. In this phase, policy-makers and governments were very uncertain about what the IPCC process might lead to and which (political) implications the report of WGIII might have. Without a proper (political) forum where these political aspects could be discussed, they were unwilling to lose control over the work and proceedings of this WG.

The old WGIII, therefore, became the "cockpit" for climate change politics in the pre-1991 period (Brenton, 1994:179), and its most important function was to serve as a forum for pre-negotiations (see also Boehmer-Christiansen, 1993). This was, by all means, a valuable and necessary contribution at this stage of the process, but it was *not* a scientific task. The political "infiltration" of the old WGIII seems to have generated some uncertainty regarding how their work was to be evaluated; as a political or as a scientific document. Within WGI and the leadership of the panel in general, moreover, there seems to have been some concern that this ambiguity could have significant credibility implications for the whole process (personal communication). The establishment of the INC in 1991 enabled the IPCC to reorganise itself, withdraw from the (explicit) advisory function and reformulate its task to a provision of *assessments* for all WGs.

3.3 The capacity of the institutional apparatus of the IPCC to serve the four main functions

In section two we suggested that institutional design may contribute to enhance the effectiveness of the science–policy dialogue to the extent that the institutional apparatus serves four main functions: maintain the scientific autonomy of the scientific bodies; ensure some level of science–policy involvement; ensure the geo-political representativity of the process; and provide mechanisms for conflict resolution. In this section, the capacity of the institutional apparatus of the IPCC to serve these functions is investigated.

[15] Rules of procedure have been developed incrementally, from a very sketchy "terms of reference" guiding IPCC activities in the initial phase (1988-91), to the also rather sketchy rules of procedure adopted at the 5th plenary session (1991), to the more detailed rules of procedure that have guided the preparation, review, acceptance and approval of IPCC reports, the workshop policy of the panel and the tasks and responsibilities of lead authors, contributors and reviewers, since the 9th plenary session in 1993.

3.3.1 Scientific autonomy and science–policy involvement

The autonomy of the various bodies of the IPCC seems to have varied somewhat, both "vertically", between decision-making levels (between Plenary, WG and scientific core), and "horizontally", between the scientific cores of the three WGs. As the discussion shows, the main distinction between the bodies runs between the more politicised WG and Panel Plenaries and the scientific core constituted by task forces, subgroups and the lead and contributing author meetings.

The actual provision of IPCC assessments takes place within the scientific core of the WGs. At least as far as WGI is concerned, the scientific core is well protected against purely politically motivated influence. Participants at this decision-making level are largely scientists active in research, funded through the regular channels for scientific funding at the national level. Above all, the scientific core of WGI enjoys a high level of both formal and operational autonomy with the norms and standards of scientific endeavour in general as an influential guide and with no "systematic" governmental control.[16] On the other hand, there are few formal channels of communication between scientists operating within the scientific core of WGI and the more policy dominated decision-making levels of the institution, apart, that is, from the role of lead authors in WGI plenaries. Participants within the scientific core of the IPCC are largely "bench scientists" with minimal direct contact with policy-makers and the policy dominated "bodies" within the IPCC. In this regard, the scientific core of WGI is characterised by a low level of policy involvement and science–policy interaction. Overall, therefore, the scientific core is characterised by a high level of both formal and operational autonomy, while it is characterised by a low level of involvement and science–policy interaction. The converse case characterises the situation in the WGI plenary. Participants to WGI plenaries are largely government officials and scientists with governmental affiliations, selected largely on the basis of administrative position, whose participation is funded by national governments, operating under a relatively strong governmental control. These aspects are all clear indications of a low level of scientific autonomy (modified by the central role of lead authors at this decision-making level). On the other hand, there are strong formal and informal links between the WGI plenary and policy-makers, not least as a function of participation and recruitment mechanisms at this decision-making level. Moreover, the WGI plenary is in itself an arena for science–policy interaction. This indicates a relatively high level of involvement.

