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Science-policy interaction and the IPCC

A proposal for a comprehensive concept of effectiveness and an analysis of the current structure of the Intergovernmental Panel on Climate Change

Master's Thesis
Department of Political Science
School of Business, Economics and Social Sciences
University of Hamburg

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Hamburg, March 2012

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“Scientists need to inform politicians in a simple manner that can be readily understood, but the message must always be scientifically exact. In reality, little of what we know as scientists is politically interesting or even understandable.”

Bert Bolin, † 2007, first Chair of the IPCC (1988-1997)*

* Quotation from Bolin 1994 (page 27).

Preface *by Dr habil Stephan Albrecht, first advisor*

The master's thesis by Johannes Bernhardt which is published in the present research paper deals with a part of global climate politics, namely with the interactions between scientific actors and political decision-makers in the Intergovernmental Panel on Climate Change (IPCC). The IPCC's task is to collect and review – based on scientific evidence – all information regarding global climate change and its consequences as well as to consider plausible strategies for mitigation and adaptation. In political science wording, the IPCC is thus a hybrid type of organisation in which actors from different societal sub-systems co-operate. Since the consequences of climate change and of mitigation and adaptation measures can be far-reaching in ecological, social, political, and economic terms, the organisation faces high expectations regarding the reliability of its work as well as strong interests regarding possible recommendations derived from its results.

The IPCC's legitimacy is based on the decisions regarding the United Nations Framework Convention on Climate Change (UNFCCC) that were made on the first Earth Summit in Rio de Janeiro 20 years ago. Its work is a historically novel phenomenon that is highly interesting from the perspective of political science: the IPCC Assessment Reports (ARs), of which the fifth will be published in 2013-14, continuously try to evaluate the impacts of all technologies affecting the global climate system. The global *assessments* – among these analyses of realms such as ecosystems, biological diversity, water, agriculture, and forests[i] – can thus be regarded as the most ambitious Technology Assessments (TAs) that have been conducted to date. The factors that regularly hinder TAs from unfolding their potential have been overcome relatively successfully in the IPCC process. Among these factors are insufficient geographical coverage, too much focus on short-term processes and lack of regular reiteration of assessments, ignorance of important interrelations and feedbacks, and insufficient involvement of stakeholders and interested third parties. At the end, however, as in every TA, the question remains how the societies deal with the results in political, social, cultural, and economic perspective.

In his master's thesis, Johannes Bernhardt has focused on an issue of enormous importance for the entire IPCC process, namely on the effectiveness of the interactions between scientific actors and political decision-makers in this process. Since a comprehen-

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[i] In contrast to the IPCC ARs, many of the mentioned assessments are unfortunately not conducted on a regular basis. Among the assessments listed below, only the FRA has been compiled for decades, and by far not as comprehensively as the IPCC ARs in political and scientific terms.

CAWMA 2007: Water for Food, Water for Life: A Comprehensive Assessment of Water Management in Agriculture,David Molden (ed.), London: earthscan.

FRA (Global Forest Resources Assessment) 2010:www.fao.org/forestry/fra/en/.

GBA (Global Biodiversity Assessment) 1995, Cambridge/MA: Cambridge University Press.

IAASTD (International Assessment of Agricultural Knowledge, Science and Technology for Development) 2009 a: 7 Volumes, Washington, D.C.: Island Press.

IAASTD 2009: Synthesebericht, S. Albrecht & A. Engel (eds.), Hamburg: Hamburg University Press.

IAASTD 2012: Regionalbericht zu Afrika südlich der Sahara, S. Albrecht (ed.), Hamburg: Hamburg University Press.

MA (Millennium Ecosystem Assessment) 2005: 4 Vols., Washington, D.C.: Island Press.

sive analysis of these interactions, e.g., over time or regarding the numerous actors involved during the process would have greatly overburdened a master's thesis, Johannes Bernhardt has chosen a clearly defined realm. This has been marked by an external evaluation of the IPCC's work by an advisory committee of the InterAcademy Council (IAC), the global umbrella organisation of the national academies of sciences. The IAC review was conducted in 2010 and was primarily propelled by a considerable mistake in the fourth Assessment Report of the IPCC which dealt with an erroneous prediction of the timescale for a possible melting of southern Himalayan glaciers. The fact that this erroneous prediction had been taken from a third source without being reviewed critically and the inadequate communication of the IPCC internally and with the public in the aftermath of the mistake's disclosure made an external review of the strengths and shortcomings of the current IPCC process necessary. Many questions of significance for the effectiveness of the interaction between scientific and political actors in the IPCC process are thus covered by the IAC review. Indeed, the IPCC has reacted to this review by implementing most of the IAC's recommendations, which is a clear hint to a high degree of acceptance of the review's findings.

The master's thesis by Johannes Bernhardt which is subject of this BIOGUM research paper is a successful example of how scientific monographs can contribute creatively to the understanding of complex research questions. Despite the numerous limitations coming along with a master's thesis, this paper contains an interesting approach to evaluate the effectiveness of science-policy interactions in international climate politics. It is therefore suitable to serve at least as a basis for further research regarding the questions it covers.

Stephan Albrecht — Oldenswort / Hamburg, March 2012

Preface *by the author*

This research paper contains my master's thesis which I have submitted to the Department of Political Science at the University of Hamburg in September 2011. I have developed it with close institutional links to the Research Centre for Biotechnology, Society and the Environment (FSP BIOGUM, Research Group Agriculture). Associate Professor Dr habil Stephan Albrecht, deputy director of the Research Group Agriculture, was my first advisor during the conduct of this thesis. I am very grateful for his valuable company during its preparation and finalization from which I have profited a lot. It has been a pleasure to co-operate with Dr Albrecht and I am looking forward to working on shared projects and activities in the future.

Prof Dr Cord Jakobeit, full professor at the Chair of International Relations at the University of Hamburg (Department of Political Science; School of Business, Economics and Social Sciences) served as my second advisor. I want to express my gratitude also for his assistance and comments, particularly on the final version.

Moreover, I want to thank the Research Group Agriculture at FSP BIOGUM and its director, Prof Dr Volker Beusmann, for supporting the publication of my master's thesis in the form of this research paper. I appreciate the valuation of my work that is conveyed by the Research Group via this publication.

Johannes Bernhardt Hamburg, March 2012

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List of abbreviations

AAU	Association of American Universities
AR	IPCC Assessment Report
AR 4	Fourth Assessment Report by the IPCC
AR 5	Fifth Assessment Report by the IPCC
CA	Contributing Author in an AR
CH_4	Methane
CLA	Coordinating Lead Author in an AR
CO_2	Carbon dioxide
ETS	Emissions Trading System
EU	European Union
FAR	First Assessment Report by the IPCC
GEA	Global Environmental Assessment
GHG	Greenhouse Gas
IAC	InterAcademy Council
IAP	InterAcademy Panel on International Issues
IPCC	Intergovernmental Panel on Climate Change
KNAW	Royal Netherlands Academy of Arts and Sciences (Koninklijke Nederlandse Akademie van Wetenschappen)
LA	Lead Author in an AR
NRC	US National Research Council
RE	Review Editor in an AR
SAR	Second Assessment Report by the IPCC
SPM	Summary for Policymakers of a WG report or of the SYR in an AR
STS	Science and Technology Studies
SYR	Snthesis Report in an AR
TAR	Third Assessment Report by the IPCC
TFI	IPCC Task Force on National Greenhouse Gas Inventories
TGICA	IPCC Task Group on Data and Scenario Support for Impacts and Climate Analysis

TSU	Technical Support Unit of the IPCC WGs or of the IPCC TFI
UN	United Nations
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNGA	United Nations General Assembly
US/ USA	United States (of America)
WG	IPCC Working Group
WG I	First IPCC WG (the physical science basis of climate change)
WG II	Second IPCC WG (climate change impacts, adaptation and vulnerability)
WG III	Third IPCC WG (mitigation of climate change)
WMO	World Meteorological Organization

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Abstract

This master's thesis investigates science-policy interactions in the realm of international climate politics. In a qualitative case study, the Intergovernmental Panel on Climate Change (IPCC) is analysed. The basic research question posed in this thesis is: "how effective is the science-policy interaction in the current IPCC assessment process?"

In order to find an answer to this question, the existing literature on science-policy interactions is reviewed with special attention being paid to analyses of international climate politics. The evolution of different theoretical strands and alternative ways to model the science-policy relation is drafted briefly.

In a next step, an approach to analyse the effectiveness of the science-policy interaction in the current IPCC assessment process is developed. This approach is largely inspired by Tora Skodvin's "Structure and Agent in the Scientific Diplomacy of Climate Change" (1999b) and her three-level concept of effectiveness. Several additional explanatory variables are constructed on the basis of a number of different authors' theoretical concepts. This modified approach is then applied to the IPCC assessment process. An external review of the IPCC's structure and procedures from 2010 as well as the documentations of several IPCC meetings serve as primary sources of information.

The results of the analysis are heterogeneous as is to be expected given the variety of variables that are investigated. In sum, however, the science-policy interaction in the current IPCC assessment process seems to attain a high level of effectiveness. This is in large parts due to the IPCC's successful provision of mechanisms that combine scientific autonomy and credibility with policymakers' influence at decisive points during the process. The analysis implies that an effective science-policy interaction will remain crucial to the IPCC's impact on international climate politics in the years to come. A high degree of willingness and ability to continuously adapt to changing political, scientific, economic, and social circumstances will be pivotal to this.

1 Introduction

Human activities influence the global climate in a number of ways. Here, the anthropogenic emission of greenhouse gases (GHGs) such as carbon dioxide (CO_2) and methane (CH_4) is of particular importance. Compared to intense controversies in the past, nowadays there is relatively wide consensus on the dangers that come along with an uncurbed human induced climate change, especially with regards to anthropogenic GHG emissions. Political effort to mitigate humankind's impact on the climate system is considered necessary by many actors involved and consequently, anthropogenic climate change has experienced a remarkable career in environmental politics (Beck 2009: 184, 196; Schönwiese 2008: 15, 334; Torrance 2006: 29).[2]

Due to the complexity of the climate system, advanced strategies and approaches are necessary to deal with human induced climate change. Therefore, climate politics necessarily have to integrate actors and interests from a wide range of policy-fields, such as energy, economic, or financial politics. Moreover, climate change is a global phenomenon: for example, GHG emissions and their effects on the earth's atmosphere cannot be restricted to the country of their origin. Therefore, internationally coordinated effort is essential if anthropogenic climate change is to be controlled now and in the future (Biermann 2007: 115; Clark, Mitchell et al. 2006: 1; Kern, Niederhafner et al. 2005: 1; Agrawala 1998a: 605; BPB: Dossier Klimawandel). From this follows that international politics are of particular relevance when ways to mitigate anthropogenic climate change are sought – even though a huge number of measures need to be taken on national and sub-national levels, i.e. regional and even local.

In modern democracies, scientific input into politics has become an integral part of policy-making and science and politics are closely linked to each other in a huge number of policy-fields. Here, international scientific assessments have experienced an increasing importance in recent years, often in the form of so-called 'Global Environmental Assessments' (GEAs) (Clark, Mitchell et al. 2006: 1, 3; Mitchell, Clark et al. 2006: 307-8; Weingart 2001: 129; 1999b: 152; Cozzens and Woodhouse 1995: 533; Salter 1988: 1, 206).

In climate politics, such scientific input is particularly important because of at least two reasons. Firstly, scientific investigation of climate change and mankind's influence on it has played a central role in making climatic change an important topic on the agenda of international politics: "The emergence of the climate change issue was primarily scientifically driven" (Bolin 2007: 77; cf. also Beck 2009: 13-5). Secondly, knowledge about the climate system and about humankind's role in its change has grown rapidly in the recent past – a trend that can be expected to go on in the years to come. This makes continuous scientific escort a precondition of informed policy-making. However, empirics show that the relationship between climate science and climate politics is not as simple and uncontroversial as one might expect (cf., among many others, ibid.: 183).

[2] In this paper, the provision of a detailed description of the historical development of climate politics as a relevant field of international politics is neither possible nor necessary. For such a description cf., among others, Beck (2009), Bolin (2007), and Agrawala (1999).

Altogether, these considerations have motivated the present thesis to focus on the interrelation between science and politics in the realm of international climate politics. Concretely, the Intergovernmental Panel on Climate Change (IPCC), an organization established in 1988 to regularly assess the worldwide knowledge about the global climate system (ibid.: 13), has been chosen as the central object of research.[3]

The decision to focus on the IPCC is based on three main reasons. Firstly, it is a unique organization that periodically brings together thousands of scientists from all over the world and from various disciplines. These collect and review the world's latest knowledge about the climate system, human induced climate change, and possible ways to mitigate mankind's influence on it. Besides the huge number of scientists, there are also government representatives from nearly 200 countries involved in the IPCC process, which – secondly – locates the IPCC directly at the interface between science and politics. Thirdly, the IPCC plays a central role in international climate politics. This is due to the aspects mentioned before: the involvement of scientists from all over the world generates an unprecedented source of knowledge and the participation of policymakers during most parts of the process makes sure that the results achieve a minimum degree of political acceptance (Oppenheimer, O'Neill et al. 2007: 1505; Bechmann and Beck 2003: 27, 30, 32-3). Consequently, public awareness of the problem of anthropogenic climate change is directly linked to the work of the IPCC. The award of the Nobel Peace Prize in 2007 to the IPCC (together with the former US Vice President Al Gore) was at least in parts based on the organization's success in making human induced climate change and its security-related implications for mankind a concern of global scale and awareness (Beck 2009: 14-5).

The fact that so many well-respected scientists and experts as well as policymakers from all over the world spend a lot of time, money, and effort in the IPCC process implies high opportunity costs: the actors participating in the IPCC could well spend their resources elsewhere (IAC 2010: 64).[4] The huge investment of resources in the IPCC process can only be legitimised by its results.[5] In other words, the IPCC process needs to affect humankind's understanding and handling of global climate change positively in order to 'deserve' the resources being devoted to it. This thought poses the question of the effectiveness of the interaction between scientists and government representatives that is central to the unique character of the IPCC.

---

[3] Indeed, the problem of global anthropogenic climate change and the (international) approaches to solve it are acknowledged as particularly adequate to analyse science-policy interactions throughout the relevant literature (cf., among others, Weingart 1999a: 103; Boehmer-Christiansen 1994a: 140; Jasanoff 1990: 1).

[4] From a global perspective, one could argue that these opportunity costs are borne by humankind as such because it might suffer in case scientific progress decelerates if (too) much effort is spent in the IPCC process.

[5] For a similar argument with regard to GEAs cf. Clark, Mitchell et al. (2006: 6-7). Here, the authors also give an overview of the existing literature on assessments in general and on GEAs in particular. They operationalise the effectiveness of an assessment primarily in terms of its influence on political decision-making and identify a varied degree of effectiveness among different assessments. This impression reappears in other publications (cf., for example, NRC 2007: 27; Torrance 2006: 51; Mitchell, Clark et al. 2006: 309).

Consequently, the central research question in this thesis is:

> *How effective is the science-policy interaction in the current IPCC assessment process?*

Finding an answer to this question requires an analytical model that facilitates an analysis of the degree of effectiveness of this science-policy interaction. The development of such a model is the first objective of this thesis. This will not be an entirely new concept. Rather, existing ones will be combined and modified where appropriate and necessary. This shall generate a comprehensive approach that permits informed conclusions.

This approach alone, however, will not provide an answer to the question just formulated. Such an answer necessitates the application of the analytical concept to the current IPCC assessment process. To carry out this analysis and to formulate well-founded results that lead to the proposal of an answer to the central research question is the second objective pursued in the present paper.

This thesis is a master's thesis. The associated restrictions regarding the editing time and allowed length of the final document require modesty with regard to the comprehension and degree of detail of the analysis. In particular, the IPCC cannot be investigated in all its facets. Thus, this paper focuses on the IPCC assessment process that culminates in periodic IPCC Assessment Reports.

Also the material available for the analysis is limited, both quantitatively and qualitatively. In particular, the capacity for original data collection is severely limited so that the investigation needs to be based on existing data. Given these conditions, a mid-2010 review of the IPCC structure and procedures has been identified as a particularly appropriate document. This review has been conducted by a committee established by the InterAcademy Council (IAC). Supported by scientific institutions from all over the world, the IAC has repeatedly conducted reports on complex current problems primarily related to science, technology, and health for governments and a number of different organizations (IAC: InterAcademy Council).

Many of the recommendations formulated by the IAC committee have already been implemented by the IPCC which has, thereby, modified its procedures considerably in reaction to the IAC review. In order to take these modifications into account and to widen the document base, the IAC review of the IPCC will be supplemented by meeting documentations of IPCC sessions and other documents.

The structure of this paper shall facilitate a substantiated evaluation of the effectiveness of the current IPCC assessment process. Initially, a short overview of the IPCC will be provided, including its central bodies and publications. The historical development of the organization and its role in international climate politics will be outlined and the structure and procedures underlying it will be summarised.

In a second step, the InterAcademy Council will be introduced. Again, the structure and procedures as well as the goals pursued and the actors involved will be presented. Here, some remarks will also be made on the committee that conducted the review of the IPCC on behalf of the IAC. Moreover, it will be explained why the IAC was requested to review the IPCC, which methodical approach was applied to do so, and why the report is suited as the primary source of information for this thesis.

A literature overview follows. It highlights theoretical and empirical results of earlier studies of the relation between science and politics, focusing on contributions which refer to international climate and environmental politics and which are relevant to the present thesis.

On this basis, an analytical model will be developed by combining and adapting existing concepts. This model will define the effectiveness of the science-policy interaction in the current IPCC assessment process as the dependent variable and will account for several factors that can be assumed to influence this effectiveness by incorporating them as independent and control variables.

This analytical model will then be applied to the document base outlined above in order to gather information that allow for an answer to the basic research question of this thesis. A proposal for such an answer will be formulated after the results of the analysis have been summed up.

Finally, a review of this paper's proceeding and an outlook that sketches points of contact for future analyses and further research questions complete this thesis.