The functions between these decision-making levels are also differentiated. While the scientific core has its primary function in the provision of the actual assessment, the WGI plenary is mainly concerned with what could be regarded as the *interpretation* of this assessment, as reflected in the choice of emphases and formulations in its *summaries*. The procedure by which this interpretation is developed taken into account, moreover, with intense science–policy and policy-internal discussions which sometimes have a clear aspect of strategic behaviour and thus strongly resemble straightforward negotiations, the function of the WGI plenary may be seen as linked to the *transformation* of the knowledge base into decision-making premises, rather than the provision of the knowledge base itself. While the WGI plenary has little direct influence on the provision of the actual assessment report, both scientists, as represented by lead authors, and policy-makers, as participants to WGI plenary

[16] We have not investigated more subtle modes of governmental control over research activities at the national level, such as, for instance, funding mechanisms which discriminate between research projects on the basis of purely political and non-scientific considerations.

sessions, have, as we have seen above, a significant influence potential over the assessment summaries, which are developed through an interactive dialogue between lead authors and policy-makers in WGI plenary meetings. Through this differentiation of roles and functions between decision-making levels, a combination of scientific autonomy and policy involvement is achieved *within* the WG.

Before 1992, a balance between scientific autonomy and policy involvement was also achieved "horizontally", across WGs, particularly between WGI and the old WGIII. While WGI managed to maintain the scientific autonomy of its scientific core and restrict policy-makers' influence on the substantive content of the knowledge base, the old WGIII became politicised at all decision-making levels. However, as discussed above, the old WGIII served an important function as a "policy arena" during a phase when no policy arena was formally established. In this regard the old WGIII provided an important link between scientists and policy-makers during a phase when it was not at all obvious how this link could otherwise have been provided without compromising the scientific autonomy of the other WGs. Moreover, there seems to be a general understanding, especially within the leadership of WGI and the leadership of the panel, that the old WGIII also served an important function as a "lightning rod", redirecting policy-makers' attention and influence attempts away from the other WGs (personal communication). During this phase, the IPCC largely operated without formal rules and procedures and the process had not yet developed its own dynamics. The "buffer" function served by the old WGIII may therefore have played a vital role for the ability of WGI to maintain the scientific autonomy and integrity of its scientific core, during a phase when the process was particularly vulnerable towards political "contamination".

3.3.2 Geo-political representativity

While the geo-political representativity of the IPCC was relatively low during the initial phase of the process, it has improved substantially during the course of the process. In the IPCC context, geo-political representativity can be "measured" in terms of participation by developing countries in the panel's work. In 1989, a Special Committee on the Participation of Developing Countries was established. This group presented its report at the 4th plenary session in Sundsvall in 1990, and recommended several actions the IPCC might wish to undertake in order to increase participation by developing countries in IPCC activities. The most important measure towards this end is the provision of funds to support developing country participation financially.

With the restructuring in 1992, it was agreed that instead of a Special Committee on developing country participation, "the special situation of the developing countries should ... be given attention as part and parcel of all the work carried out by the Panel and its groups (working groups/subgroups/task forces)" (IPCC Task Force on IPCC structure 3rd session, Doc.2, 1992, item 4.3.3.). It was particularly emphasised that developing country participation to the bodies constituting the scientific core of the IPCC was increased.

Judged by the number of developing country delegates to IPCC plenary sessions, the efforts to increase developing country participation seem to be relatively successful. Developing country participation has increased substantially since 1988: While only 14 non-OECD participants attended the first plenary session in 1988, 48 attended the 4th plenary session in 1990 and 98 non-OECD participants (of a total of 215 participants) attended the 11th plenary session in 1995 (Agrawala, 1998).

3.3.3 Mechanisms for conflict resolution

Mechanisms for conflict resolution are needed to handle disputes both in the development of the knowledge base and in its transformation into premises for decision-making. The former type of conflict concerns questions related to the representativity of the knowledge base and would mainly occur between scientists. The latter type of conflict concerns questions related to presentation and interpretation of the knowledge base within its political context and mainly arises between scientists and policy-makers. Generally, institutional arrangements for the provision of mechanisms for conflict resolution differ from other institutional functions in the sense that institutional arrangements, by themselves, can not provide this function: Institutional arrangements can provide *instruments* for conflict resolution while their *utilisation* depends on the behaviour of (individual) agents. More specifically, the provision of mechanisms for conflict resolution is particularly complex in processes of science–policy interaction, since outright negotiations and bargaining would be an illegitimate mode of procedure which could seriously compromise the scientific authority of the outcome.

Within the IPCC, the WG plenary is the main arena at which conflicts between policy-makers and between scientists and policy-makers surface. As pointed out above, the WG plenary serves its most important function as arena for an interactive dialogue between scientists and policy-makers. In general, the WG plenary represents an opportunity for scientists and policy-makers to discuss and develop agreement on how a piece of information is best presented and communicated. Thus, the main function of the WG plenary is as a forum where scientists and policy-makers can meet regularly and where important parts of the knowledge base on climate change is developed through an interactive dialogue between scientists and policy-makers.

In some cases, however, the differences of opinion expressed in these discussions reflect (conflicts of) interest in the policy area. In such cases the discussions at WG plenaries may take the form of straightforward negotiations. This is above all indicated by the extent of political strategic behaviour by many delegations.

The presence of strategic thinking and behaviour in WGI plenaries taken into account, the establishment of informal arenas and smaller side meetings is important. It should be noted, however, that a transfer of the discussions to informal arenas is a very important tool for at all being able to get through the agenda of plenary meetings even in situations characterised by no or little controversy. A transfer of the discussions to informal arenas, therefore, represents an important tool in the development of science–policy consensus on the assessment summaries in the IPCC *in general*, which *also* may be utilised as an instrument for conflict resolution if and when conflicts occur. As noted in our discussion above, the establishment of informal arenas is a central feature of the proceedings of the IPCC's WGI.

Finally, a decision-making procedure based on positions of authority is also a central characteristic of the proceedings of WGI. As discussed above, lead authors usually get the last word in situations of disagreement between scientists and policy-makers over the formulations of the summaries. The lead authors' scientific authority is generally accepted by policy-makers as a basis for this decision-making procedure, and if policy-makers wish, they can record their dissenting view in a footnote. So far, no delegation has chosen to do so in WGI (see also footnote 13).

These instruments are primarily designed for resolving disputes and conflicts between delegations and between delegations and scientists. They are not applicable for handling scientific dispute. In WGI, disputes between scientists have been handled by methods corresponding to the methods whereby the scientific community usually deals with scientific dispute, although perhaps with a stronger determination to find compromises and "solutions" capable of integrating all scientifically based viewpoints.

The most important mechanism in this regard is the review procedure. Peer review is the main mechanism for quality control in all scientific endeavour. The review procedure constitutes the backbone of the IPCC process and is essential for the scientific credibility and authority as well as the political acceptability of IPCC reports. The IPCC has developed an *extended*, two-tiered, review procedure; the peer (expert) review, and the government review. The extended review procedure serves a dual function. First, the peer review is the main mechanism for ensuring that the assessments constitute a fair representation of state-of-the-art knowledge within relevant fields and disciplines, and is acknowledged as such by the scientific community. Thus, the peer review is the main link between IPCC scientists (lead- and contributing authors) and the scientific community at large. While the main function of the peer review is scientific quality control, it may also be regarded as a mechanism at least for visualising points of dispute within the scientific community, which are then subsequently discussed and resolved at lead- and contributing author meetings. Points of dispute are usually resolved either by developing "generous" intervals of uncertainty or by attempting to develop "compromises" that reflect the major (scientifically substantiated) viewpoints of the community of scientists. The second phase of the review process, the government review, serves to bring the assessments and their summaries under the adversarial scrutiny of parties with conflicting interests. This is of particular importance with regard to the summaries, since they represent a *choice* of which conclusions (of the assessments) the community of scientists finds it important to communicate to policy-makers (recall that the summaries are a 10-20 page summary of a 3-400 page assessment), and thus represents an *interpretation* of the knowledge base and a first step towards the transformation of this knowledge into decision premises in the form of a comprehensive problem diagnosis. The government review thus provides governments with a first opportunity to comment on the interpretation of the knowledge base as represented in the summaries, and provides the teams of lead authors and the leadership of the WGs with an opportunity to intercept conflicts before the reports reach WG plenaries by incorporating comments beforehand.