2 The IPCC

The Intergovernmental Panel on Climate Change has already been introduced as an important actor on the stage of international climate politics. It plays a pivotal role in this paper so that some explanations regarding its general structure seem necessary. A few remarks about the establishment and development of the organization will be followed by an explanation of the central bodies, the funding, and the most important publications of the IPCC.[6]

2.1 History and key characteristics

The Intergovernmental Panel on Climate Change was established jointly by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988. All member countries of the UN and WMO can participate in the IPCC. Currently, the IPCC has 194 member countries, thus enjoying a nearly universal membership throughout the world. The primary motivation for the founding of the IPCC was "to prepare, based on available scientific information, a report on all aspects of climate change and its impacts, with a view to formulating realistic response strategies" (IPCC 2010b: 4). The United Nations General Assembly (UNGA) confirmed this focus by releasing a mandate for the organization in its 43rd session, also in 1988 (ibid.; IPCC: History; IPCC: Organization; IAC 2010: 8; Skodvin 2000: 409; Agrawala 1998a: 606).

The IPCC is a UN body with reporting responsibilities to WMO, UNEP, the UN Framework Convention on Climate Change (UNFCCC), and the UNGA. However, in practice, the IPCC has acted more independently than its legal status as "an intergovernmental joint subsidiary panel of WMO and UNEP" suggests (IAC 2010: 44; cf. also Skodvin 1999b: 146).

Generally, the IPCC does not generate own data and does not conduct own research but collects, assembles, reviews, and evaluates existing scientific knowledge. Thus, the review of scientific (and other) sources of information plays a central role in the IPCC system. The review mechanisms are correspondingly comprehensive (IAC 2010: 8, 18-9, 27).[7]

The IPCC carries characteristics of both scientific and intergovernmental organizations. It is a scientific body because thousands of scientists take part in collecting, reviewing, and evaluating information relevant to understand climate change. It is also an intergovernmental body because government representatives play a crucial role in the IPCC process. Thus, it is located directly at the interface between science and politics and can be called

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[6] All these explanations will be restricted to the basic aspects. More detailed investigations of the IPCC as an organization, including thorough explanations of its development over time, are left to others (cf., for example, Beck 2009; Bolin 2007; Agrawala 1998a; 1998b).

[7] The IPCC's review system, including its strong and weak points will be subject to a more detailed investigation later in this paper (cf. the analysis of the 'involvement between science and politics' in the institutional framework, pp. 67-70).

a 'hybrid organization'.[8] Within the IPCC, some bodies are primarily political in nature and others are primarily scientific in nature so that the distinction between both spheres within the organization "constitutes a *zone* rather than a clear-cut boarder" (Skodvin 1999b: 146, italics in the original; cf. also IAC 2010: xii; Beck 2009: 185; Bechmann and Beck 2003: 27, 32-3; Alfsen and Skodvin 1998: 5).

Not least because of this hybrid character, the IPCC has been evaluated as unique both by its own representatives and by several scholars (IPCC 1990: i; IPCC: Organization; Beck 2009: 16; Skodvin 2000: 409). Consequently, the organization has been subject to a huge number of analyses. These have experienced additional momentum by the fact that in the recent past, the IPCC – and science in general – has increasingly been exposed to external influences. In the case of the IPCC, these influences are particularly strong from the political realm (Beck 2009: 19; Nowotny, Scott et al. 2001: 50).

In sum, these arguments show that the IPCC is an extraordinarily interesting case for the study of science-policy interactions on the international and intergovernmental levels (cf. also Beck 2009: 16).

2.2 Central bodies

The central bodies in the IPCC are the Panel, the Bureau, the Working Groups (WGs), the Task Force on National Greenhouse Gas Inventories (TFI), the Technical Support Units (TSUs), and the Secretariat.

In the Panel, government representatives from all member countries meet in mostly annual Plenary Sessions. Also hundreds of experts from different organizations take part in these sessions. Here, the most important decisions governing the IPCC process are made. These include the election of the IPCC Chair and the other Bureau members, the approval of principles and procedures for the IPCC as such, the nomination of authors and reviewers for IPCC reports, and the scoping of reports and their final acceptance (IPCC: Structure; IAC 2010: 7).

The Bureau currently comprises 31 members. Among these are the IPCC Chair, the IPCC Vice-Chairs, the Co-Chairs and Vice-Chairs of the three WGs, and the Co-Chairs of the TFI and its Bureau. The various tasks of the Bureau members are not defined formally, but can be summarised as follows: they ought to advise the Panel on scientific and technical matters as well as on matters of management and strategy. Moreover, they ought to coordinate and oversee the work of the author teams during the preparation of IPCC reports (IPCC: Structure; IAC 2010: 7).

The three Working Groups contain the 'scientific core' of the IPCC system (Skodvin 1999b: 147). WG I covers 'the physical science basis of climate change', WG II deals with 'climate change impacts, adaptation and vulnerability', and WG III collects and evaluates information related to 'mitigation of climate change'. The TFI is primarily responsible for the development and advancement of methods that facilitate a calculation and report-

[8] For considerations on the IPCC's intergovernmental character cf. also Skodvin and Alfsen (2010: 11) and for the general importance of hybrid organizations at the interface between science and politics cf. also Bechmann and Beck (1997: 137).

ing of countries' GHG emissions and removals (IPCC: Structure; IPCC: Working Groups/ Task Force).

For each WG and for the TFI, a Technical Support Unit facilitates the respective body's activities, including the organization of meetings and the coordination of the review process. Each TSU is hosted and financed by the government of one of the Co-Chairs of the respective WG or Task Force (IPCC: Secretariat and Technical Support Units; IAC 2010: 7).

The Secretariat is of particular importance in the IPCC process because it is the only body that remains active beyond single assessment loops. It is hosted by the WMO in Geneva and supported by both WMO and UNEP. Generally speaking, "The IPCC Secretariat plans, oversees and manages all IPCC activities" (IPCC: Secretariat and Technical Support Units). This includes such different tasks as the preparation and organization of the Plenary and Bureau meetings, travel support for scientists from developing countries, and the coordination of the publication and outreach of IPCC reports (IPCC 2010b: 2; IAC 2010: 7, 49-50).

The IPCC system contains some more bodies. Among these are the Government Focal Points which coordinate the IPCC-related activities of the member countries, a Task Group on Data and Scenario Support for Impacts and Climate Analysis (TGICA), and further Task Groups and Steering Groups that are assigned the investigation of particular problems and questions (IPCC: Structure; IPCC: Working Groups/ Task Force).

Despite the internal heterogeneity, three decision-making levels can be identified within the IPCC. These are the 'scientific core' within the Working Groups, the WG Plenaries, and the full Panel Plenary, that is, the IPCC Plenary at the top of the organization (Alfsen and Skodvin 1998: 10; Skodvin 1999b: 146-7). The analysis that follows later in this paper will repeatedly refer to these levels when investigating the science-policy interaction in the IPCC assessment process.

2.3 Funding

The funding of the IPCC and its activities is defined in the "Financial Procedures for the Intergovernmental Panel on Climate Change" which are attached to the principles governing IPCC work (IPCC 1996). The primary sources of financial support are the regular contributions by WMO, UNEP, and the UNFCCC. WMO is important for the funding of the IPCC also because it hosts the IPCC Secretariat and because it – like UNEP – provides a senior member of its regular staff. Also the IPCC member countries contribute to its funding via voluntary financial input, via the hosting of TSUs and IPCC meetings, and via supporting domestic scientists who participate in the IPCC process. Another important source of monetary input is the IPCC Trust Fund which is mainly used to assist experts from developing countries, to organize meetings, and to publish and translate the IPCC reports. The overall annual IPCC budget is decided upon by the Panel based on information provided by the Secretariat (IPCC: Principles and Procedures; IPCC 1996: 1-2).

2.4 Publications

The most important publications of the IPCC are the Assessment Reports (ARs). Besides these, the IPCC publishes Special and Methodology Reports, Technical Papers, and Supporting Material (IPCC: Publications and Data).[9]

Broadly, assessments can be defined "as formal efforts to assemble selected knowledge with a view toward making it publicly available in a form intended to be useful for decision making" (Clark, Mitchell et al. 2006: 3). Here, the reference to formality shall imply a relatively high degree of organization that allows for an identification of "such aspects as products, participants, and issuing authority". Moreover, a wide range of sources of information are considered as well as such different arenas for decision-making as politics, science, private companies, nongovernmental organizations, and civil society in general (ibid.). To date, the IPCC has conducted four ARs. The first one was published in 1990 (FAR), the second one in 1995 (SAR), the third one in 2001 (TAR), and the fourth one in 2007 (AR 4). Currently, a fifth AR (AR 5) is underway and scheduled for completion in 2013-14. The ARs typically consist of one report by each WG, each of them including a Technical Summary and a Summary for Policymakers, and a Synthesis Report which sums up the entire AR and also includes an SPM (IPCC: Publications and Data).

IPCC Special Reports are issued in response to particular problems or questions. Their conduct follows the same procedures that underlie the ARs. The Special Reports cover a wide range of topics. Among these are aviation, technology transfer, CO_2 capture and storage, and – most recently – 'renewable energy sources and climate change mitigation' as well as 'managing the risks of extreme events and disasters to advance climate change adaptation'. In IPCC Methodology Reports, the focus lies on practical guidelines for the preparation of national GHG inventories that the parties to the UNFCCC are required to provide. Technical Papers are published if a certain problem requires scientific or technical clarification. They are based on information already contained in existing IPCC publications. Finally, Supporting Material typically consists of reports and proceedings from IPCC workshops and expert meetings. It can also include databases and software (IPCC: Publications and Data; IPCC: Reports; IPCC: Supporting Material; IPCC WG III: SRREN).

Most of the major IPCC reports and documents are available in all six official UN languages. The vast majority of the more recent IPCC publications are available at the IPCC website (IPCC: Home), some of them even translated into others than the official UN languages (IPCC: Publications and Data; cf. also Biermann 2006: 104).

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[9] The distinguished role of the Assessment Reports within the portfolio of IPCC publications as well as the particularly high degree of science-policy interaction during their preparation further justify the focus of this thesis on the assessment process surrounding the ARs.

3 The IAC and the review of the IPCC

The IAC review of the IPCC from 2010 has already been introduced as the central source of information for the analysis in this paper. This section explains the reasons for this choice. For this purpose, the IAC will be introduced in a first step. Some remarks on the committee that was assigned the review conduct follow and the methodical procedure it pursued is drafted. As was the case in the previous chapter, the explanations are restricted to some basic arguments that allow for an evaluation of the IAC review's appropriateness as primary source of information.

3.1 InterAcademy Council

The IAC was established in 2000 by "all of the world's science academies" (IAC: About the IAC). According to the statutes governing the IAC, its purpose is "to facilitate the provision of advice and recommendations on issues of global and regional importance for international organizations, multinational organizations and national governments." For that, the IAC institutes expert panels in cooperation with the different parties to the InterAcademy Panel on International Issues (IAP) (IAC: IAC Statutes). These panels conduct comprehensive reports that touch upon science, technology, and health. Climate change and the handling of genetically modified organisms are only two examples in this regard (IAC: About the IAC; IAC: InterAcademy Council; IAC: IAC in Brief).

Legally, the IAC is a foundation under Netherlands law due to its residence at the Royal Netherlands Academy of Arts and Sciences (KNAW) in Amsterdam (IAC: IAC Statutes; IAC: IAC Governance).

The bodies of the IAC are the Board and the Secretariat. As the highest decision-making body, the Board consists of two Co-Chairs and of currently 14 further members, two observers, and three ex officio members. Together, they represent academies of science and equivalent organizations from all over the world. The varied responsibilities of the Board comprise the definition of general IAC policies and procedures, the initiation of IAC study projects and the approval of their budget and personnel, the appointment of the Executive Director, and the election of its own members and Co-Chairs (IAC: Bylaws; IAC: InterAcademy Council).

The Secretariat is headed by the Executive Director and has a number of responsibilities that aim at assisting the IAC in fulfilling its purpose. Among the varied tasks of the Executive Director are the preparation and organization of IAC meetings and decisions, the preparation of an annual report on IAC programmes and activities and of an annual financial report, the provision of information for the public, and the maintenance of working contacts with relevant partner organizations (IAC: Bylaws).

Financial support for the IAC stems from various sources. A considerable share of this is provided by the hosting academy, currently the KNAW. Voluntary contributions by member academies as well as negotiated contracts or grants from governments, foundations, or other intergovernmental or private organizations add further financial resources (ibid.).

3.2 Review committee

The Chair of the IPCC, Rajendra K. Pachauri, and the Secretary-General of the United Nations, Ban Ki-moon, jointly requested the IAC to conduct an independent review of the IPCC in March 2010. In order to be in time for the fifth Assessment Report of the IPCC, this review ought to be completed in late August 2010. Adopting this request, the IAC established a 12 member ad hoc review committee. The IAC Board selected these members based on nominations from scientific and engineering agencies throughout the world. These members represented a variety of scientific disciplines, expertise, and experience as well as different geographical regions (IAC 2010: iii, 75-8).

The committee was chaired by Harold T. Shapiro and vice-chaired by Roseanne Diab. Harold T. Shapiro is president emeritus and professor of economics and public affairs at Princeton University, USA. Roseanne Diab is Executive Director of the Academy of Science of South Africa and professor emeritus of environmental sciences as well as honorary senior research associate at the University of KwaZulu-Natal in Durban, South Africa. A team of seven staff members assisted the committee in conducting the review (ibid.: iii, vi).[10]

3.3 Review conduct

Due to the tight time frame, the review committee had to focus on central aspects of the IPCC system and could not investigate the whole organization in detail. However, a wide range of sources of first-hand information were taken into account. Particularly relevant in this regard were presentations by high-level officials from the IPCC and UN as well as by a number of other relevant experts. Among the presenters were Rajendra K. Pachauri (IPCC Chair), Achim Steiner (Executive Director of UNEP), and Michel Jarraud (Secretary-General of WMO). Also the IPCC Secretariat provided a huge amount of relevant information about the IPCC's general processes and procedures to the review committee (ibid.: 3, 6, 44, 70).

Moreover, interviews and the responses to a questionnaire generated a huge amount of relevant information on strengths and shortcomings of the current IPCC structure. The questionnaire was distributed widely among government representatives, scientists, and organizations relevant to and/ or affected by the results of the IPCC assessments. It was also published on the review committee's website in order to allow for comments by the general public. In sum, the views of more than 400 persons – critics as well as proponents of the IPCC – were included in the process. The questionnaire consisted of ten open questions and allowed for additional comments. The questions covered a wide range of aspects such as the handling of different scientific points of view, the role of

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[10] A list of the committee members and of the assisting staff is attached to this paper as an appendix.

governments, the sources of information used, and the sustainability of the IPCC assessment process (ibid.: 4, 81).

Finally, some secondary literature, dealing with the IPCC and with assessments in general, added information to the review conducted by the IAC committee (ibid.: iii, 6).

The review report that resulted was itself subject to a review as is demanded by the IAC procedures. The review process involved 12 experts from a variety of disciplines and regions and was supervised by two review monitors. These were responsible for ensuring the accordance of the report review with the IAC procedures, including a thorough consideration of all reviewer comments (ibid.: iii, ix-x).[11]

After the review proceeding was completed in August 2010, the IAC Board approved the final report for publication (ibid.: iii, 6).

3.4 Adequacy of the IAC review as primary source of information

In a number of regards, the overview of the IAC and of its review of the IPCC provided in the previous sub-sections recommends this report as the central source of information for the analysis in this paper. Five particularly important arguments are summarised below.

Firstly, the IAC and its review committee can be evaluated as rather independent of IPCC, WMO, UNEP, and the UN as a whole. This independence refers to the institutional as well as to the financial and personal levels. Thus, the IAC review took a rather external perspective on the IPCC. This external perspective was further strengthened by the extensive review process that the IAC report underwent before its final release.

Secondly, the IAC report enjoys a wide range of sources of information that cover both the internal viewpoints of IPCC, WMO, and UNEP officials and the external ones of many experts and organizations. Thus, both the methodical approach chosen by the IAC committee and the report's informational basis are very comprehensive. Such a comprehensive document base could not have been generated within the limits of this master's thesis.

Thirdly, the entire process of report conduct was characterised by a high degree of transparency. The mandate assigned to the IAC by the IPCC Chair and the UN Secretary-General, the names, current positions, and biographical data of the members of the review committee, and the names and current positions of the reviewers and review monitors are included in the final review report. The same holds for the questionnaire and for the names of the persons who provided oral or written input during the process of report compilation. In addition, all comments (made anonymous) as well as audio recordings of some of the presentations that informed the IAC review committee are available from the IAC (ibid.: vi, ix-x, 4, 6, 81-6, 99-102). Thus, the statements in the report can be considered as well-founded and reliable.

[11] A list of the reviewers and review monitors is to be found in the appendix to this paper.

Fourthly, the report is a comprehensive analysis of the current structure of the IPCC and provides a huge amount of information relevant with regard to the research question posed in this paper.

Finally, the report has proven to be highly influential on the IPCC. As will become obvious in the course of the analysis, most of the recommendations formulated by the IAC committee have already been implemented by the IPCC (IPCC 2011a; 2011b; 2011c; 2011d; IAC: Statement by IAC). This is especially remarkable because by the time the present paper was conducted, only about one year had passed since the official release of the IAC report. Therefore, an analysis of the current structure of the IPCC as is aspired in the present paper actually *has to take* the IAC review report and the IPCC's response to its recommendations into account.

4 Methodical considerations

Before an analytical model is developed, the methodical procedure applied in this thesis will be outlined in order to give an overview of how the analysis as such will be conducted and of the reasons for the choice of the particular methodology.

It has already been mentioned that this thesis is oriented to Tora Skodvin's "Structure and Agent" (1999b) in a number of regards.[12] This includes the methodical procedure which can be explained by far-reaching parallels to the research questions in Skodvin's analysis. However, also some differences occur. These are, in the first place, due to disparities in the sources of information available.[13]

Like in Skodvin's paper, a qualitative procedure is applied. Qualitative methods have often been related to the development of hypotheses and theories. Still, they can also be useful to test existing ones. As will become obvious later, the present thesis contains both – it applies parts of an existing approach and it supplements them with additional variables. Hence, a qualitative proceeding that remains flexible towards the object of interest despite the necessary degree of formalisation and explication of variables and their respective operationalisation (Mayring 2008: 22, 117) is adequate.

Even though the IPCC process is perceived as "a process of science-policy interaction *par excellence*, it is also a *unique* exemplar of its kind" (Skodvin 1999b: 19, italics in the original). It is thus not one case amid many but a rather singular object of analysis.[14] Consequently, insights obtained in an analysis of the IPCC can only to a limited degree be generalised. This is a strong argument against a quantitative, 'large n'-approach. Additionally, the questions underlying the present thesis can hardly be answered by analysing numerical data. Instead, they require a detailed investigation of the available material. This, again, strongly suggests a qualitative approach (Mayring 2008: 21; Skodvin 1999b: 12-3, 19; Beck 2009: 98; IAC 2010: vii, xii, 43).