The review procedure serves an important role for the IPCC's capacity to handle disputes and conflict both within the scientific community and in the science–policy debates that take place in WG plenaries. Thus, while the review procedure itself cannot be regarded as a mechanism for handling and resolving conflicts within the IPCC, it serves an important role in visualising points of dispute and potential conflict which then can be brought up and handled in the appropriate forums and in appropriate manners depending on the nature of the disagreement.

3.4 Enhanced effectiveness ?

The institutional apparatus of the IPCC seems to function well in terms of the four dimensions identified above. Our analysis strongly suggests, however, that within the IPCC these various functions are served by different "bodies", i.e., at different decision-making levels within the

institution. The IPCC constitutes a multi-tiered system with a high level of formal differentiation between roles and functions – notably the actual *provision* of a knowledge base and the *transformation* of this knowledge base into a comprehensive problem definition and diagnosis, agreed upon by both scientists and policy-makers. This differentiation between roles and functions at different decision-making levels enables the institutional apparatus to serve a set of seemingly incompatible functions. This explains, in particular, the difficult combination, achieved within the IPCC, of both separating and integrating science and politics.

The institutional dimensions of autonomy and involvement serve different functions in the process. While autonomy primarily seems to facilitate the development and *provision* of a knowledge base, involvement seems to facilitate the *transformation* of the knowledge base into inputs to processes of policy-making. Moreover, our analysis suggests that these dimensions may not be as hard to combine as might be expected: The institutional dimensions of autonomy and involvement may be combined to the extent that institutional arrangements can be differentiated according to functions (see also Andresen et. al., forthcoming). This is precisely what is accomplished in the case of the IPCC.

One major aspect of a functional differentiation is the establishment of institutional "buffers" that serve to separate the scientific and the more policy oriented functions of the institution. In the IPCC context (after 1992), the WG plenary seems to serve as a buffer between the (most) politicised decision-making level of the panel, the panel plenary, and the scientific cores of the WGs. Before the 1992 restructuring, the old WGIII served a different, but equally important, buffer function which may have increased the ability of the other WGs to maintain the scientific autonomy of their scientific cores. As pointed out by Miles, the establishment of institutional buffers between research results and their utilisation for regulation and distribution of costs is important, particularly from the perspective of science itself (Miles, 1989). Our analysis suggests, however, that this kind of functional differentiation also may be useful from the point of view of policy-makers (Underdal, in Andresen et al., forthcoming).

The institutional set-up of the IPCC, and particularly the capacity of institutional arrangements to balance and combine scientific autonomy and involvement, seems to have contributed substantially to the extent to which policy-makers have acknowledged the scientific authority of the knowledge base, and accepted its substantive conclusions as factually valid. In this case, policy-makers' confidence in the research results communicated by scientists seems to be drawn from at least two main sources: first, the scholarly competence, integrity and independence of the scientists involved in the process, and second, the adversarial scrutiny by actors and parties representing conflicting interests in the policy area. In an area as conflict prone as climate change policies, the latter mechanism seems at least as crucial as the first.

In the IPCC, adversarial scrutiny is accomplished through different procedures. First, the extended and open review procedures adopted by the IPCC serves an important function in this regard, in terms of ensuring that the reports and their summaries are subjected to the scrutiny of the scientific community at large *as well as* ensuring the adversarial scrutiny by governments representing potentially conflicting interests, at a relatively early stage in the assessment process (before the reports are submitted and discussed in plenary sessions). Second, the assessment summaries are subjected to an intense scientific and political scrutiny

in WG plenary sessions. The function of WG plenaries as an arena for an interactive science–policy dialogue is the most "visible" mechanism for ensuring adversarial scrutiny by parties with conflicting interests. Third, adversarial scrutiny is ensured through the recruitment and participation procedures adopted by the IPCC, particularly with regard to the institutional arrangements developed over time to ensure the geo-political representativity of the panel.