Concretely, a single case study-approach as was chosen by Skodvin in her analysis also appears to be sensible for this paper. The objective of a case study is the "exact description or reconstruction of a singular case" (Flick 2007: 177, translated by JB). As a central problem, Flick identifies the selection of the object of research. This selection should be based on the degree to which the particular case can provide relevant insights into the central questions underlying the study at hand (ibid.). In the course of the present paper, a number of arguments will document that the IPCC assessment process fulfils this criterion with regard to science-policy interactions in the realm of international climate politics. Here, the focus lies on the assessment *process* and not on the actual Assessment Reports which mark the published *result* of this process. This shall allow for a detailed investigation of the effectiveness of the science-policy interaction in the current IPCC assessment process. A number of scholars recommend such a proceeding for the

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[12] The approach developed and applied by Skodvin will be summarised later in this paper (cf. chapter 'focal concepts for the analysis', pp. 22-32).

[13] The sources of information referred to by Skodvin are summarised in the chapter 'focal concepts for the analysis', pp. 22-32.

[14] The unique character of the IPCC has already been drafted above, cf. pp. 5-6.

analysis of the effectiveness of assessments (Clark, Mitchell et al. 2006: 14; Mitchell, Clark et al. 2006: 324; Agrawala 1998b: 638).

Another important part of the methodical procedure applied here is the selection of sources of information. For the development of the analytical model, existing scientific literature about science-policy interactions is reviewed. Approaches and considerations of a number of scholars are taken into account and on this basis, a modified concept is designed. The actual analysis of the IPCC process, on the other hand, requires other sources of information. The basis will be the IAC review of the IPCC's processes and procedures from 2010. This central document will be supplemented by different IPCC publications. Here, the meeting documentations of the 32nd and 33rd Plenary Sessions are particularly important because they show which of the recommendations formulated in the IAC review have (already) been adopted by the IPCC. To a considerably smaller extent, the IPCC's website as well as parts of Assessment Reports and other publications will be considered in the analysis.

The confinement to existing written documents as the informational basis for this thesis is first and foremost due to a lack of access to more informal sources of information, such as interviews with high-level IPCC officials. The timely limitations of this project add the need to limit the amount of information taken into account. However, there are also some advantages coming along with a purely document-based analysis. Methodically most important in this regard is the seemingly trivial fact that these documents already exist. Thus, no primary data have to be generated and, therefore, the risks of biased and distorted data collection are avoided (Mayring 2002: 47-9). Of course, bias and distortions are a problem also in documents that have been produced for research purposes by other authors. However, as has been explained above, the IAC review can be evaluated as satisfying high demands of scientific accuracy. The IPCC meeting documentations have not been compiled for particular research purposes.

In sum, it is therefore concluded that sound-standing results can be derived from the document base as depicted above despite the restrictions that come along with this papers' nature as a master's thesis.

5 Theoretical fundamentals

The analytical model for this paper will be based on existing approaches. Thus, this chapter begins with an overview of the relevant literature. With the research question and the document base of this thesis in mind, a number of approaches will then be identified that contain relevant elements for the analytical model to be applied here. These approaches will be introduced and serve as the basis for the derivation of the actual model.

5.1 Literature overview

Science-policy interactions can be investigated in many policy-areas and a lot of scientific effort has been devoted to their analysis, not least in the field of international climate and environmental policy-making (Rutgers and Mentzel 1999: 147). For the present thesis, it is neither possible nor necessary to present this wide spectrum in all its facets. However, a lean summary of relevant theoretical strands appears to be useful because it highlights how this field of research has developed over time. Even more important is that such an overview can depict which aspects have been neglected in early approaches. This will be helpful for the later selection of approaches suitable for this thesis.

5.1.1 Simple approaches to the relation between science and politics

The approaches which have been developed to analyse the relation between science and politics differ significantly from each other. However, some strands can be identified that many approaches can be assigned to. In this sub-section, two of these strands are summarised. A more detailed account of the different concepts and their historical development is left to others (for example, Beck 2009).

A first strand of approaches has been labelled the ‘technocratic’ perspective. It is characterised by a clear differentiation between science and policy-making as two spheres and by the image of scientific neutrality. Furthermore, it (implicitly) assumes that scientific knowledge is superior to other kinds of knowledge and that scientists gain political influence due to this superiority. Consequently, the prominent image of scientists ‘speaking truth to power’ can be assigned to this perspective (Jasanoff 1990: 236; Beck 2009: 27, 29). From a technocratic point of view, scientific expertise has a technically-instrumental function in politics, an idea particularly popular in theoretical approaches from the realm of International Relations. Here, science ought to deliver consensual knowledge for informed political decision-making. Thus, the technocratic perspective suggests that the quality of political decisions increases with the involvement of scientific expertise in the political process (ibid.: 30; Bechmann and Beck 2003: 20; Skodvin 1999a: 4).

An alternative to the technocratic perspective is the ‘decisionist’ one. It emphasizes the danger of policymakers merely using scientific knowledge to legitimise their own decisions. In accordance with this perspective, some models have identified a symbolically-instrumental function of scientific expertise in politics with self-interests being a central driver of policy-making. This image of a symbolically-instrumental function of science underlies many concepts in the realm of Science and Technology Studies (STS) and marks a hugely different viewpoint than the technically-instrumental function that the technocratic perspective assigns to scientific advice in policy-making (Bechmann and Beck 2003: 20; Beck 2009: 30, 35).

Both the technocratic and the decisionist perspectives as well as the approaches that are based on these have been criticised because of their simplistic assumptions that suggest a linear, unidirectional, and one-dimensional relationship between science and politics (Weingart 2006: 75-6; 1999b: 154; van Eeten 1999: 185; Hellström 1998: 26). A number of shortcomings arise from this pattern. These shortcomings are subject to the following sub-section.

5.1.2 Shortcomings of the simple approaches

Even though a number of scholars have developed alternative perspectives, unidirectional models of the relationship between science and politics are still prominent in large parts of science, politics, and policy-advising (Beck 2009: 191; Weingart 1999b: 154). Therefore, the following pages will give a more detailed account of four central shortcomings of the simple approaches introduced above. In this context, also some advanced perspectives are presented. These can to a large extent be interpreted as responses to the weak points of the simpler models and show how these can be overcome.

As will become obvious, the shortcomings are interrelated. Thus, their separation in this chapter is purely analytical in nature.

5.1.2.1 Negligence of scientific self-interest

Along the lines of the simple concepts of the science-policy relation one often finds the perception of science being a disinterested endeavour for an objective truth (cf., e.g., Pinkau 2006: 33-4). In contrast, then, politics is characterised as driven by actors' struggle for power.

A significant amount of critique has been brought forward against this simplified image. Inter alia, the ideal of disinterested science has been interpreted as part of science's effort to maintain a monopoly in the generation of reliable knowledge and thereby to remain relevant in modern societies. This implies that scientists as individuals and science as such do not act entirely free of self-interest (Weingart 2001: 70; Nowotny 1993: 64-5; Kettner 1993: 172; Jasanoff 1990: 63, 81). In the realm of international climate politics, science has been suspected of exploiting the dangers of anthropogenic climate change to enhance its influence in international politics. Moreover, the emphasis on scientific uncertainty has been interpreted as an instrument to generate additional research funds. This, again, contradicts the idea of disinterested science (Boehmer-Christiansen 1994b: 185, 192, 195; for a similar argumentation cf. Weingart 1999b: 159-60).

In this context, it is worth noting that a number of environmental problems have been identified by science before policymakers turned to scientists during the search for solutions. Examples are anthropogenic climate change, global warming, and the depletion of the ozone layer. Thus, scientific input has become necessary not only to solve problems observed by policymakers, but also to identify these problems in the first place (Skodvin 1999b: 25; Weingart 2006: 74; 1999a: 103; 1999b: 155; Bechmann and Beck 2003: 22-3; 1997: 123, 136).[15] This implies an agenda-setting function of science that contradicts the reduction of science's function to the delivery of neutral information for the solution of problems that are defined by policymakers. In fact, it has been argued that complex decision-making processes do not necessarily follow predetermined sequences of phases with scientific research ultimately resulting in a reasonable solution. Evidence rather suggests that 'solutions' that accord to the interests of relevant (political) actors often 'look for a problem'. The decision-making process, then, "jumps from one partial decision to another" with particular arenas with different actor constellations being built around each sub-decision (de Bruijn and ten Heuvelhof 1999: 181; cf. also Weingart 1999b: 154-5). In such a situation, scientific institutions may use their advice strategically to push certain problems while neglecting others, for example in order to increase their influence, reputation, and research funds (ibid. 2006: 83; Skodvin 1999b: 7; Brunner 1996: 127-8; Bolin 1994: 27-8). Policymakers, on the other hand, may filter the information provided by science according to their respective interests.

In sum, "Numerous studies of political controversies indeed show that science advisors behave like any other self-interested actor" (Hoppe 1999: 202; cf. also de Jong 1999: 198; Salter 1988: 206).[16] Simple models of the relation between science and politics do not take this insight into account and assume scientific neutrality instead.

5.1.2.2 Negligence of the transformation of scientific knowledge

Many concepts that are based on the technocratic perspective implicitly assume a direct and undistorted transport of scientific knowledge into political decision-making, even though this assumption fails empirical testing (Skodvin 1999a: 4; Beck 2009: 31, 183).

One of these concepts is the 'epistemic communities' approach (Haas 1992) which has been widely used in the relevant literature and thus plays an important role in this strand of research. Given that this approach illustrates a number of shortcomings of the technocratic perspective, it is not surprising that a huge amount of critique has been brought forward against it (Bechmann and Beck 2003: 27; 1997: 137; Beck 2009: 23-4, 27). Some advance in this regard has been achieved by Litfin (1994) who analysed 'knowledge brokers', i.e. intermediaries, in the context of the development of the international regime to protect the ozone layer. The mere idea that intermediaries between science and politics can be necessary to translate scientific knowledge into a policy-relevant form represents an image of the science-policy relation that comes closer to the empirics (Skodvin 1999b: 307; cf. also de Jong 1999: 193; Salter 1988: 10). However,

[15] Political consideration of these problems often seems to require public awareness in addition to – and maybe as a consequence of – scientific awareness (Bechmann and Beck 1997: 124, 132).

[16] For further criticisms of the idea of a value-free science cf., inter alia, Weingart (1999b: 154-6), Bimber and Guston (1995: 554-5), and Jasanoff (1990: 12, 230, 249).

also Litfin's approach inhibits weak points. It can hardly be applied in cases where such intermediaries do not play a central role. Moreover, it does not formulate recommendations for the actors involved in the process at hand and does not investigate institutional structures in detail. These two last aspects also apply to the epistemic communities approach (Skodvin 1999b: 307-8).

A number of scholars support the evaluation that the process of translating scientific findings for policymakers needs to be taken into account in analyses of the relation between science an politics. Among these are Rutgers and Mentzel (1999). Their conclusion that "it is not so much expertise about the subject, but 'administrative expertise' that determines the interaction [between experts and policymakers]" strongly indicates that scientific expertise alone does not make sure that scientific knowledge finds access to political decision-making (Rutgers and Mentzel 1999: 150; cf. also Jasanoff 2010: 696).

5.1.2.3 Negligence of the mutuality of the relation between science and politics

As described above, the simple approaches to the relation between science and politics assume that this relation is unidirectional. This is largely due to the idea of a hierarchical relationship between science and politics where science is superior to politics because of the preponderance of scientific knowledge (Beck 2009: 29-30).

Empirics show, however, that science does not only have an impact on policy-making by providing the informational input that policymakers (ideally) base their decisions upon. Rather, science itself is also influenced by its close ties to politics and by its "mandate to produce scientific conclusions to support policy decisions" (Salter 1988: 186; cf. also Mitchell, Clark et al. 2006: 324-5). This 'mandated science' (Salter 1988)[17] is characterised by a strong evaluative orientation with the review of existing literature marking the 'end product' instead of the starting point as is usual in scientific research. A high degree of influence exerted by (political) interest groups and a limited public access to relevant data are further traits of mandated science (Salter 1988: 187-9). "In summary, if one were to apply the norms of conventional science to the activities of mandated science, then it might be dismissed as unscientific, and as interest-laden" (ibid.: 189-90). In other words, science is indeed influenced by its relation to policy-making, and that influence is to be evaluated as problematic in many cases (cf. also Jasanoff 2010: 695; Weingart 2006: 74; 1999b: 156; Bechmann and Beck 2003: 24, 26; Skodvin 1999b: 88; de Bruijn and ten Heuvelhof 1999: 182).

Salter is by far not the only scholar who points at the mutuality of the science-policy relation. Among others, Peter Weingart has analysed this phenomenon substantially. Weingart has formulated two paradoxes (1999b) which have become a regular point of reference within the literature on science-policy interactions.[18]

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[17] Salter's analysis focuses on the setting of environmental standards (Salter 1988: 12). This object of research departs significantly from the one investigated in this paper so that Salter's concept of mandated science is only marginally taken into account here.

[18] Cf., among others, van Eeten (1999: 185, 191), Hoppe (1999: 202), de Jong (1999: 194), Rutgers and Mentzel (1999: 148-50).

As a first paradox, Weingart identifies the simultaneous scientification of politics and the politicisation of science. The scientification of politics implies that science's influence on politics increases, mainly via the increased agenda-setting power of science which has already been mentioned in the context of the 'negligence of scientific self-interest': science itself can identify problems that force policymakers to search for solutions. Moreover, scientific actors have gained more formal influence in processes of political decision-making (Weingart 1999b: 155; Beck 2009: 39-41).

The agenda-setting function of science in politics also marks the starting point of the politicisation of science: the more active science becomes in politics, the less value-free and objective it acts. In cases of scientific uncertainty and controversy, scientific arguments might then be used strategically by policymakers to support their own goals. Thus, an active role of scientists in policy-making questions scientific neutrality (Weingart 1999b: 156; Beck 2009: 42, 47-9), a conclusion that is in line with what Salter has diagnosed in the context of mandated science.

Weingart concludes that the "relationship between science and policy-making appears to be recursive and reciprocal rather than linear" which, according to the author, also dissolves the seeming paradox of simultaneous scientification of politics and politicisation of science (Weingart 1999b: 157). This description of the science-policy relation is in line with the broader strand of approaches that in sum mark the 'pragmatic' perspective. Shaped by Jürgen Habermas and others since the 1960s, this perspective understands the relationship between science and politics as one of functional differentiation. Science is no longer assumed to be superior to politics and the boarders between the two spheres are redefined – relative autonomy replaces strict separation. Weingart's appreciation of the science-policy relation as recursive is a further advancement of this pragmatic perspective. Models based on the recursive image emphasize that the relation between science and politics is one of close coupling (ibid.; Beck 2009: 33-6, 39-42; van Eeten 1999: 185).

These close ties between science and politics imply a weakening of scientific independence and credibility. On this basis, Weingart formulates a second paradox as follows: "despite the loss of authority of scientific expertise, policy-makers do not abandon their reliance on existing advisory arrangements, nor do the scholars adapt their ideas on science and its relation to politics" (Weingart 1999b: 151; a similar phenomenon is described by Jasanoff 1990: 234)[19]. Weingart tries to solve this puzzle by arguing that both spheres are interested in maintaining their functional relationship including the preservation of a clear boundary. The scientific side aims at remaining (relatively) autonomous which requires a sufficient degree of scientific independence that is closely linked to scientific credibility. The policy-making side, on the other hand, aims at maintaining this credibility in order to make use of it for purposes of legitimatising policy-decisions. While scientists have the know-how to develop different possible solutions to a particular problem, they lack the legitimisation to choose between these alternatives.

[19] In some contributions, Weingart divides this second paradox into two elements: the increase of controversy in the process of political decision-making despite the increase in scientific advice is then labelled as one paradox and the absence of adaptation of the relationship between science and politics despite this phenomenon is presented as a third one (cf., for example, Weingart 2001: 132). In the present paper, this division is not relevant so that it is not discussed in detail.

Policymakers, on the other hand, obviously have this legitimisation qua being elected representatives of the population[20] (Weingart 1999b: 152-3, 159; 2001: 128-9, 168-9; de Jong 1999: 196; Bimber and Guston 1995: 557; Beck 2009: 187-8).

By referring to both spheres' interest in maintaining their functional differentiation, Weingart rejects the image of blurred boundaries of science and politics which has been referred to by a number of scholars (Weingart 1999b: 154-7; cf. also, inter alia, Beck 2009: 188-9; van Eeten 1999: 185). Also de Bruijn and ten Heuvelhof argue that different arenas for science and politics are necessary in which these can operate during the decision-making process. However, the authors also emphasize that close links between these arenas are a precondition of bilateral acceptance of the results (de Bruijn and ten Heuvelhof 1999: 183-4). This, again, points at the processes of scientification of politics and (especially) politicisation of science.

5.1.2.4 Negligence of scientific dissent

The problem of anthropogenic climate change affects a huge number of heterogeneous actors with a wide range of interests and points of view. Moreover, many scientific disciplines are involved in its exploration. The degree of scientific controversy and uncertainty is accordingly high which is typical of many global problems (Bechmann and Beck 1997: 134; de Bruijn and ten Heuvelhof 1999: 179). Often the different actors refer to different scientific arguments. Many of these arguments may be scientifically valid from a certain perspective but still contradict each other. Consequently, invalidating the respective opponents' arguments is not an option for the rival parties and the situation resembles what van Eeten labels a 'dialogue of the deaf', depicting the difficulty to reach mutual understanding (van Eeten 1999: 186).

Especially in the context of problems that cannot be solved domestically, the variety of scientific knowledge generated in different countries further increases the probability of scientific dissent. Engels and Ruschenberg (2008) point out that "cross-border flows of ideas, personnel and technologies" in transnational science cannot be taken for granted, particularly if scientists both from OECD-countries and from the developing world are involved (Engels and Ruschenberg 2008: 357).[21] Moreover, on the transnational level, common perceptions and shared values exist to an even smaller degree than domestically (Beck 2009: 57). Therefore, the establishment of scientific consensus is especially demanding if scientists from different countries and cultures participate in the process as is clearly the case in the IPCC.

International cooperation is not the only factor that augments the heterogeneity of perspectives and viewpoints in scientific advice. Also the processes of scientification of politics and politicisation of science which have been discussed above have such an effect.

[20] This argument only holds for democratic political systems and even here, scientific advice often lacks democratic legitimacy. As possible ways to solve this problem, a democratisation of scientific advice in form of participatory democratisation (advisory processes that are open to the broad public) and in form of corporatist democratisation (increase in interest groups' involvement in processes of scientific advice) has been discussed. However, the practical implementation of such proposals has remained relatively vague and doubts remain whether democratisation alone is a satisfying solution to the dilemmas in the interrelation between science and politics (Weingart 2006: 75, 78-80, 83).

[21] Nowotny, Scott et al. (2001: 52) as well as Jasanoff (2010: 696) argue similarly.

The reason is that scientific advice takes place at the "research frontier where knowledge claims are uncertain, contested and open to challenge" with policymakers and scientists being involved in an ever intensifying "competition for the latest, and therefore supposedly most compelling, scientific knowledge" (both citations from Weingart 1999b: 158; for similar arguments cf. Kettner 1993: 174-5; Salter 1988: 200-1). Thus, uncertainty and controversy in scientific advice tend to increase and scientific consensus becomes even less likely. On the other hand, policymakers tend to prefer clear-cut information and reliable recommendations for action (Skodvin 1999b: 31; Hellström 1998: 30-1; Kettner 1993: 173; Salter 1988: 199). This does not result in less uncertainty but rather in what Oppenheimer, O'Neill et al. call 'premature consensus' that is characterised by the negligence of scientific uncertainty in favour of clear-cut results (2007: 1505-6). This argument further supports the rejection of simple models that per se assume stable scientific consensus. In fact, a considerable share of the criticisms that have been brought forward against concepts like the epistemic communities approach refers to the negligence of the generation of scientific consensus in cases of high scientific uncertainty (Beck 2009: 23-4; Bechmann and Beck 2003: 27; 1997: 137; Skodvin 1999b: 4-5, 306-7).

Thus, the potential contributions of scientific advice to policy-making need to be formulated more modestly. Inter alia, it is then said to ensure "a much needed minimal amount of order and articulation of concepts, arguments and ideas." It can become "some sort of compass in an ideological universe in disarray" (both citations from Hoppe 1999: 202). Other authors even identify negative effects of science's involvement: "there seems to be a legitimisation crisis for both the scientific expert and the policymaker that arises out of their interaction" (Rutgers and Mentzel 1999: 146; cf. also de Jong 1999: 194).[22]

The decisive insight to be derived from the above considerations is that consensual scientific advice to policy-making as it is assumed by the simple models can hardly be expected. This insight is accommodated in social-constructivist models. These have been developed based on the recursive perspective introduced above and emphasize the contingent and negotiated character of science-policy interactions. This perspective does not take scientific consensus for granted but understands it as the result of complex processes of consensus-building. An example of this is the concept of coproduction that focuses on mutual legitimisation of science and politics (Jasanoff 1990: 230, 234; Beck 2009: 51, 53-4, 58-60).

5.1.2.5 In short

For the present thesis, a central conclusion can be drawn from this rough account of the shortcomings of early models of science-policy interactions and their development over time: the interrelations between these two spheres are manifold and recursive, science and politics influence each other in a number of ways. The simplified image of a pure and value-free science that provides consensual knowledge to policymakers who make use of this knowledge in favour of informed policy-decisions does not depict the empir-

[22] This argument relates to the problem of democratic legitimisation of scientific advice to politics which has been mentioned above.

ics of science-policy interactions in international climate politics appropriately. Thus, the linear and unidirectional conception of science-policy relations that underlies the traditional strands of research has to be rejected and 'science-policy *interaction*' is a far more appropriate term to describe the mutuality of the relationship between the two.

This conclusion is an important basis for the following chapters: it implies that the analytical framework for this thesis needs to take the recursive nature of science-policy interactions into account, especially since the object of interest is located in the realm of international climate politics.

5.2 Focal concepts for the analysis

In the previous sub-section, the relevant literature on science-policy interactions has been summarised with special attention being paid to the realm of international climate politics and to the shortcomings of the simple models. On this basis and with the characteristics of the IPCC in mind, two central criteria can be identified that the analytical framework for the present thesis ought to fulfil: firstly and most importantly, it needs to be able to capture the recursive and multilayer character of the relationship between science and politics. Secondly, it should be adaptable to the unique traits of the IPCC. Moreover, of course, it has to be able to generate reliable results with regard to the research question that is central to this paper.

The following sub-sections present four approaches from the relevant literature which are considered useful for the purposes of this thesis. Owed to this usefulness, they will provide the basis for the analytical model applied in this paper.

5.2.1 The effectiveness of the IPCC assessment process

A first approach to be presented here is the one developed by Tora Skodvin for her analysis of "Structure and Agent in the Scientific Diplomacy of Climate Change" (1999b), in which the IPCC is investigated in a case study. The analysis focuses on the effectiveness of the IPCC process in its early years from the IPCC's establishment in 1988 until 1995 and pursues three main objectives. Firstly, it aims at exploring the nature of processes of science-policy interaction. Secondly, it seeks to describe the organization of the early IPCC process and thirdly, it wants to provide hints to how the outcome of this process can be explained. Moreover, Skodvin aims at identifying effectiveness-enhancing factors (Skodvin 1999b: 12, 123).

Initially, two preconditions for successful science-policy interactions are identified: firstly, scientific knowledge is not automatically applicable as a basis for political decisions. It thus needs to be 'transformed'. In line with a number of scholars, Skodvin thereby explicitly rejects one of the shortcomings of the simple models that have been discussed above. Secondly, Skodvin points out that both scientific and political legitimacy are important for the process to be successful (ibid.: 5; 1999a: 4).

As was already mentioned in the context of the two paradoxes developed by Peter Weingart, the mutual influence of science and politics on each other does not necessarily imply that the differences between the two disappear (Weingart 1999b: 154-7; 2001:

168). Rather, in the words of Skodvin, science and politics are two different “systems of behaviour” (Skodvin 1999b: 57) that profit from their interaction.

However, Skodvin also points out that scientific credibility can suffer from science’s close ties with politics. Especially in cases of intense political conflict, scientific knowledge may be exploited as an instrument for legitimizing the own and delegitimizing the respective opponents’ policy-arguments. Also interest groups might seek to develop a ‘counter-expertise’ against the one presented by policymakers (Weingart 2006: 81; von Schomberg 1993a: 9). In sum, science finds itself caught between the necessities of independence of and involvement in policy-making. As a result, “Science-policy interaction may […] be subject to a vicious dynamics of scientific legitimisation and de-legitimisation of policy-arguments” (Skodvin 1999b: 88). Possibilities to design science-policy interactions effectively by finding a way to reconcile these two poles are of central interest in Skodvin’s thesis.

Methodically, Skodvin’s analysis is a qualitative case study. The central reason for the choice of a qualitative approach is that the variables of interest could hardly be investigated quantitatively. As was described earlier, the methodical procedure applied in the present thesis is in large parts inspired by the one chosen by Skodvin. The author considers different sources of information, ranging from official documents (reports from IPCC sessions) to unofficial communications with members of the TSU of Working Group I. Moreover, the author participated in a number of plenary meetings by both the IPCC at large and WG I in particular. This rich basis of material was further supplemented by personal interviews with key actors in the IPCC process and by an extensive review of secondary literature about the IPCC (ibid.: 12, 17-8).

5.2.1.1 Dependent variable – a three-level concept of effectiveness

The effectiveness of the science-policy dialogue in the IPCC assessment process is the dependent variable in Skodvin’s analysis. Intuitively, one would assume the effectiveness of a science-policy dialogue to be a function of the extent to which the decisions of policymakers follow scientific advice. This would equal a conceptualisation of ‘acted-upon effectiveness’. A process would then be evaluated as effective if and only if policy-decisions were actually based on recommendations by scientists (ibid.: 26). Such a simplified concept of effectiveness, however, would cause a number of problems. Central are the following three.

Firstly, scientific advice regarding complex problems is often heterogeneous due to dissent and controversy.[23] The resulting variety of recommendations can never be considered in its entity in political decision-making. Policymakers will thus, secondly, tend to select from this variety the pieces of advice that serve their own objectives. The reference to scientific arguments in policy-decisions can then become an instrument for legitimising policymakers’ positions which would obviously not imply a high degree of effectiveness. Thirdly, policymakers’ actions are not exclusively based on scientific advice but a number of other factors such as strategic considerations influence their decisions. Only looking at the actual decisions made by policymakers does therefore not

[23] By taking the existence of scientific dissent and controversy into account, Skodvin’s argumentation complies with the advanced models of science-policy interactions.

reflect the effectiveness of the science-policy dialogue sufficiently (ibid.; cf. also Skodvin and Alfsen 2010: 10-1; Kettner 1993: 173).

Consequently, the 'acted-upon' idea of effectiveness needs to be supplemented in order to facilitate a comprehensive analysis of the effectiveness of science-policy interactions. Following this insight, Skodvin operationalises the dependent variable via a three-level concept of effectiveness (for this and for the following cf. Skodvin 1999b: 10-1, 24-5, 39, 123).

The first level is the existence of a knowledge base that represents current ('state-of-the-art') scientific knowledge in the fields of interest. Scientists as well as political decision-makers need to accept the representativeness of this knowledge base if this first level is to be attained.

On the second level, the knowledge base is linked to valued policy-goals in a way that both scientists and policymakers agree to. In combination with the existence of a representative knowledge base, this constitutes a 'consensual problem diagnosis'. Here, policymakers accept the factual validity of the scientific findings. The concept of 'consensual problem diagnosis' comes close to what other authors describe as 'consensual knowledge' but avoids some of the latter's weak points: a consensual problem diagnosis does not demand scientific consensus, since it is the consensus on the representation of scientific knowledge that matters, not consensus on the knowledge in the first place. Moreover, the consensual problem diagnosis interprets consensus as the result of a process and thus accounts for developments over time. Moreover, according to Skodvin, 'consensual knowledge' can hardly be distinguished clearly from related concepts and remains ambiguous in its definition (ibid.: 35-8).[24]

Finally, there is a third level of effectiveness. If this level is reached, policymakers derive premises for their political decisions from the knowledge base, that is, they accept the policy 'implications' that arise from the knowledge base. In other words, level three-effectiveness means that scientific knowledge "not only *informs* the deliberations of policy-makers, it also serves as a *guide* and a *premise* for the decisions made" (ibid.: 24-5, italics in the original).

The three levels of effectiveness are not conceptualised as a cumulative scale: the attainment of the first level is a precondition to reach the second and third levels but policymakers can act in accordance with scientific advice without a consensual problem diagnosis. This would equal a situation where the third level of effectiveness is reached without the characteristics of the second level being fulfilled (ibid.: 34).

The gradual character of the three-level concept allows for different degrees of effectiveness to be identified and avoids the pitfalls associated with a simple 'acted-upon' concept of effectiveness. Moreover, Skodvin's approach overcomes criticism that has been brought forward against the use of effectiveness as a measure of quality in science-policy interactions: de Bruijn and ten Heuvelhof, for example, have argued that effectiveness (and efficiency) fall short of acknowledging the variety of the different actors' interests and objectives in the context of complex problems and that a concentration on effectiveness (and efficiency) does not take the dynamic development of

[24] Skodvin identifies this 'conceptual ambiguity' of the concept of consensual knowledge as another shortcoming of the epistemic communities approach (Skodvin 1999b: 37).

these interests and objectives over time into due account (de Bruijn and ten Heuvelhof 1999: 180). By recognising a first level of effectiveness below the existence of a consensual problem diagnosis, Skodvin admits that such a diagnosis cannot be taken for granted. Thus, the variety and potential contrariness of the different actors' interests and objectives are recognised. Additionally, the concept of a consensual problem diagnosis models consensus dynamically, implying that it is not necessarily stable over time (Skodvin 1999b: 38).

5.2.1.2 Independent and control variables

On the basis of the three-level concept of effectiveness, Skodvin explores how this effectiveness can be enhanced in the context of science-policy interactions. Here, the institutional structure of the process at hand is identified as particular relevant (ibid.: 42, 124; for a similar argument cf. Agrawala 1999: 158).

The concept of institutions lacks a consensual definition across authors and disciplines. Skodvin's understanding of institutions shows a number of parallels to the understanding developed in the theoretical strand of 'new institutionalism' and 'new institutional economics'. Here, institutions are generally described as sets of rules that provide incentives and constraints and thereby orient behaviour in social interactions. They can be differentiated, inter alia, according to the degree of their formalisation, to their functional scope, or to their geographical reference. All kinds of institutions are considered as social constructs that can be shaped by humans to varying degrees. Consequently, the institutional setting of a process of science-policy interaction is admitted a potential to enhance its effectiveness. According to Skodvin, a number of analyses of how institutions influence the effectiveness of science and politics alone had already been conducted before her analysis. However, institutions' influence on their interrelation had been a field hardly covered by scientific investigation before that (Skodvin 1999a: 5; 1999b: 42, 88, 90-2; Göbel 2002: 3; Richter and Furubotn 2003: 7).

Skodvin's analysis thus models the institutional framework as the first independent variable and originates four main functions that it should fulfil in order to increase the effectiveness of a science-policy dialogue (summarised in Skodvin 1999b: 120, 124): firstly, such a framework should maintain the scientific autonomy and integrity of the scientific bodies involved. Secondly, it should provide a 'sufficient' level of involvement between science and politics. Thirdly, it should make sure that the scientific bodies fulfil the criterion of geographical represenativeness – an argument that is in line with the relevant literature (cf., for example, Engels and Ruschenberg 2008: 347). Fourthly, the institutional framework should be able to handle controversies and profound disagreement between actors, especially between scientists and policymakers, by providing appropriate formal and informal mechanisms for conflict resolution.

Leadership performance marks the second independent variable in Skodvin's analysis and focuses on the behaviour of individual actors.[25] Again, a differentiated concept is developed. It consists of three categories which are acknowledged as the most important types of leadership behaviour in science-policy dialogues. The first one is leadership

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[25] For the evaluation of leadership performance as a key factor of influence on the quality of the results of the IPCC process cf. also Beck (2009: 15-7), IAC (2010: iii).

that aims at developing the knowledge base that has been described as the first level of effectiveness. The second type taken into account is leadership that aims at making the knowledge base the foundation of policymakers' decisions. Thus, the transformation of scientific knowledge is central to this second type. Finally, 'boundary role leadership' is investigated. It refers to the communication between science and politics and to the continuing development and adaptation of the institutional framework. The ability to solve conflicts is supposed to be part of all these kinds of leadership, mainly in the first two categories (Skodvin 1999b: 121, 125).

The institutional framework and individual leadership behaviour are supposed to be interdependent in two ways. Firstly, different institutional structures contain different incentives and options for individual leadership performance. Secondly, leadership performance itself can influence the institutional framework via the four central functions of this framework that have been summarised above: "How institutional arrangements work depends to some extent upon how agents operating within the system *make* them work" (ibid.: 258, italics in the original; cf. also ibid.: 125).

Despite the assumed importance of the institutional framework and the leadership performance by relevant actors, these, of course, cannot be expected to be the only factors that have an impact on the effectiveness of a science-policy dialogue. Therefore, Skodvin includes two control variables into her analysis. These shall allow for an evaluation of the importance of the independent variables relative to other factors of influence (ibid.: 117, 125, 305).

The first of these is the political malignancy of the problem at hand. Skodvin refers to the concept of political malignancy developed by Underdal (2002).[26] This concept focuses on the configuration of interests and preferences of the actors involved. The more similar these interests and preferences are, the lower is the degree of the problem's malignancy. The more they differ and the more contradictory they are between actors, the higher is the degree of political malignancy (ibid.: 118).

As the main indicator for this malignancy, the problem's incongruity is taken into account. This incongruity increases with the extent to which the actors' evaluations of alternative courses of action are biased in favour of either their costs or their benefits. Moreover, it augments in case the actors' interests are correlated negatively. Finally, incongruity is assumed to be intensified by so-called cumulative cleavages. Here, the result on one dimension of the problem at hand affects the results on other dimensions so that an actor who profits on one dimension will also profit on the others and vice versa (ibid.: 118-9).

The second control variable focuses on the state of knowledge. Skodvin argues that the degree of uncertainty in a particular knowledge base is an inverse indicator for its degree of conclusiveness: the more uncertainty a knowledge base contains, the higher the probability of scientific dissent and controversy becomes and the less conclusive the knowledge base will be (ibid.: 120).

[26] Underdal's contribution was in the process of submission when Skodvin conducted her analysis. This is why the reference in the present paper is dated 2002, that is, after Skodvin's thesis was published.

5.2.1.3 In short

Three characteristics of Skodvin's approach constitute its particular adequacy to serve as a conceptual landmark for the present thesis. Firstly, it was developed for an analysis of the IPCC process and the research questions come very close to what has been identified as object of interest in this paper. Secondly, Skodvin's approach avoids the pitfalls of the simplistic perspectives on the relation between science and policy-making. Thirdly, the degree of its theoretical comprehension is appropriate for the purposes of a master's thesis: the three-level concept of effectiveness is embedded into a broader theoretical framework, primarily spanned by philosophy and sociology of science as well as negotiation theory (ibid.: 15). Moreover, the independent and control variables provide a number of linking points at which supplementary factors of influence can be added. Still, the approach is lean enough to be manageable within the timely and capacity-related limits of a master's thesis.

5.2.2 Demonopolisation of scientific advising

The previous chapters have repeatedly referred to the question how scientific dissent influences the role of science in the formulation of policy-decisions. Martin de Jong (1999) investigates this topic under the label of 'the demonopolisation of scientific advising'. The starting point of de Jong's reasoning is the empirical insight that science can, in most cases, not provide consensual advice to politics that is free of uncertainty. As was described above, climate science is characterised by a relatively high degree of scientific uncertainty and controversy. Therefore, de Jong's considerations are highly relevant in the context of the present analysis.

The author seeks to demonstrate that the quality of policy-decisions is enhanced by an increasing variety of points of view in scientific advice. De Jong develops the thesis that variety in the approaches applied, in the scientific views taken into account, and in the sources of information considered is in fact necessary to enable science to solve complex problems. This, in turn, is a precondition for the provision of helpful advice to policymakers (de Jong 1999: 193, 195-6, 198).[27] De Jong refers to the concept of institutionalised criticism introduced by Imre Lakatos (1978) and a number of other scholars have confirmed this evaluation (cf., for example, von Schomberg 1993b: 379).