This emphasis on the provision of critical review procedures and mechanisms for adversarial scrutiny within the institution, seems also to require a system for handling the conflicts and points of dispute that can be assumed to arise in its aftermath. In our analysis of the IPCC, however, we found that the institution largely relies on implicit, rather than explicit, mechanisms for conflict resolution. The mechanisms for handling conflicts and dispute within the IPCC are implicit in the sense that procedures are designed and accommodated the needs of the assessment process, but that these procedures also can be utilised for purposes of the resolution of conflicts if and when they occur. Mechanisms for handling disputes and conflicts thus seem to be *embedded* in the institutional apparatus designed for the development and provision of assessments. The capacity of the IPCC to tap this instrumental *potential*, however, seems to a large extent to depend upon the behaviour of individual agents within the system. Our analysis indicates that individuals occupying central roles within the institution seem to have been capable of handling relatively difficult conflicts arising in the interface of science and politics.[17]

The ability of the IPCC to submit its reports to the adversarial scrutiny of parties with conflicting interests in the policy area is also a function of the high level of political involvement characterising the IPCC process. In the public debate on climate change science and policies, the IPCC process has maintained its "image" as a *scientific* body and a *scientific* process. This is slightly paradoxical given the extensive governmental and political participation characterising the process in general, and, especially, the most "public" and visible parts of the process, namely the WG and panel plenaries towards which most public attention is drawn. Policy-makers' degree of involvement in the IPCC process is, above all, indicated by the fact that it is the panel plenary – the most "political" decision-making level of the institution – which decides the rules of procedure of the panel.

The climate change issue touches upon vital national interests and thus involves a high potential for serious political conflicts. Furthermore, the issue is scientifically complex and associated with profound scientific uncertainty. Scientific findings are to a large extent open to interpretations, with a corresponding risk, from the point of view of policy-makers, of information distortion. The combination of these features seems to have implied a desire by governments to ensure scientific "objectivity" and disinterestedness, while at the same time, maintain a certain political "control" over the process. This is achieved by submitting the *products* of the process to the scrutiny of a broad set of actors, and by submitting the functioning of the *process* itself to a political "control" through the rules of procedure.

[17] In 1989-90 a conflict arose between WGs I and II over the use of past warm climate intervals as an analogue of a future greenhouse modified world (the use of paleo-analogues as forecasting technique). This dispute is an example of how possible policy implications could "infuse" the scientific debate and how a conflict with an obvious political dimension was handled by scientists and the leadership of (particularly) WGI (see Skodvin, 1998).

A key factor in this regard is the intergovernmental status of the IPCC, which permits governmental participation at the main decision-making levels. Through this institutional device policy-makers are permitted to participate in the development of the knowledge base. They thus have access to very detailed information, not only concerning the nature of the problem at hand, but also concerning the *manner* in which this knowledge has been brought about. Especially the latter aspect constitutes very important information in a conflictual negotiation setting because negotiating parties are then provided with a basis for evaluating the *reliability* of the information they receive regarding the nature and diagnosis of the problem at hand. In this case, moreover, the intergovernmental status of the IPCC implies that policy-makers have significant influence on the manner in which the knowledge base is provided. They can contribute to the establishment of rules and procedures that, in their view, serve to increase the reliability of the knowledge base. The political "control" over rules of procedure, however, can and has been utilised by some governments as a tool for delaying the process, and posed a difficult challenge for the IPCC leadership. Rules of procedure, moreover, is also a potentially powerful instrument in efforts to undermine the IPCC's credibility. That is, delegations deprived of scientifically based arguments to support their political position can accuse the IPCC of violations of their own rules of procedure in the development of the knowledge base and hence demand that conclusions and findings should be deleted. There are several examples in the IPCC's history which illustrate that delegations have adopted this strategy.