Consequently, also a variety in scientific disciplines is helpful to cover a complex policy-problem in due comprehension, an argument that de Jong develops in reference to Ackoff and Emery (1972; cf. also de Jong 1999: 196; for a similar reasoning cf. Beck 2009: 192). The call for varied scientific input also takes a dynamic perspective into account: over time, concepts, approaches, and sources of information need to be adapted to changing states of knowledge, since "The usefulness of concepts and criteria can only be proved by the actual use made of them, because apparently they fulfil a need" (de Jong 1999: 197). The consideration of a variety of approaches during the decision-making process initially increases the costs but according to de Jong, this effect is compensated

[27] In fact, even scientific controversies are evaluated as helpful. For example, they can mobilise different interest groups and thereby strengthen the democratic inclusiveness of the process of problem-solving (van Eeten 1999: 187-8).

later by an avoidance of controversy and conflict during the implementation of the decisions made (ibid.: 196).

A varied scientific input into policy-making does not imply unbiased or disinterested scientific advice. Instead, bias remains but is more varied than before and thus reflects a broader spectrum of viewpoints. Thus, de Jong's approach acknowledges the existence of scientific self-interest that has been discussed above. This self-interest has particular strong repercussions in case of a high degree of uncertainty, that is, in case of a huge number of information gaps. By filling these gaps in a way that supports the objectives of the assigning policymakers, scientists seek profits, e.g. in terms of additional research funds (ibid.: 193-4, 196).

De Jong's reasoning marks an interesting perspective on scientific uncertainty because it does not call for a higher degree of consensus in scientific advice and less (perceived) uncertainty for policymakers. Indeed, it calls for the opposite, that is, for a more diverse landscape of approaches and information. As a means to achieve this goal, de Jong proposes the design of the institutional structures: these should be shaped in a way that includes manifold perspectives and sources of information into processes of decision-preparation and decision-making. A 'demonopolisation' of scientific input into the political process, according to de Jong, increases the evolutionary pressure on the different alternative pathways to solve the problem at hand and provides for alternatives that can be applied in case the chosen one does not perform successfully. An accordant institutional framework is to be preferred over one that consolidates the monopolistic position of a single scientific opinion, institution, or community (ibid.: 197-8).

De Jong's reference to the institutional framework constitutes an obvious linking point to Skodvin's approach. Moreover, the insight that heterogeneous scientific advice can be more valuable than the one-dimensional uncontroversial delivery of scientific support for particular policy-decisions is important because it affects the design of indicators for an effective IPCC process that is aspired in the present thesis.

5.2.3 Political feasibility in international climate politics

The concept of political feasibility as applied by Skodvin, Gullberg et al. (2010) emphasizes the impact of the actor constellation in a particular policy-problem on its solvability. Thus, the concept is relevant in the context of the present thesis. In their original article, the authors investigate the revised EU Emissions Trading System (ETS) (Skodvin, Gullberg et al. 2010: 855). Therefore, the approach is not developed for the analysis of science-policy dialogues and a number of reformulations will be necessary in order to unfold its fertility in the context of this paper.

Skodvin, Gullberg et al. focus on the influence of target groups on the process of political decision-making. Target groups are interest groups that a particular policy is oriented to. Thus, these groups need to be differentiated "from the larger group of organized social interests" (ibid.). If they are able to prevent certain policies from being implemented via the mobilisation of political support, then the policies at hand are politically infeasible. This infeasibility results from the fact that "these policies […] do not satisfy all the constraints of the problem they try to solve" and becomes visible as a gap between what is 'desirable' and what is 'possible' (ibid.: 854-5).

Two central elements constitute the concept of political feasibility. The first one is resource interdependence and the second one is the distribution of agenda-setters and veto players.

The idea underlying the factor resource interdependence is that the different actors relevant in a particular policy-process control different resources necessary to solve the problem at hand. The main groups of actors are policymakers, i.e. decision-makers, and target groups. The resources commanded by policymakers include information regarding the political agenda and their power to make collectively binding decisions. Target groups, on the other hand, can deliver expert knowledge as well as public trust and support. Policymakers are in need of these resources when trying to implement their policies and to enhance the probability of being re-elected (ibid.: 856).

Two main indicators for resource interdependence are identified. The first one is the unity of target group positions. The second one is the effectiveness, that is, the credibility and severity, of threats from dissatisfied target groups. Both these indicators are supposed to have a positive effect on the degree to which policymakers include target groups' interests into their decisions (ibid.: 856-7).

The second central element of political feasibility is the distribution of agenda-setters and veto players. Veto players in a legislative process enjoy the privilege of having comprehensive influence on which decisions are made. The more such players exist in a legislative process, that is, the more demanding the rules for decision-making are, the easier it is for target groups to prevent a decision that thwarts their interests from being taken. Agenda-setters, on the other hand, are significant because they are decisive for determining which aspects of a particular policy-problem are taken into account in the process of decision-making (ibid.: 857).

In sum, the approach to political feasibility applied by Skodvin, Gullberg et al. provides a number of linking points to the present analysis. Obvious are the parallels between the relevance of agenda-setters (and veto players) in their concept and the insight that scientists often have agenda-setting power in processes of science-policy interactions as discussed above. Moreover, and most importantly, political feasibility as understood by Skodvin, Gullberg et al. (2010) is an essential element of effectiveness as conceptualised above: if political veto players (and agenda-setters) do not accept the scientific input, then none of the three levels of effectiveness can be reached. Thus, the political feasibility approach helps to put additional emphasis on the actor-related factors of influence on the effectiveness of the IPCC assessment process. It is hence sensible to consider this approach in the development of an analytical model for the present thesis despite the fact that Skodvin, Gullberg et al. focus on the EU ETS and the influence of target groups.

5.2.4 Scientific accountability in international climate politics

The integration of considerations on scientific accountability in this paper will be based on a concept presented by Sheila Jasanoff (2010). This concept's relevance to the present thesis primarily stems from its reference to the role of scientific credibility. This credibility's importance for effective science-policy interactions has been confirmed widely throughout the relevant literature, especially in the context of global assessments (cf., among others, IAC 2010: 6).[28]

According to Jasanoff, trust between scientists has always been a precondition of scientific progress and public trust a key component of scientific credibility (Jasanoff 2010: 696; for a similar argument cf. Salter 1988: 1; Weingart 2001: 300-1). However, the amount of public expenditures for scientific purposes has grown, as have science's enmeshment with politics and its (visible) impact on policy-decisions. Thus, scientific input into the political process becomes more momentous for an increasing number of political, social, and economic actors. On the other hand, science itself continuously demands a high degree of independence and self-regulation. Consequently, the actors affected by scientific influence on policy-decisions become increasingly sceptical and this potentially weakens science's credibility and acceptance throughout the different political, social, and economic communities. Thus, mere trust in science has become insufficient and science finds itself in constant need to justify both its processes and the results of its research.[29] Supplementary accountability mechanisms are needed, especially since the nature of the scientific system does not provide for formal mechanisms of accountability (Jasanoff 2010: 695).[30]

Based on these considerations, Jasanoff conceptualises accountability "as a three-body problem, with each interacting component posing special problems for climate science" (ibid.: 696).

The first body of accountability is the individual scientist or expert. According to Jasanoff, the "self-correcting practices" at work in science guarantee a relatively high degree of reliability of scientists' behaviour (ibid.). Despite a lack of comprehensive empirical confirmation, this impression is shared by other authors (Weingart 2001: 300, 309-10). However, deviances from the high claims of honesty and reliability in science occur and are monitored attentively by politics and the broad public (the latter mostly via the media). In the context of the present thesis, these considerations are relevant because some errors in AR 4 have been subject to heated public controversies. The erroneous prediction of the melting of the Himalayan glaciers is probably the most prominent example in this regard.[31] Here, the WG II report predicts that a disappearing of these gla-

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[28] However, several other factors are assumed to be of similar importance for the success of such assessments. Central among these are salience and legitimacy (NRC 2007: 47; Mitchell, Clark et al. 2006: 309, 314, 324; Torrance 2006: 31; Cash, Clark et al. 2002: 1-2; IAC 2010: 6).

[29] Similar observations date back to the 1980s and 1990s (cf., among others, Cozzens and Woodhouse 1995: 533, 553). For example, in 1982, a commission established by the Association of American Universities (AAU) concluded that more formal mechanisms were required to discourage scientific dishonesty. Such diagnoses have been made with regard to different industrialised countries (Weingart 2001: 304-5, 308).

[30] Cf. also Weingart (2001: 86, 290-1, 303, 310, 315, 317), de Jong (1999: 198), Nowotny (1993: 68), and Bimber and Guston (1995: 558).

[31] Cf., among many others, Morello (2010), Pearce (2010), Traufetter (2010), Schmitt (2010), Spiegel Online (2010). Another example from the realm of climate science that has also affected the IPCC is the disclosure of internal emails and documents from the Climate Research Unit of the University of East Anglia in 2009. These emails and documents hinted at systematic attempts of scientists to exaggerate the scale of anthropogenic climate change and its effects (Jasanoff 2010: 695). This incident received a huge amount of public attention and gave rise to a significant debate on the credibility of climate science as such (Leake 2009a; 2009b; Revkin 2009a; 2009b; Merkel 2009; Naughton 2009).

ciers is to be expected until 2035 if rates of global warming remain unchanged (Parry, Canziani et al. 2007: 493). The associated public debate has included accusations of insufficient scientific accuracy and of scientific misconduct and deceit. In fact, it has catalysed the discussion about the IPCC's processes and procedures.

The second element of accountability in Jasanoff's model is the body of scientific knowledge. Here, scientific peer-review constitutes a key component. As the process of critical assessment and inspection of scientific contributions within a particular scientific community, "peer review is ubiquitous in science" (Jasanoff 1990: 64). The primary aim of peer-review processes lies in making sure that scientific contributions come up to requirements of quality and originality before they are presented to a broader audience as "certified knowledge" (ibid.: 61) via their publication in distinguished scientific journals. Moreover, peer-review is a central method to select research proposals for public funding (ibid.). Consequently, it is widely evaluated as a central precondition for scientific progress and thus as an indispensable element of science itself. It is said to be essential both for the trust within the scientific community and for the trust between the public – including politics – and science as such, which in turn is important to legitimatise public research funding (cf. also Weingart 2001: 284-7).

Such positive evaluations of peer-review are not uncontroversial. Peer-review mechanisms are not entirely objective, value-free, fail-safe, and unbiased. Instead, actors with particular interests (individual ones as well as institutional ones) choose which research finds access to a journal or to a research grant. Consequently, peer-review has even been suspected of preventing scientific progress and external control of scientific findings by only allowing a small circle of actors to evaluate scientific contributions (Jasanoff 1990: 61-2, 64, 68-9, 79; Weingart 2001: 284).

Despite these founded objections, scientific peer-review is generally evaluated as helpful to distinguish findings that are widely accepted within a particular scientific community from findings that are not (Jasanoff 2010: 696). Because it is of utmost importance in the IPCC process, peer-review will also be referred to comprehensively in the present thesis.

The third and final body of accountability is constituted by "Committees that translate scientific findings into policy-relevant forms" (ibid.). Such committees often combine experts and thus knowledge from different disciplines. Their importance has increased in modern democracies and due to their close cooperation with politics, they have always been subject to accountability claims (ibid.). Such committees play a central role in international climate politics which founds their relevance to the present thesis. Moreover, the consideration of such committees shows that Jasanoff's approach, like the other concepts presented here, is based on an advanced image of the relation between science and politics: it does not neglect the necessity to transform scientific knowledge before its application in policy-making.

In sum, Jasanoff's concept of scientific accountability can enrich the analytical framework of this paper, since a lack of responsibility and accountability has been a prominent argument for the IPCC's lack of scientific credibility (IAC 2010: vii-viii). Especially the emphasis on scientific peer-review and committees that translate scientific knowledge for policymakers is relevant to the research question that this thesis tries to answer. The fact that Jasanoff does not provide comprehensive empirical evidence for her results does not disqualify her concept for this analysis because the concept is derived conclusively and its contribution to the analytical model applied in this paper lies in posing interesting questions rather than in providing proven answers.

6 Derivation of an analytical model

The approach to the effectiveness of a science-policy dialogue developed and applied by Tora Skodvin (1999b) has been evaluated as particularly appropriate for the analysis that is aspired in the present paper. This evaluation gives rise to the question why Skodvin's concept needs to be supplemented by other approaches at all. Skodvin points out that the institutional setting and individual actors' leadership behaviour are most probably not the only factors influencing the effectiveness of the IPCC process, even though they can be assumed to be highly relevant. Skodvin responds to this insight by including two control variables into the analysis (Skodvin 1999b: 125, 305).

In the present thesis, further explanatory variables are accommodated. These are based on the contributions introduced before as 'focal concepts'. By this means, a model is derived that shall allow for an analysis of the current structure of the IPCC that is both comprehensive enough to generate well-founded results and lean enough to be practicable within the page and time limits of this master's thesis.[32]

In sum, the model contains 15 independent and two control variables. It is likely that these variables do not only influence the effectiveness of the IPCC process but that interrelations between them exist. To factor in these interrelations would massively add complexity to the analysis. This would not only thwart the effort to maintain a lean and manageable model but would in fact exceed the analytical capacity of this paper. Hence, the variable-wise investigation that follows will not discuss possible inter-variable-relations systematically but will consider these relations only marginally. This is evaluated as acceptable because the assumed effects of the variables on the effectiveness are formulated under the ceteris paribus condition. Moreover, the whole analysis is qualitative in nature. Here, the exact degree of possible interrelations between the independent variables is not as decisive as in purely quantitative investigations where a number of statistical tests are applied in order to make sure that explanatory variables are independent of each other.[33]

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[32] Moreover, the fact that only official documents and a limited amount of secondary literature are available for this analysis is taken into consideration.

[33] In empirical data, independent variables are nearly always correlated to some extent. In quantitative analyses, however, the reliability of statistical estimators is compromised in case of a high degree of multicollinearity which is a common measure of correlation between independent variables (Backhaus, Erichson et al. 2008: 87-9).

6.1 Variables

This sub-section describes the dependent variable as well as the independent and control variables that are included in the analytical model.

6.1.1 Effectiveness

The effectiveness of the science-policy interaction in the current IPCC assessment process is the central object of interest and the formulation of well-founded conclusions regarding this effectiveness is the main objective of this thesis. Effectiveness is understood in the way that has been proposed by Skodvin (1999b) and explained earlier in this paper.[34]

The operationalisation of this dependent variable follows Skodvin's three-level concept of effectiveness. The existence of a knowledge base that represents state-of-the-art knowledge in a way that is accepted by scientists and policymakers constitutes the first level. On the second level, a consensual problem diagnosis is established, that is, the knowledge base is linked to valued policy-goals. The third level is reached if policymakers derive premises for their political decisions from the knowledge base. The adoption of this three-level concept in the present paper allows for a qualitative evaluation of the effectiveness.

However, one restriction arises: reliable conclusions regarding the third level can not be drawn. Such conclusions would require a comprehensive analysis of political reactions to IPCC publications. The present thesis can not provide such an analysis because of two central reasons: firstly, the time- and length-related restrictions of this paper prohibit a widening of the analysis beyond the IPCC assessment process itself towards its impact in the international climate protection regime. Secondly, the IPCC has adopted many of the recommendations from the IAC review at its 32nd and 33rd Plenary Sessions which took place only a few months before this thesis was completed. It will take some time until the amendments that were made to the IPCC processes and procedures in these sessions actually affect policymakers' decisions in international climate politics.

6.1.2 Institutional framework

The institutional framework constitutes one of two central factors of influence on the effectiveness in Skodvin's analysis. The author identifies four main functions that this structure ought to fulfil in an effective science-policy interaction. For the present thesis, each of these four functions is converted into an independent variable. These are the degree of scientific autonomy of the scientific bodies involved;[35] the level of involvement between science and politics; the degree of geographical representativeness of scientific bodies; and the extent to which mechanisms to handle controversies and profound disagreement between scientists and policymakers exist (Skodvin 1999b: 124). The more the four functions are fulfilled, that is, the higher the 'values' of these vari-

[34] Cf. the 'focal concepts for the analysis', pp. 22-32.

[35] In deviance from Skodvin's analysis, the present thesis will not investigate these bodies' integrity.

ables are, the more is the institutional framework capable of enhancing the effectiveness of the science-policy interaction in the IPCC assessment process.

6.1.3 Variety of scientific input

In the context of his claim to 'demonopolise' scientific advising, de Jong (1999) unfolds the thesis that the problem-solving capacity of policy-decisions increases with the variety of scientific approaches, points of view, and sources of information involved in the process of decision-making.[36] Similar arguments are brought forward by other authors (cf., for example, Beck 2009: 187). The problem-solving capacity of the science-policy interaction in the IPCC process is an element of its effectiveness so that a varied scientific input can be assumed to be positively correlated with this effectiveness.

The variety of scientific input will be incorporated into the analysis in this paper via three independent variables. These cover the variety of scientific disciplines, points of view, and sources of information that find access to the IPCC process. On the basis of the above explanations, a generally positive effect of a varied scientific input (in its different forms) on the effectiveness of the science-policy interaction is assumed.

However, one should keep in mind that the more interests are involved in a decision-making process, the harder it generally becomes to achieve consensus, especially if these interests are contradictory (cf., among others, Skodvin and Alfsen 2010: 12). Depending on the degree of controversy, this effect might to a smaller or larger extent level out the effectiveness-enhancing repercussion of a varied scientific input. Therefore, the correlation between an increase in the variety of scientific input and the effectiveness of the science-policy interaction is assumed to be only moderately positive.[37]

This consideration provides an example of likely inter-variable-relations that have been denoted earlier in this paper: scientific controversy and dissent are not only a result of varied scientific input but can also be assumed to compromise the conclusiveness of the knowledge base which is one of the control variables in this analysis.[38] A decrease in this conclusiveness is by definition assumed to decrease the overall effectiveness. Also within the group of variables that cover the variety of scientific input, inter-variable-relations are likely. For example, a high variety of scientific disciplines involved in the process implies a large number of sources of information included and of points of view considered in the process.

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[36] Skodvin and Alfsen extend this argument beyond the boundaries of science by assuming that the involvement of actors from fossil fuels industries, especially from the oil industry, would have positive effects on the IPCC process because it would add relevant knowledge to it and because it would prevent some of the most fundamental criticisms against the IPCC by involving powerful sceptics (cf. also Mitchell, Clark et al. 2006: 325). However, Skodvin and Alfsen also point to the dangers of involving such 'spoilers' in the process (Skodvin and Alfsen 2010: 12).