This design could have been devastating for the development of a scientific knowledge base on global warming because it left the process particularly vulnerable towards undue political influence on the substantive content of the knowledge base. When such an influence can not be traced, the scientific authority and the (potentially) central role of lead authors as exemplified in WGI plenaries seems to be an important explanatory factor. Moreover, the ability of the leadership of the IPCC to retain control over the scientific process and serve as an authoritative guide in the incremental development of the rules of procedure seems to be another important explanatory factor. Succeeding in this, moreover, the institutional design of the IPCC serves the very important function of providing an arena for a broad science–policy dialogue. In this regard, the institutional design of the IPCC seems to constitute a crucial factor in the explanation of the high level of acceptance among policy-makers of the scientific knowledge base provided by the IPCC. While it is methodologically impossible to control this effect, it seems very unlikely that the knowledge base could have gained the level of acceptance that it actually has in this case, if the knowledge base was provided for instance by an "independent" body in complete isolation from the political process on climate change. In an interview with Science (September, 1997), Bob Watson, chairman of WGII until 1997 and panel chairman since 1997, states that, "I believe the IPCC process is much, much more powerful than the single-agency approach. The most important thing when you have an assessment process is that it has to be credible to all stakeholders. They may not all agree with the outcome, but if they're all part of designing the process in the beginning, they'll be more willing to let the chips fall where they may." Similarly Sir John Houghton, Chairman of WGI, has maintained that, "any move to reduce political involvement in the IPCC would weaken the panel and deprive it of its political clout... If governments were not involved, then the documents would be treated like any old scientific report. They would end up on the shelf or in the waste bin" (Nature, vol. 381, June 1996).

On this basis it is our judgement that the institutional design of the IPCC process, and especially the extent to which one has succeeded in differentiating institutional arrangements according to function, thereby combining scientific autonomy and political involvement, and the adversarial scrutiny of parties representing conflicting interests in the transformation of the knowledge base into a comprehensive problem definition and diagnosis, constitute important explanatory factors to the outcome in this case. In this regard, it is also our judgement that the institutional arrangements, and their capacity to serve the four main functions identified above have served to enhance the effectiveness of the science–policy dialogue of the IPCC process. A crucial condition for this effect, however, is the leadership functions served by occupants of key roles in the process. The leadership provided by individual actors is, in a sense, the "glue" of the system. As it seems, the explanatory power of institutional design for the outcome of this process is entirely dependent upon the capacity of individual actors to provide leadership, both in the development of the assessment, its transformation into decision premises for policy decisions and in boundary roles between the scientific and the policy dominated decision-making levels of the institution (leadership is analysed in Skodvin, 1998).

4 References

Agrawala, S. (1998a). 'Context and Early Origins of the Intergovernmental Panel on Climate Change', *Climatic Change*, vol. 39, no. 4, pp. 605-620.

Agrawala, S. (1998b). 'Structural and Process History of the Intergovernmental Panel on Climate Change', *Climatic Change*, vol. 39, no. 4, pp. 621-642.

Andresen, S., T. Skodvin, A. Underdal and J. Wettestad (forthcoming.), *Science in International Environmental Regimes: Between Integrity and Involvement*, accepted for publication by Manchester University Press.

Boehmer-Christiansen, S. (1993), Scientific Uncertainty and Power Politics: The Framework Convention on Climate Change and the Role of Scientific Advice. Paper prepared for the conference: *"Geopolitics of the Environment and the New World Order"*, Chantilly, January 1993.

Boehmer-Christiansen, S. (1995), Britain and the International Panel on Climate Change: The Impacts of Scientific Advice on Global Warming. Part I: Integrated Policy Analysis and the Global Dimension, *Environmental Politics*, vol. 4, no.1, pp. 1-18.

Bolin, B. (1998). 'The Kyoto Negotiations on Climate Change: A Science Perspective'. *Science*, 279: 16 January.

Brenton, T. (1994). *The Greening of Machiavelli: The Evolution of International Environmental Politics*. London: Earthscan Publications.