[37] More precisely, the above arguments suggest that the relation is inversely u-shaped with the effect of an increase in scientific input on the effectiveness turning negative once this variety becomes too large. However, this assumption can neither be proven here nor can a quantitative value be estimated for the variety of input at which the effect turns negative.

[38] See below.

6.1.4 Leadership

The leadership behaviour of key actors in the IPCC process constitutes the second independent variable in Skodvin's analysis. Skodvin differentiates between three kinds of leadership that are central in science-policy dialogues. The establishment of informal modes of conflict resolution is assumed to play an important role in all three kinds, mainly in the first and second ones (Skodvin 1999b: 121, 125). Based on these kinds of leadership, three further independent variables are added to the analytical model applied in this paper. It can reasonably be assumed that their effect on the dependent variable is principally positive because a comprehensive provision of such leadership facilitates the characteristics of an effective science-policy interaction.

The first variable refers to leadership that aims at developing a knowledge base (ibid.: 212-3). Here, it is investigated which actors are important for the acceptance of the knowledge base by scientists and policymakers.

The second variable focuses on the transformation of scientific knowledge into premises for the decisions taken by policymakers. Since the decisive Summaries for Policymakers of the IPCC Assessment Reports are negotiated in WG and Panel Plenary Sessions, special attention will be paid to these.

Finally, a third leadership-related variable is established. This one covers the so-called 'boundary role' leadership and refers to the development of institutional arrangements that allow for a separation and an integration of science and politics. Moreover, boundary role leadership can take the form of communicative links between the different decision-making levels within the organization.[39] The analysis will focus on the question how important boundary role leadership is in the current IPCC system. It will investigate in how far the IPCC's institutional structure provides mechanisms to link the decision-making levels. The more comprehensive and elaborate these mechanisms are, the less important individual boundary role leadership becomes.

As described above, the following analysis is based on official documents and some secondary literature. It is difficult to draw in-depth conclusions about individual actors' behaviour on such a basis (ibid.: 206). Thus, the analysis of leadership performance cannot be as detailed in this paper as it is in Skodvin's analysis.

6.1.5 Political feasibility

As the central factors influencing the political feasibility, Skodvin, Gullberg et al. (2010) introduce resource interdependence and the distribution of agenda-setters and veto players in the process of decision-making. Both will be included as explanatory variables in the following analysis.

In their original article, the authors investigate the variable 'resource interdependence' via the indicators 'unity of target groups' positions' and 'effectiveness of threats by dissatisfied target groups'. Both indicators do not seem suitable for the purposes of this analysis because target groups as defined by Skodvin, Gullberg et al. (2010) are neither

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[39] As described in the chapter 'the IPCC', these levels are the 'scientific core' in the WGs, the WG Plenaries, and the full Panel Plenary (Alfsen and Skodvin 1998: 10; Skodvin 1999b: 146-7).

central in the IPCC process nor in the concept of effectiveness outlined above. The operationalisation of the variable resource interdependence will, therefore, deviate significantly from the operationalisation proposed by the authors. The modest objective is to collect information regarding the general distribution of resources between scientists and policymakers. The underlying question is whether the degree of resource interdependence is rather balanced between the two groups or rather imbalanced in favour of one of them. Of course, the mere number of resources commanded is an incomplete measure of resource independence. Thus, it will be tried also to estimate the importance of the different resources for the respective other group.

It is assumed that a balanced ratio of resources is best suited to increase the effectiveness of the IPCC assessment process. The reason for this assumption is that the concept of effectiveness applied here suggests that both scientists and policymakers need to accept the representativeness of the knowledge base and its linking to valued policy-goals (first and second levels of effectiveness). Such an acceptance is most likely if both groups are similarly influential in the decision-making process, that is, if both groups command a similar amount of resources that the other group needs. Otherwise, one group would dominate the process and mutual acceptance would become unlikely.[40]

The distribution of agenda-setters and veto players is the second independent variable that the authors derive for the concept of political feasibility. Like the first one, this variable can be carried over to the science-policy interaction in the IPCC assessment process. In both groups, there could be certain agenda-setters and veto players. Of central interest is their ratio between the two groups. It is straight-forward to assume that – ceteris paribus – a group that holds all agenda-setters and veto players will dominate the process. Again, such an imbalance would imply a low degree of effectiveness in the overall process because it would complicate the mutual acceptance of the knowledge base and its linking to valued policy-goals.

Not only between scientists and policymakers is the distribution of agenda-setters and veto players interesting. It is also relevant within these two groups. The identification of agenda-setters and veto players allows for a more detailed analysis of both groups' respective influence. If, for example, both groups command a similar amount of resources that the respective other group is interested in but only in one group, agenda-setters and veto players are affected by these resources, then there will be one dominant group despite the balanced ratio of resources commanded.

These considerations point out that the two variables in the context of political feasibility not only affect the dependent variable but that they also influence each other. Thus, they constitute another example of what has been described above as 'inter-variable-relations'.

[40] The argument that a balanced ratio between science and politics is an important factor of influence on the outcome of the IPCC process is in line with Skodvin's reasoning in the context of the sub-variable 'boundary role leadership in the development of institutional arrangements' (Skodvin 1999b: 228-9).

6.1.6 Scientific accountability

According to Jasanoff, accountability mechanisms become more important for science with an increasing relevance of scientific findings for influential (political) actors because the more an actor is affected by scientific results, the more attentively will this actor observe scientific proceedings and their outcome (Jasanoff 2010: 695; Beck argues similarly in the context of the IPCC: 2009: 185; cf. also Weingart 1999a: 103). Thus, scientific credibility is in danger and the public's traditional trust in science needs to be supplemented by accountability mechanisms.

Based on Jasanoff's arguments, the existence of comprehensive accountability mechanisms can be expected to increase the acceptance of scientific findings by the general public and by policymakers. Since this acceptance is an integral element of effectiveness as conceptualised by Skodvin, the extent of scientific accountability mechanisms is likely to be positively correlated with the effectiveness of the science-policy dialogue at hand. This assumption is supported by the arguments of political feasibility that have been outlined above: the more comprehensive accountability mechanisms are, the more credible science becomes in the perception of policymakers (as well as in the perception of the public in general). Thus, the existence of comprehensive accountability mechanisms augments the legitimating potential of science. This, in turn, increases science's relative influence as it then commands a resource that is important for policymakers.[41]

Three further independent variables are included in the analytical model. These are based on the three bodies of accountability identified by Jasanoff (2010: 696). From the above arguments follows that each of these variables can be assumed to be correlated positively with the dependent variable.

The investigation of the individual scientist or expert as the first body of accountability will focus on the question in how far scientific reputation plays a role in the selection of personnel for central positions within the IPCC process. Some attention will also be paid to errors in the ARs because these intensify the need for effective accountability mechanisms by endangering the scientific credibility of the organization. Incidentally, this variable provides another example of inter-variable-relations, since it can be assumed that scientific reputation is not only a manifestation of scientific accountability but that it also facilitates leadership behaviour that aims at developing the knowledge base.

The second body of accountability is that of scientific knowledge with the extensive use of scientific peer-review as its central element. Thus, the role that (peer-) review plays in the current IPCC assessment process will be investigated. The review of the report chapters by the respective Lead Authors and Review Editors is of particular relevance in this regard.

The third body of accountability are "Committees that translate scientific findings into policy-relevant forms" (ibid.). The analysis of this body will focus on the question where

[41] It would be interesting also to include the role of political accountability into the analysis. This would require a differentiated analysis of the numerous states participating in the IPCC process because mechanisms of political accountability vary between different political systems. Such an analysis would by far be too comprehensive for this paper so that the aspect of political accountability cannot be investigated in detail.

such committees are located within the IPCC and which responsibilities they are assigned by the institutional framework.

6.1.7 Control variables

As control variables, Skodvin includes the "political malignancy of the problem" in hand and the "state of knowledge" into her analysis (Skodvin 1999b: 125). Both will also be taken into account in this paper because these potentially important factors need to be considered when trying to evaluate the relative importance of the other variables investigated. They are not designed as regular independent variables because they cannot be influenced within the IPCC to the degree that is possible with regard to all other variables considered here.

The nature of the central problems that the IPCC tries to solve has not changed significantly since the 1990s when Skodvin conducted her analysis. The characteristics of the knowledge base can be supposed to have remained relatively similar since then as well. This, of course, is not to say that no new facets have become apparent or that no new knowledge has been generated. However, the general composition of the knowledge base that Skodvin has identified as characterised by a relatively high degree of scientific uncertainty and, consequently, controversy, can reasonably be assumed not to have changed remarkably in the last two decades. Therefore, and in order not to exceed the analytic capacity of the present thesis, the investigation of the documents concerning these two control variables will be less detailed than with regard to the independent ones.

Skodvin operationalises her first control variable, the political malignancy of the problem, via the degree of its incongruity (ibid.: 121). It is assumed that the political malignancy is negatively correlated with the dependent variable, at least in a ceteris paribus scenario. For the sake of simplicity, the analysis of this variable will be restricted to some remarks on the role of conflicts of interest between different actors in the IPCC process. The extent of such conflicts is assumed to be positively related to the incongruity and, consequently, to the political malignancy of the problem.

The second control variable refers to the state of knowledge, that is, to the nature of the knowledge base. This is operationalised via this base's conclusiveness. In accordance with Skodvin, the degree of scientific consensus in the IPCC process is regarded as an indicator for the conclusiveness (ibid.: 120-1). Furthermore, it is assumed that a conclusive knowledge base and consensus among scientists are much more likely to occur if the subject matter is characterised by a low degree of scientific uncertainty. Thus, conclusiveness is supposed to be negatively correlated with scientific uncertainty and positively with scientific consensus.[42] In this paper, the analysis of this second control variable will, therefore, focus on the degree of scientific uncertainty and dissent during the preparation and approval of ARs.

The isolated effect of this second control variable on the dependent variable is expected to be positive: ceteris paribus, the effectiveness of the science-policy interaction in-

[42] However, controversy, that is, a lack of consensus, also holds some advantages since it stimulates scientific progress by continuously challenging current knowledge (IAC 2010: viii).

creases with an increasing degree of conclusiveness of the knowledge base because this facilitates its acceptance by scientists and policymakers.

6.2 Model summary

In the following paragraphs, the analytical model applied in the chapters to come is summarised. A graphical overview of the model is provided at the end of this section.

The effectiveness of the science-policy interaction in the current IPCC assessment process is the dependent variable in the analysis. It is operationalised according to the three-level concept of effectiveness introduced by Skodvin (1999b). The first of these levels is the existence of a knowledge base that contains state-of-the-art scientific knowledge. The representativeness of this knowledge base is accepted by scientists and policymakers. On the second level, policymakers accept the factual validity of the scientific findings (‘consensual problem diagnosis’). The third level of effectiveness is reached if policymakers also accept the implications arising from the knowledge base and derive premises for policy-decisions from it (Skodvin 1999b: 24-5, 38, 123).

In this thesis, five groups of independent variables are investigated in order to permit an informed evaluation of which levels of effectiveness are attained in the current IPCC assessment process.

The first of these groups refers to the institutional framework of the IPCC and contains four variables. To a large extent, these are in line with the four central functions that the institutional structure ought to fulfil according to Skodvin. The variables refer to the levels of scientific autonomy, of involvement between science and politics, and of geographical representativeness of the scientific bodies as well as to the comprehensiveness of formal and informal mechanisms for conflict resolution. In accordance with the arguments brought forward by Skodvin, all these variables are assumed to be positively correlated with the overall effectiveness of the science-policy interaction in the current IPCC assessment process.

A second group of explanatory variables covers the variety of scientific input and is adopted from Martin de Jong (1999). The underlying idea is that the amount of relevant knowledge included in the final reports and the number of actors who will accept the results grow with an increase in the variety of scientific input. Concretely, the variables investigated are the variety of scientific disciplines, points of view, and sources of information. Again, a positive effect on the dependent variable is assumed. This effect, however, is expected to be only moderate because an uncurbed increase in variety might fuel controversy and conflict.

The third group of independent variables looks at individual actors’ leadership behaviour and is largely oriented towards Skodvin’s approach. Here, leadership that aims at developing the knowledge base, leadership that aims at transforming it into premises for policy-decisions, and boundary role leadership that primarily refers to the communication between science and politics are investigated. Moreover, some considerations on conflict resolution as a characteristic of all these kinds of leadership are made. Also the leadership-related variables are assumed to have a positive effect on the dependent one.

The concept of political feasibility is the basis of a fourth group of independent variables. Concretely, the configuration of resource interdependence between science and politics in the current IPCC process and the distribution of agenda-setters and veto players between them are investigated. In the context of both variables, the analysis aims at finding out whether the respective ratio between science and politics is symmetric or imbalanced. The closer this ratio comes to the state of symmetry, the more effective the science-policy interaction is assumed to be.

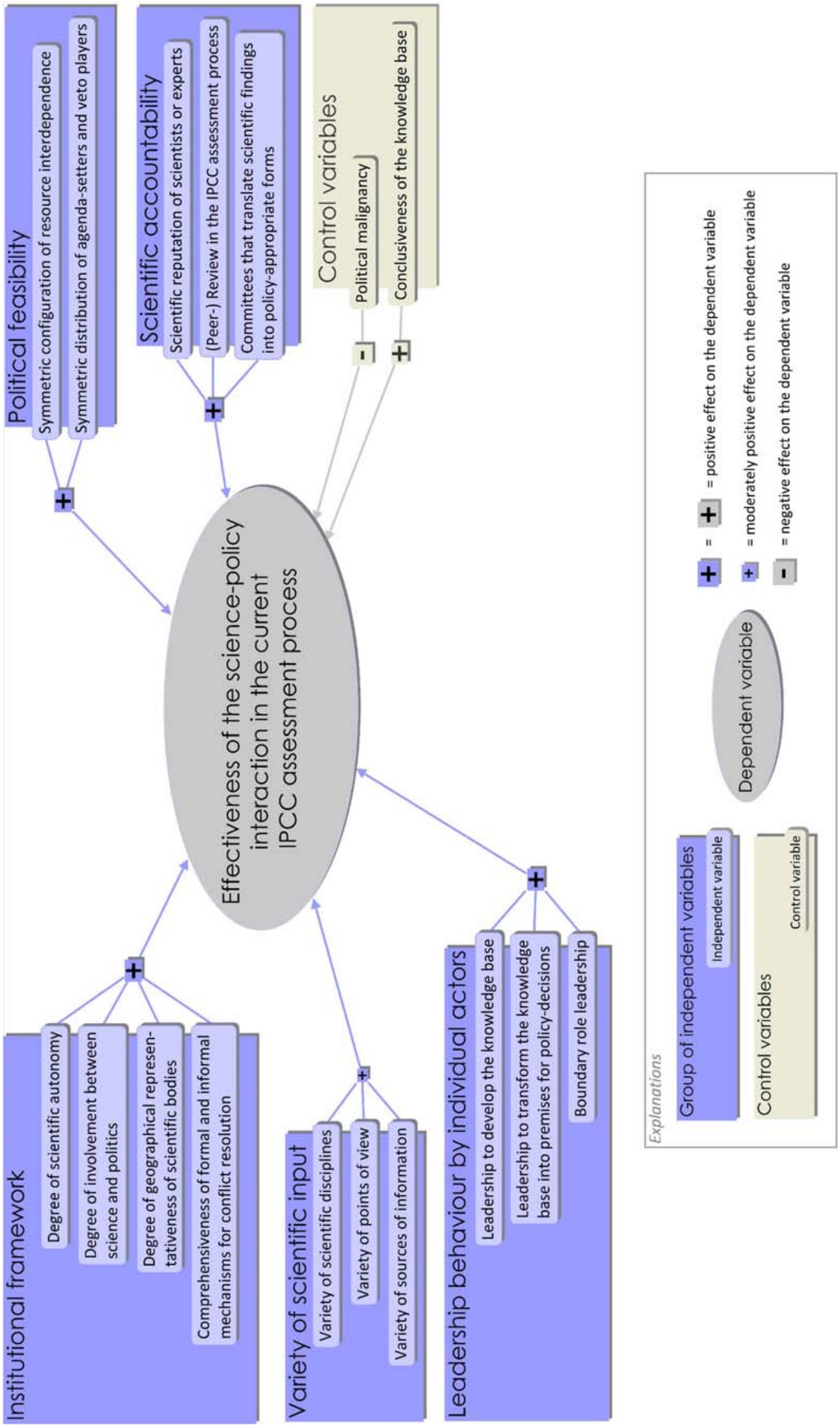
The fifth and final group of independent variables covers aspects of scientific accountability. Three bodies of accountability that have been proposed by Sheila Jasanoff (2010) underlie these variables, namely the individual scientist or expert, scientific knowledge, and committees that translate scientific findings so that they become policy-relevant. The first body is investigated via the scientific reputation of central actors in the IPCC process, the second body is investigated via the role of scientific (peer-) review in this process, and the third body is investigated via the identification of corresponding committees in the IPCC system. Again, a positive effect on the dependent variable is surmised: the more comprehensive the existing accountability mechanisms are, the more effective the science-policy interaction is expected to be.

Two control variables complete the analytical model applied in this thesis. These are in line with the ones introduced by Skodvin (1999b), namely the political malignancy of the problem and the conclusiveness of the knowledge base. The first one is assumed to be negatively correlated with the dependent variable and the second one is assumed to be positively correlated with it. Since these factors can hardly be influenced within the IPCC system, they are not considered as regular independent variables but as control variables.

The high number of factors of influence considered makes this analytical model relatively comprehensive. However, the variables are operationalised leanly in order to enable a sufficiently thorough investigation of all of them. The complexity of the analysis is further abated by the far-reaching exclusion of possible inter-variable-relations. Thus, a gradual analysis of the different variables is possible within the limits of this thesis and a proposal for a substantiated answer to the basic research question can be developed.

The following figure summarises the analytical model graphically. In a simplified manner, the assumed effects of the explanatory and control variables on the dependent variable are depicted. Based on the arguments just exposed and for the sake of graphical clarity, possible interrelations between the independent variables and between these and the control variables are excluded from the figure.