Cole, S. (1992), *Making Science: Between Nature and Society*, Cambridge Mass.: Harvard University Press.

Collingridge, D. and C. Reeve, (1986), *Science Speaks to Power: The Role of Experts in Policy Making*, London: Frances Pinter Publishers.

Fisher, R. and W. Ury (1981/87), *Getting to Yes: Negotiating Agreement Without Giving In.* London: Arrow Books Limited.

Gibbons, M.; C. Limoges; H. Nowotny; S. Schwartzman; P. Scott; and M. Trow, (1994), *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London: Sage Publications.

Gilbert, N. (1976), The Transformation of Research Findings into Scientific Knowledge, *Social Studies of Science*, vol. 6, no. 3 & 4, pp. 281-307.

Haas, E. B. (1975), Is There a Hole in the Whole? Knowledge, Technology, Interdependence, and the Construction of International Regimes. *International Organization*, vol. 29, no. 3, pp. 827-876.

Haas, E. B., M. P. Williams and D. Babai (1977), *Scientists and World Order: The Uses of Technical Knowledge in International Organizations*, Berkeley: University of California Press.

Haas, E. B. (1980), Why Collaborate? Issue-Linkage and International Regimes, *World Politics*, vol. 32, no. 3, pp. 353-405.

Haas, E. B. (1990), *When Knowledge is Power: Three Models of Change in International Organizations*. Berkeley, Los Angeles and London: University of California Press.

Haas, P. M. (1989a), Do Regimes Matter? Epistemic Communities and Mediterranean Pollution Control, *International Organization*, 43, no.3, Summer 1989.

Haas, P. M. (1989b), *Saving the Mediterranean: The Politics of International Environmental Cooperation*, New York: Columbia University Press.

Haas, P. M. (1992a), Introduction: Epistemic Communities and International Policy Coordination, *International Organization*, vol. 46, no.1, pp. 1-37.

Haas, P. M. (1992b), Banning Chlorofluorocarbons: Epistemic Community Efforts to Protect Stratospheric Ozone, *International Organization*, vol. 46, no.1, pp. 187-225.

Haas, P. M. (1993a), Stratospheric Ozone: Regime Formation in Stages, in O. R. Young and G. Osherenko (eds.), *Polar Politics: Creating International Environmental Regimes*, Ithaca and London: Cornell University Press, pp. 152-186

Haas, P. M. (1993b), Epistemic Communities and the Dynamics of International Environmental Co-Operation, in V. Rittberger and P. Mayer (eds.), *Regime Theory and International Relations*, Oxford: Claredon Press, pp. 168-202.

Houghton, J. T., G. J. Jenkins and J. J. Ephraums (eds.) (1990), *Climate Change: The IPCC Scientific Assessment. Report Prepared for IPCC by Working Group I*. Cambridge: Cambridge University Press.

Houghton, J. T. et al., (eds.) (1992), *Climate Change 1992: The Supplement Report to the IPCC Scientific Assessment*. Cambridge: Cambridge University Press.

Houghton, J. T. et al., (eds.) (1994), *Climate Change 1994: Radiative Forcing of Climate Change*. Cambridge: Cambridge University Press.

Houghton, J. T. et al. (eds.) (1995), *Climate Change 1995: The Science of Climate Change*. Cambridge: Cambridge University Press.

Intergovernmental Panel on Climate Change (1990), *Climate Change: The IPCC Response Strategies*. World Meteorological Organization/ United Nations Environment Program. Washington D. C.: Island Press.

Intergovernmental Panel on Climate Change, Panel Plenary session reports from 1st to 13th session, 1988-1997.

Jasanoff, S. (1990), *The Fifth Branch: Science Advisers as Policymakers*. Cambridge, Mass.: Harvard University Press.

Kuhn, T. S. (1962/1970), *The Structure of Scientific Revolutions*, 2nd Edition, Chicago: The University of Chicago Press.