Figure 1 - Overview of the analytical model



7 Analysis

The analytical model just developed will now be applied to the science-policy interaction in the current IPCC assessment process in order to analyse its effectiveness. For the sake of clarity, the independent and control variables will be investigated successively. After this stepwise analysis, the individual results will be integrated into an evaluation of the overall effectiveness of the process and an answer to the central research question will be proposed.

The data collection for the analysis was completed on 28th August 2011. Documents published and decisions announced after this date could not be taken into account in the analysis and, therefore, have not been considered during the formulation of results and conclusions.

7.1 Stepwise analysis of the variables

The explanatory and control variables will now be investigated separately and in the same order in which they have been introduced in the previous chapter. Due to the inter-variable-relations mentioned above, a number of aspects are relevant to several variables and thus will appear repeatedly during the analysis. A summarising paragraph at the end of each sub-section recapitulates the results. The formulation of conclusions regarding the dependent variable is left to the next section.

7.1.1 Institutional framework

In the context of the institutional framework, four variables are investigated. These are the degrees of scientific autonomy of the scientific bodies involved, of involvement between science and politics, and of geographical representativeness of scientific bodies as well as the comprehensiveness of mechanisms to handle controversies and profound disagreement between scientists and policymakers.

7.1.1.1 Scientific autonomy

In this paper, scientific autonomy is primarily investigated relative to political influences. Thus, limitations of this autonomy that do not stem from political interference are not taken into account.

According to Skodvin (1999b: 99), scientific autonomy centrally requires institutional measures that allow for a separation of science and politics – despite the necessary linkages between the two. Consequently, a way to estimate the degree of scientific autonomy is to analyse who is responsible for appointing and funding the participants of the respective assessment process and which criteria underlie the recruitment of the scientists involved (ibid.: 169). The Working Groups as the central scientific bodies within the IPCC are headed by two Co-Chairs each. Nominated and elected by the Panel, the major decision-making body of the IPCC that consists of government representatives, these Co-Chairs (and the WG Vice-Chairs) have a decisive impact on the scientific elements of the

IPCC assessment process. Inter alia, they are assigned the primary responsibility for selecting the Coordinating Lead Authors (CLAs) and Lead Authors (LAs) from a list of nominees compiled by government representatives, observer organizations, and further experts. These CLAs and LAs, then, select Contributing Authors (CAs). The degree of formalisation of the author selection in the IPCC has been relatively low in the past and only modest progress has been made in this respect at the latest Plenary Session. This low degree of formalisation further increases the relative influence of the bodies responsible for author selection (IAC 2010: 7, 10, 14-5, 48; IPCC 2011d: 2).

These few remarks show that via their choice of WG Co-Chairs and Vice Chairs (as well as of the other Bureau members), government representatives exert significant influence on the scientific work being done during the assessment process (IAC 2010: xii, 45, 47). This finding implies a relatively low degree of scientific autonomy.

This autonomy is also affected by the pattern of financial support of scientists. Generally, the IPCC itself does not pay a salary for the scientists contributing to its assessments. Instead, these can be funded by a wide range of different organizations, with their respective home universities or research institutes being only two of several possibilities. As long as these institutions are scientific in nature and not (directly) financed by governmental institutions, this implies a relatively high degree of scientific autonomy towards political interference.[43] However, government funding does play a role in financing scientific effort in IPCC assessments because CAs may be supported financially by government bodies in case these are their regular employers. Moreover, governments can exert significant influence by hosting a TSU since the WG Co-Chair whose government hosts such a TSU has a "particularly strong voice" in the respective WG. Financing a TSU thus augments a government's (indirect) say during the assessment process (IAC 2010: 47; cf. also ibid.: 1).

Beneath author selection and funding, the actual conduct of Assessment Reports is relevant with regard to the degree of scientific autonomy in the current IPCC process. The general outline of the ARs is fixed early in the process. It is prepared by an invited group of scientific and non-scientific experts as well as government representatives, developed by the Bureau, and approved by the Panel. The early outline fixation limits the ability of the author groups to adapt their chapters to newly gained knowledge and thus considerably constrains scientific freedom of action (ibid.: 13-4).

Further considerations on the process of AR conduct require a differentiated inspection. In the basic report, the influence of CLAs and LAs on the contents of their respective chapters is relatively high, despite the comprehensive review mechanisms. Political influence increases once the Synthesis Report and the Summaries for Policymakers are looked at. An SPM is compiled for each WG report and for the SYR. "These four summaries are arguably the most influential part of the Assessment Report because they are the part that policymakers are most likely to read" (ibid.: 23). Government representatives negotiate the final wording of these SPMs line by line – a procedure heavily criticised by respondents to the IAC questionnaire, even though WG Co-Chairs and LAs have

[43] A detailed analysis of the actual sources of funding that are relevant to the scientists conducting IPCC reports cannot be provided in this paper.

the right to reject proposals they evaluate as not being in line with the basic reports (IAC 2010: xiii-xiv, 8-11, 23-4).

In short

The impact of government representatives from WMO and UNEP member countries on the selection of key scientific personnel as well as on the scoping and final formulation of the reports – especially with regard to the influential SPMs – is high (cf. also ibid.: 1). Consequently, the overall level of scientific autonomy seems to be rather low, even though the IPCC regularly emphasises the aspired policy-neutrality of its reports (IPCC 2011a: 3). However, as pointed out by Skodvin and as hinted at in the previous explanations, this level varies significantly both between the different Working Groups and between the different decision-making levels of the IPCC. The degree of autonomy tends to increase towards the lower levels, namely towards the scientific core of the WGs (cf. also Skodvin 1999b: 171-2).

7.1.1.2 Involvement between science and politics

The second variable in the context of the institutional framework investigates institutional measures that provide for an integrated arena for scientists and policymakers. Here, scientists take part in the process of political decision-making while policymakers take part in the development of the knowledge base. Moreover, formal links between scientific and decision-making bodies and the separation of scientific research and policy-advice are taken into account (ibid.: 99-100, 103, 172).

The IPCC regularly describes its work as "policy-relevant and yet policy-neutral, never policy-prescriptive" (IPCC: Organization; cf. also IAC 2010: 8). This statement implies both a high and a low degree of involvement between science and politics: 'policy-relevant' shows the IPCC's claim to provide a knowledge base that is referred to by policymakers and thus indicates a high degree of involvement. 'Policy-neutral, never policy-prescriptive', on the other hand, implies a differentiation between the two spheres and thus a low degree of involvement.[44]

The IPCC's insistence on its alleged policy-neutrality is striking given the fact that its hybrid character and its location at the interface between science and politics can be regarded as keys to its relative success in the past. By maintaining the self-description of political disinterestedness, the IPCC contributes to the persistence of a technocratic image of science-policy relations which seems to lie in the interests of both opponents and proponents of the IPCC. Based on the technocratic idea that political action requires reliable scientific knowledge, objectors of an ambitious international climate protection regime argue that the current levels of scientific knowledge and consensus are not sufficient for comprehensive action. The IPCC itself, on the other hand, stresses the existing degree of consensus (Beck 2009: 191, 199). Moreover, the maintenance of perceived neutrality augments the IPCC's legitimating potential and thus makes it more valuable for politics.

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[44] Moreover, this last argument suggests a high degree of scientific autonomy.

A number of examples indicate, however, that the degree of involvement between science and politics in the IPCC process is indeed high. Especially the notion of the IPCC's policy-neutrality has been doubted and the IPCC itself identifies governments and policymakers as the "primary target audiences of [its] communications efforts" (IPCC 2011a: 4). By focusing on these audiences, the organization consciously orients its work towards politics which indicates scientific advice rather than mere scientific research.

One of the arenas in which scientists and policymakers meet during the assessment process are the sessions for approving the SPMs of the WG reports and of the Synthesis Report. As mentioned above, government representatives negotiate the wording and WG Co-Chairs and LAs make sure that this does not distort the basic reports (IAC 2010: 8-9, 23, 64). In this context, three aspects indicate a high degree of involvement between science and politics: firstly, these sessions constitute close formal links between the Panel and the WGs. Secondly, they provide an arena for dialogues between scientists and policymakers. Thirdly, the degree of differentiation between the functions of scientific research and advice is apparently very low in these sessions.

Another arena that brings together scientists and policymakers is the process of report scoping. This ought to make sure that scientifically reliable knowledge exists regarding the issues involved in the report and simultaneously guarantee that these issues are indeed relevant to political decision-making (ibid.: 13, 43).

Also the review process for the WG reports and the SPMs allows for conclusions regarding the degree of involvement between science and politics. The first draft of each WG report is reviewed by scientific experts. The second draft is reviewed by these experts and by government representatives. These formal review loops are supplemented by one or several informal reviews that are often carried out by IPCC authors who are not involved in the conduct of the chapters they review. For each chapter, two or more Review Editors supervise the review process. With regard to involvement between science and politics, the second formal review loop is particularly interesting since here, both scientific experts and government representatives review the second draft compiled by the respective WG's Lead Authors. The more governmental comments are adopted in the final reports, the more these reports move from mere scientific research towards policy-relevant (though not necessarily policy-prescriptive) scientific advice. However, the degree of differentiation between research and advice is ultimately up to scientists because the LAs finally decide upon which comments to include (ibid.: xiii-xiv, 9, 18, 23).[45]

In short

The overall degree of involvement between science and politics appears to be rather high in the current IPCC assessment process. The analysis indicates that the extent to which policymakers are involved in the development of the knowledge base is higher than the extent to which scientists are involved in political decision-making. In sum, the IPCC's self-description as entirely policy-neutral is not confirmed by the analysis. These

[45] Nevertheless, the LAs are not entirely free in their handling of review comments because Review Editors have the responsibility to supervise their incorporation (IAC 2010: xiv).

impressions are in line with the results obtained by Skodvin more than a decade ago (1999b: 177-8).

7.1.1.3 Geographical representativeness of scientific bodies

Geographical representativeness of scientific bodies facilitates the inclusion of a wide range of perspectives and fields of expertise in the assessment process. Moreover, it increases the probability of political acceptance of the scientific findings. The group of scientists should therefore be geographically balanced so “that the geographic composition of the group of scientists/experts is representative of the geographic composition of parties to the policy-making process” (ibid.: 100; cf. also Biermann 2006: 88; Engels and Ruschenberg 2008: 347; Jasanoff 2010: 696).

Within the IPCC, especially the participation of developing countries has been discussed for a long time and the pursuit of geographical representativeness is not limited to the writing of the reports. Also in the review process, in the Bureau, and among the WG Co-Chairs, such representation is aspired (IAC 2010: 9; Agrawala 1998b: 628-9).[46]

Each Working Group is co-chaired by regularly two major scientists.[47] One of these comes from a developing country, the other one from a developed country. This indicates geographical balance, but a closer look reveals some imbalance: the Co-Chair whose country hosts the TSU tends be particularly influential in his or her WG and to date, only developed countries have borne the associated costs. The frustration expressed by many scientists from developing countries in their responses to the IAC questionnaire confirms this result.[48] Many of them suspected political considerations to be the central reason for them not having been chosen as authors (IAC 2010: 14-5, 47, 49).

Though indubitably necessary, the pursuit of comprehensive involvement of scientists from developing countries is challenged by the fact that in most disciplines relevant to the IPCC ARs, scientific expertise is first and foremost to be found in developed countries – a situation that has not changed fundamentally since the early 1990s. Consequently, the use of the best knowledge available often thwarts the pursuit of developing country involvement in the scientific elements of the IPCC assessment process (ibid.: 4, 15, 64; Skodvin 1999b: 179).

In order to solve this problem, comprehensive capacity building in developing countries appears to be indispensable because among the reasons for the underrepresentation of developing country scientists are difficulties in the use of the English language, the lack of (financial) support by their home institutions, and poor access to relevant literature. The IPCC Scholarship Programme for students from developing countries is an example of this but the mandate of the IPCC does not schedule comprehensive direct capacity building in developing countries (IPCC: IPCC Scholarship Programme; IAC 2010: 66-7; Biermann 2006: 100, 105-6; Mitchell, Clark et al. 2006: 328-9).

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[46] A fixed number of Bureau members representing the respective regions and continents has been established, with the IPCC Chair not representing a region (IAC 2010: 47).

[47] WG III is an exception with currently three Co-Chairs: one from Cuba, one from Germany, and one from Mali (IPCC WG III: Working Group III Organization).

[48] A similar impression is described by Biermann (2006: 105).

In short

According to the IAC committee, some progress has recently been made with regard to the scientific participation of developing countries in the IPCC assessment process as well as with regard to more transparent criteria for author selection, but still many problems remain and developing country participation continues to be far from being proportional (IAC 2010: 15; IPCC 2011d: 2; Biermann 2006: 99, 103-5; Mitchell, Clark et al. 2006: 328-31). This conclusion is in line with Tora Skodvin's results from 1999 (1999b: 180).

7.1.1.4 Mechanisms for conflict resolution

According to Skodvin (ibid.: 180-1), two main types of conflict need to be considered with regard to the institutional framework. Beneath conflicts between scientists about the representativeness of the knowledge base, these are conflicts between policymakers and between them and scientists about its communication. As possible instruments for solving these kinds of conflict, Skodvin identifies "the establishment of arenas for an interactive dialogue, the development of informal arenas, and decision-making procedures based on informal positions of authority" (ibid.: 181).

The review mechanisms within the assessment process have already been described as a key component of the IPCC process. Here, the Review Editors play a crucial role for conflict resolution because they are responsible for making sure that "review comments and controversial issues are handled appropriately" (IAC 2010: 9; cf. also ibid.: 7). According to the IAC committee, the REs have not always fulfilled this task satisfactorily which implies that their (informal) authority has often been insufficient (ibid.: 20-1). The IPCC has recently established a new "Guidance on the Role of Review Editors" that clarifies the role of the REs and ought to strengthen their authority (IPCC 2011d: 5-6; 2010a: Appendix 2).

Once again, the Plenary Sessions in which scientists and government representatives approve the SPMs turn out to be relevant to the analysis. Since these sessions are important arenas for dialogues between science and politics, they also hold a potential for conflict resolution: government representatives can discuss their contradictory points of view and the WG Co-Chairs and LAs have the formal authority to reject governments' proposals that they evaluate as distorting the basic reports. However, some shortcomings regarding these sessions have been identified by the IAC committee. Most importantly, these refer to governments' right to come up with proposals for changes in the wording of the SPMs during the meetings. This massively prolongs the sessions so that participants are required to be considerably persistent and countries with large delegations become disproportionately influential (IAC 2010: 9, 23, 64). The IPCC has made some slight amendments to its procedures for the approval of SPMs but, apparently in order not to restrict governments' influence, "both written comments and inputs from the floor" (IPCC 2011d: 6) are still possible and "No revision to the process is required" (ibid. 2010a: 4).[49]

[49] The mentioned amendments solely aim at 'clarifying' the existing procedures (IPCC 2011d: 6-7).

As the major decision-making body of the IPCC, also the Panel plays a decisive role in the resolution of conflicts. However, it lacks ability to act quickly on urgent issues between its annual meetings. Following a recommendation by the IAC committee, the IPCC decided to establish an Executive Committee at its 33rd session. It will be chaired by the IPCC Chair and will also comprise the Co-Chairs of the WGs and of the TFI, the IPCC Vice Chairs, and – as advisory members – the head of the Secretariat and the TSU heads. Inter alia, the Executive Committee shall "Address urgent issues related to IPCC Products and Programme of Work that require prompt attention by the IPCC between Panel sessions" (ibid. 2011c: 2; cf. also IAC 2010: 45).[50] Conclusions regarding the ability of this newly established body are not possible by the time this analysis is conducted, but the investigation implies that it will indeed improve the IPCC's capacity to react quickly to external enquiries and that it will thus also improve the organization's capacity to solve conflicts.

In short

The IPCC assessment process provides a number of mechanisms for conflict resolution and these address both kinds of conflict that are relevant in this context: conflicts between scientists can be dealt with via the extensive review mechanisms and conflicts between policymakers as well as between them and scientists can be confronted in a number of sessions that both groups participate in and that provide for interactive dialogues (cf. also Skodvin 1999b: 187). Moreover, the arguments just presented indicate that by establishing an Executive Committee, the IPCC has strengthened its formal appliances for conflict resolution. However, a number of shortcomings remain and the actual conflict-solving capacity is in large parts dependent on informal processes, leadership skills, and positions of informal authority. These factors elude a detailed evaluation in this thesis.

7.1.2 Variety of scientific input

The variables that cover the variety of scientific input are based on Martin de Jong's considerations on the 'demonopolisation of scientific advising' (1999). Three elements of the scientific input are taken into account, namely the variety of scientific disciplines, points of view, and sources of information that find access to the IPCC Assessment Reports.

Given the complexity of human induced climate change, it is not surprising that many scientific disciplines are involved in the IPCC assessment process. The different scopes of the three Working Groups add to this variety. While WG I mainly covers natural sciences, the other WGs focus on social sciences in order to analyse and predict impacts of climate change, adaptation options, and vulnerabilities (WG II) and to identify and evaluate mitigation options (WG III). This wide range of relevant disciplines holds an enormous potential for cross-WG cooperation and review. However, this potential is not developed fully because all WG contributions to an assessment are released in the same

[50] The Terms of Reference for the Executive Committee are to be found in the documentation of the results of the IPCC's 33rd Plenary Session (IPCC 2011c).

year.[51] The IPCC has recently amended its review procedures in order to encourage inter-WG cooperation (IAC 2010: 3-4, 69-70; IPCC 2011d: 6).

Collaboration between Working Groups is not the only means to increase the variety of scientific input. Also the selection of authors leading and contributing to the preparation of the ARs plays a central role. Shortcomings in this regard have been identified in the IAC review which has led the IPCC to emphasize the "need to consider the range of scientific, technical and socioeconomic views, expertise and geographical representation" during the selection of CLAs and LAs (ibid.: 4; cf. also ibid.: 2, 5; IAC 2010: 15).[52] Moreover, the IPCC has limited the terms of the IPCC Chair, the WG and TFI Co-Chairs as well as of the IPCC Vice Chairs to – in principle – no more than one term, that is, to one assessment cycle. This decision can be interpreted as another attempt to raise the variety of scientific perspectives at the top of the organization. Finally, diversity of disciplines and viewpoints is also one of the criteria for the selection of experts for the review of draft reports (IPCC 2011c: 3; IAC 2010: 9, 46, 60).