Kuhn, T. S. (1970a), Logic of Discovery or Psychology of Research? In I. Lakatos and A. Musgrave (eds.), *Criticism and the Growth of Knowledge*. Cambridge: Cambridge University Press, pp. 1-25.

Kuhn, T. S. (1970b), Reflections on my Critics. In I. Lakatos and A. Musgrave (eds.), *Criticism and the Growth of Knowledge*. Cambridge: Cambridge University Press, pp. 231-279.

Lakatos, I. (1970), Falsification and the Methodology of Scientific Research Programmes. In I. Lakatos and A. Musgrave (eds.), *Criticism and the Growth of Knowledge*. Cambridge: Cambridge University Press, pp. 91-197.

Latour, B. and S. Woolgar, (1979/1986), *Laboratory Life: The Construction of Scientific Facts*. New Jersey: Princeton University Press.

Litfin, K., (1994*), Ozone Discourses: Science and Politics in Global Environmental Cooperation*. New York: Columbia University Press.

Lunde, L. (1991). *Science or Politics in the Global Greenhouse? A Study of the Development towards Scientific Consensus on Climate Change* Lysaker: The Fridtjof Nansen Institute, EED Report 1991/8.

Midgaard, K. (1976), Co-operative Negotiations and Bargaining: Some Notes on Power and Powerlessness, in Brian Barry (ed.), *Power and Political Theory: Some European Perspectives*, London: John Wiley.

Miles, E. (1989), Scientific and Technological Knowledge and International Cooperation in Resource Management. In S. Andresen and W. Østreng (eds.), *International Resource Management: The Role of Science and Politics*. London and New York: Belhaven Press. pp. 46-88.

Mulkay, M. (1978), Consensus in Science, *Sociology of Science*, vol. 17, no. 1, pp. 107-122.

Nature vol. 381, 6 June, 1996, p. 455: 'Head of Climate Group Rejects Claims of Political Influence', by E. Masood.

Nature, vol. 381, 13 June, 1996: 'Climate Report 'Subject to Scientific Cleansing'', by E. Masood.

Popper, K. (1963), Science: Conjectures and Refutations. In *Conjectures and Refutations*, London: Routledge and Kegan Paul, pp. 33-59.

Popper, K. (1968), *The Logic of Discovery*. 2nd Edition, New York: Harper and Row.

Popper, K. (1970), Normal Science and its Dangers. In I. Lakatos and A. Musgrave (eds.), *Criticism and the Growth of Knowledge*. Cambridge: Cambridge University Press, pp. 51-59.

Science, vol. 277, 26 September, 1997: 'The Right Climate for Assessment', by R. A. Kerr.

Scott, W. R. (1981), *Organizations: Rational, Natural and Open Systems*. New Jersey: Prentice-Hall.

Skodvin, T. (1998), *Structure and Agent in the Scientific Diplomacy of Climate Change: An Empirical Case Study of the Intergovernmental Panel on Climate Change (IPCC)*. PhD thesis, accepted but not defended at the time of this publication, to the University of Oslo, Department of Political Science. Accepted for publication by Kluwer Academic Publishers.

Sundquist, J. L. (1978), Research Brokerage: The Weak Link, in L. E. Lynn (ed.), *Knowledge and Policy: The Uncertain Connection*. Washington D. C.: National Academy of Sciences.

Underdal, A. (forthcoming), Comparative Conclusions, chapter 8 in Andresen et. al., *Science in International Environmental Regimes: Between Integrity and Involvement*.

Underdal, A. (subm.), One Question, Two Answers. In E. Miles et al., *Explaining Regime Effectiveness: Confronting Theory with Evidence*.

Young, O. R. (1994), *International Governance: Protecting the Environment in a Stateless Society*. Ithaca and London: Cornell University Press.

Walton, R. E., and R. B. McKersie (1965/93), *A Behavioral Theory of Labor Negotiations: An Analysis of a Social Interaction System*. Ithaca, New York: ILR Press.

Ziman, J. (1968), *Public Knowledge: The Social Dimension of Science*. Cambridge: Cambridge University Press.

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