It has already been described that CLAs and LAs have a considerable degree of influence on the contents of their respective WG reports. In reaction to a recommendation by the IAC committee, the IPCC now explicitly requires CLAs, LAs, and REs "to consider the range of scientific, technical and socio-economic views, expressed in balanced assessments" (IPCC 2011d: 5). This ought to make the selection of information and viewpoints more transparent and thereby enhance the assessments' overall credibility (IAC 2010: 17-8, 63).

A further widening of the range of viewpoints and sources of information has been pursued by a number of participating countries by opening the review process for additional comments on the second report draft. In this context, also an increased use of non peer-reviewed and unpublished literature as well as a strengthening of the involvement of the private sector have been considered (ibid.: 16, 67-8).

Such means can raise the variety of perspectives involved, but they also cause problems: the involvement of private actors inhibits the risk of financial conflicts of interest and biased input. The use of non peer-reviewed and unpublished literature has similar effects, even though peer-reviewed sources alone are not sufficient for a comprehensive assessment of global climate change. The IPCC has recently changed its procedures regarding this aspect, including explicit guidelines on what kinds of literature are unacceptable for the use in ARs (IPCC 2011d: 3-4; IAC 2010: 8, 16, 34, 63).[53] Independent of the sources, an increase in the number of review comments makes it more difficult to thoughtfully consider them in the adapted reports so that more sophisticated technologies for managing a huge data volume become necessary. This aspect is particularly relevant given that the successive ARs have become more and more comprehensive over time. Moreover, the access to data bases that key statements of IPCC reports are based upon has often been insufficient in the past. The IPCC has reacted to these diffi-

[51] The simultaneous release of all WG reports also has its advantages. For example, it helps to ensure that the Synthesis Report does not contain obsolete information (IAC 2010: 69-70).

[52] This focus on varied scientific perspectives during author selection is not least a means to balance single authors' and reviewers' bias (IPCC 2011b: 3, Appendix 1).

[53] Among these are broadcast media and personal communications of scientific results (IPCC 2011d: 3-4).

culties by requesting the responsible bodies to develop procedures that allow for a more effective process of responding to reviewer comments as recommended by the IAC review (ibid.: 18-9, 64-5, 67-9; IPCC 2011d: 5-6).

In short

The variety of scientific input in the IPCC assessment process in terms of the variety of scientific disciplines, points of view, and sources of information can, in sum, be evaluated as high. Indeed, a potential for an even higher degree of variety has been identified. However, especially with regard to the sources of information, this would severely challenge the information-processing capacity of both the individual actors and the whole assessment process. Arbitrary selection of information and points of view might then become a primary problem for the overall credibility of this process.

7.1.3 Leadership

In this analysis, three variables cover the leadership performance of individual actors. These are based on the kinds of leadership introduced before: leadership that contributes to the development of the knowledge base; leadership that contributes to the transformation of this knowledge base into premises for policy-decisions; and boundary role leadership that helps to facilitate the science-policy dialogue. The ability of individual actors to solve conflicts between the interested parties is regarded as a prerequisite of successful performance in all three kinds of leadership, primarily in first and second ones (Skodvin 1999b: 121, 125, 205).

7.1.3.1 Leadership to develop the knowledge base

The first type of leadership behaviour refers to the scientific community's perception of the knowledge base as representing state-of-the-art knowledge. Due to their large influence on the contents of the IPCC ARs, the WG Lead Authors are of particular relevance in this respect. The representativeness of the knowledge base largely depends on the professional judgement by the LAs so that the scientific and political communities will only accept it if they perceive the LAs as qualified. Also the Coordinating Lead Authors and Review Editors have a responsibility to make sure that the different points of view that are brought forward in an assessment process are considered appropriately (IAC 2010: xiv, 7; Skodvin 1999b: 213).[54]

What adds to the relevance of individual leadership by CLAs, LAs, and REs is their central role in the evaluation of non peer-reviewed and unpublished literature. Even though the IPCC has strengthened its commensurate procedures recently, these actors can still decide relatively autonomously on the use of such sources of information (IAC 2010: 16; IPCC 2011d: 3-4).

This situation has been criticised repeatedly. Particularly, concerns have been raised that certain viewpoints might be neglected systematically. In line with these anxieties is the

[54] Indirectly, also the WG Co-Chairs play an important role in this regard since they "Lead the the selection of authors and reviewers and the preparation, review, and finalization of their Working Group report" (IAC 2010: 7).

suspicion that LAs might use their influence during the preparation of the SPMs to accent perspectives that are popular among them. Despite merely being an impression by some respondents to the IAC questionnaire instead of an empirically proven observation, this shows that the authority of CLAs, LAs, and REs is far from being unquestioned. Such worries can be expected to increase further with the disclosure of errors after the release of the respective reports (IAC 2010: xi, 22, 24).

In reaction to such anxieties, recent amendments of the procedures for Lead Author selection have underlined the need of LA teams to represent, inter alia, "the range of scientific, technical and socioeconomic views" (IPCC 2011d: 4). Balanced viewpoints within author teams are furthermore regarded as a means to balance confirmation bias (IAC 2010: 17-8).

In short

CLAs, LAs, and REs appear to be the most important actors with regard to individual leadership that aims at developing the knowledge base in a way that is accepted by the scientific and political communities. The reason for these actors' central role is that they command a significant autonomy to decide which sources of information and which viewpoints find access to the final IPCC reports. Worries about these authors' neutrality have been raised but they generally seem to be regarded as competent enough to reach acceptance by the interested parties. This acceptance is encouraged by recent modifications to the respective IPCC procedures.

7.1.3.2 Leadership to transform the knowledge base into premises for policy-decisions

The SPMs of the WG reports and of the Synthesis Report are classified as the most policy-relevant elements of the whole assessment (ibid.: 23). This is why the analysis of the second type of leadership primarily refers to the Plenary Sessions for SPM adoption. As denoted earlier in this paper, these sessions regularly last for several days with conflicts both between government representatives and between these and scientists being highly probable. Here, the WG Co-Chairs and the chapter LAs are assumed to play a decisive role since they are responsible for preventing political agendas from distorting the results and for keeping the process productive despite the existence of contradictory interests. Their success in this regard largely depends on their individual leadership skills. Moreover, conflicts of interest might arise: for example, LAs might hesitate to reject proposals that are brought forward by their own government, especially in case they are government employees (ibid.: 23, 64; Skodvin 1999b: 218-9).

Consequently, the joint approval of SPMs by scientists and government representatives has been a major concern formulated by the respondents to the IAC questionnaire and several suggestions for improvement have been made. One of these suggestions is to approve the SPMs section by section instead of line by line. Even more important is the idea to require governments to hand in proposals for amendments to the SPMs in advance instead of raising them during the actual approval sessions (IAC 2010: 23). The

IPCC's refusal to implement the respective IAC recommendation has already been discussed above.[55] This underlines the necessity of appropriate individual leadership skills.

In short

The competencies of WG Co-Chairs and Lead Authors in the approval of the SPMs are comprehensive. In principle, they can make sure that the knowledge base is transformed into premises for policy-decisions in a way that maintains scientific accuracy and still allows government representatives to participate in the final formulation of policy-relevant statements. The degree to which the WG Co-Chairs and Lead Authors actually make use of these competencies seems to depend largely on their individual leadership skills. Particularly, this refers to their ability to reconcile conflicting points of view and interests and to the degree to which they are able and/ or willing to act independently of the interests of their respective governments.

7.1.3.3 Boundary role leadership

Boundary role leadership refers to the development of institutional arrangements and to the provision of communicative links between the decision-making levels of the IPCC system. It is the third type of leadership considered in this analysis.

Development of institutional arrangements

Effective boundary role leadership contributes to the development of an institutional framework that allows for both a separation and an integration of science and politics. A key to reaching these seemingly contradictory goals can be seen in differentiating primary competencies between the decision-making levels of the system, that is, the 'scientific core' in the WGs, the WG Plenaries, and the full Panel Plenary (Alfsen and Skodvin 1998: 10; Skodvin 1999b: 146-7, 149, 229). Skodvin identifies a balance between "governmental control at the upper decision-making levels and scientific control at the lower decision-making levels of the system". According to Skodvin, WG and Panel chairs have been decisive in achieving this balance which is seen as a key to the IPCC's success in simultaneously allowing for separation and integration of science and politics (ibid.: 229).

On the upper decision-making levels, decisions are made regarding the general guidelines, scope, personnel, and key formulations of the IPCC assessments. Three aspects shall exemplify where at these levels governmental control becomes evident. Firstly, government representatives are involved in the scoping process of the entire assessment as well as in the scoping of the Synthesis Report and in the selection of the Bureau members including the IPCC Chair. Secondly, they exert significant influence in the Plenary Sessions that approve the politically highly relevant SPMs. Thirdly, the IPCC has reporting responsibilities to several bodies of the UN, namely UNEP, WMO, UNFCCC, and UNGA. This further supports the notion of government dominance on the upper decision-making levels of the IPCC system, even though in practice, the oversight of these bodies over the IPCC appears to be rather limited (IAC 2010: 10-1, 44).

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[55] Cf. the analysis of the 'mechanisms for conflict resolution' in the institutional framework, pp. 48-9.

On the other hand, the ability of WG Co-Chairs and Lead Authors to prevent the reports from being distorted by governmental considerations qualifies the image of seemingly overwhelming governmental influence. Moreover, the preparation and drafting of the single WG reports is a largely scientific process that takes place in the 'scientific core' of the system. The same holds for the first review loop that exclusively involves scientific experts (ibid.: 18, 23).

A more detailed analysis of the ratio of scientific vs. political control on the different decision-making levels cannot be provided here. However, the analysis suggests that Skodvin's assumption of political dominance on the upper levels that include the decisions on major scopes and personnel and a high degree of scientific influence on the lower, that is, preparatory stages of the assessment process (1999b: 228-9) is still valid with regard to the IPCC assessment process.

Provision of communicative links

Skodvin evaluates the institutional links between the different decision-making levels of the IPCC system as relatively weak. Thus, communicative links – primarily provided by individual actors – are of particular importance for a successful assessment process. Also the IAC review identifies shortcomings in this regard, e.g. when considering the cooperation of and knowledge transfer between the Working Groups (ibid.: 239; IAC 2010: 69).

Only the WG CO-Chairs and the Panel Chair take part in decision-making at all three levels. Thus, if individual actors need to provide communicative links between these levels, these actors are the ones most likely to do so (Skodvin 1999b: 239-40).

Communicative links are also necessary between the IPCC and the political actors who have an impact on its scope of action because the institutional framework of the IPCC still exhibits weak points also in this regard. As the head of the IPCC, the Chair plays a decisive role in communicating with external parties. Thus, he or she is largely responsible for representing the organization as well as for mediating between the different decision-making levels and organizational bodies. Hence, the IPCC Chair and, to a smaller degree, the other IPCC leaders such as the IPCC Vice Chairs and WG Co- and Vice Chairs are pivotal to the provision of boundary role leadership in the IPCC process. In the past, they have not always performed successfully in this regard, for example when it comes to being available for external enquiries or to clearly separating personal opinion and official IPCC statements. The IPCC has reacted to these problems by accenting and clarifying the need of its leaders to speak and act in accordance with its principles (ibid.: 228, 239-40, 246, and footnote 6, pp. 241-2; IPCC 2011a: 7; 2011c: 2; IAC 2010: 55, 58).

In the present thesis, a detailed analysis of key figures' particular traits and leadership skills cannot be provided and in fact, the degree to which individual actors' boundary role leadership is necessary at all is even more relevant with regard to the basic research question. Therefore, the following paragraphs pursue an evaluation of the institutional framework of the IPCC. That shall allow for an estimate of the need for the additional provision of communicative links by individual actors.

So far, the IPCC Secretariat has been the only operational unit that acts continuously even between the assessments. With its various cross-sectional tasks, the Secretariat seems to be one of the few candidates for the institutional provision of communicative links. It reports to the IPCC Chair on most technical and administrative matters and to

UNEP and WMO on personnel-related matters. Thus, it can reasonably be considered to be a communicative linchpin within the IPCC and between it and the mentioned UN bodies. The degree to which this potential is deployed is likely to depend on individual actors' behaviour within the Secretariat. Thus, individual (leadership) behaviour once again proves to play an important role (ibid.: 10, 44, 49-50).

The evaluation of the Secretariat's performance varies greatly between the respondents to the IAC questionnaire. Generally, however, adaptations of its architecture seem necessary in order to enable it to cope with new internal and external communicative challenges (ibid.: 50). A prominent example of this is the IPCC's handling of the public debate about the error with regard to the melting of the Himalayan glaciers in its fourth Assessment Report. The inappropriate and delayed reaction by the IPCC to public criticisms following the error's disclosure was at least in parts due to a breakdown of communicative links between the Secretariat and the responsible WG and TSU which had already been dissolved by then. At its 33rd session, the IPCC has reacted to these problems by adopting a new "Protocol for Addressing Possible Errors in IPCC Assessment Reports, Synthesis Reports, Special Reports or Methodology Reports" which shall improve the IPCC's reactions to public enquiries (IPCC 2011d: 7; cf. also IAC 2010: 54-5).

Further recommendations to improve the performance of the Secretariat have been formulated in the IAC review and the IPCC has requested its Task Group on Governance and Management to "elaborate" the procedures guiding the Secretariat's work. However, the IPCC will not establish an elected Executive Director to lead the Secretariat as proposed in the IAC report. The mandate of the Task Group on Governance and Management has recently been extended to further address these issues so that a terminal conclusion in this regard cannot be drawn yet (IPCC 2011c: 4; IAC 2010: 50-1).

Beneath the Secretariat, the newly established Executive Committee which has already been introduced above[56] can become a relevant provider of communicative links within the IPCC and beyond. Among its key responsibilities are the strengthening of the coordination between Working Groups and Task Forces, the oversight of responses to possible errors in approved IPCC publications, and the undertaking of communications and outreach activities (IPCC 2011c: 1-2). Thus, the Executive Committee could remarkably improve the institutional provision of communicative links within the IPCC and with external interested parties (IAC 2010: xiii, 45), but well-founded conclusions regarding its actual functioning cannot be drawn yet.

In short

In the late 1990s, Tora Skodvin came to the conclusion that the provision of communicative links between the decision-making levels of the IPCC and with external stakeholders was a decisive factor of influence on the overall performance of the organization. Given the insufficiency of institutional links, boundary role leadership by IPCC leaders appeared to be of utmost importance.

The present analysis indicates that since then, the institutional setting of the IPCC has been improved with regard to the provision of communicative links. This is not to say that individual (boundary role) leadership behaviour is not important anymore. Indeed,

[56] Cf. the analysis of 'mechanisms for conflict resolution' in the institutional framework, pp. 48-9.

it still plays a central role in several phases of the assessment process. However, clarified procedures for the Secretariat and, mainly, the establishment of an Executive Committee have contributed to a more powerful institutional basis for communicative links.

Moreover, the institutional framework of the IPCC provides for a balanced ratio of governmental control at the upper and scientific control at the lower decision-making levels of the system. This balance was achieved primarily via individual actors' provision of boundary role leadership and does not seem to have changed fundamentally over time (Skodvin 1999b: 229). The (current) institutional framework apparently stabilizes this pattern.

7.1.4 Political feasibility

In the concept of political feasibility developed by Skodvin, Gullberg et al. (2010), resource interdependence and the configuration of agenda-setters and veto players are identified as the central elements. In this subsection, these two elements are investigated successively. Both times, the scientific side and the policy-making side are analysed separately.

7.1.4.1 Resource interdependence

As has been described in the derivation of the analytical model, the variable resource interdependence asks which resources science and policymakers command with special attention being paid to resources that are needed by the respective other group. The more balanced the ratio of these resources is, the more effective the entire science-policy dialogue will be (ceteris paribus).

Resources commanded by science

Generally, the scientific side can be said to possess knowledge and tools to enhance mankind's understanding of the climate system. In the IPCC assessment process, scientists are primarily responsible for the provision of input to the ARs. Additionally, they take part in drafting and reviewing the reports, even though they partly do so together with government representatives. Moreover, the WG Co-Chairs – distinguished scientists in most cases – have a decisive influence on the selection of authors and reviewers and on the contents of their respective WG report. Also the TSUs are commonly headed by scientists (IAC 2010: xiii-xiv, 7, 10-1, 47-8).

For governments and other interested parties, scientists can additionally provide support for their respective points of view and for political action. Here, it is important that science and scientists are perceived as 'neutral', especially with regard to particular policy-positions. Thus, publicly perceived scientific neutrality and the resulting public trust in science and, consequently, in the IPCC can be understood as resources commanded by science that are extremely valuable for policymakers (ibid.: 43).[57]

[57] The fact that in the past, leading IPCC scientists have not always succeeded in remaining policy-neutral when making public statements has not changed this pattern substantively (IAC 2010: 55, 58).

As the scientists participating in the IPCC process do so voluntarily, their scientific home institutions support the IPCC's scientific work also financially. However, as was described earlier in this paper, the major part of the costs associated with an IPCC assessment is borne by governments so that the financial resources commanded by science can be evaluated as dispensable (ibid.: viii, xii, 1, 13, 43-4, 64, 66; IPCC: Organization).

Resources commanded by policymakers

Generally, policymakers are most influential in the realm of essential decision-making in the IPCC process. A central reason for this is that the Panel, a clearly political body comprising government representatives of nearly 200 member countries of WMO and UNEP, is the major decision-making body of the IPCC. At its annual sessions, the general structure, procedures, budget, and the personnel leading the scientific work of the IPCC – including the IPCC Chair and the other Bureau members – are determined. The Panel also plays an important role in the scoping of ARs: even though scientists and other experts take part in the initial scoping process with government representatives, it is the Panel that finally approves the detailed outline. Additionally, the SPMs, the SYR, and the underlying WG reports are finally approved or accepted, respectively, by the Panel (IAC 2010: xii, 1, 7, 9, 13, 43-7).

Moreover, governments are involved in the composition of author and reviewer teams, e.g. by nominating experts (together with observer organizations and the IPCC Bureau) who are then assigned the review of the first and second drafts of the WG reports. In the second review loop, government representatives are directly involved as reviewers. The same holds for the review of the SYR draft (ibid.: viii-ix, 9, 11).

Finally, another channel through which governments exert influence on the IPCC shall be mentioned. This has already been described in the context of geographical representation: via the housing and financing of TSUs, governments who are willing and able to bear the associated costs can increase their impact on the contents and key statements of WG reports (ibid.: 47). This exemplifies the importance of financial resources commanded by governments in the IPCC system. Via a number of ways, these resources influence the scientific agenda and even the concrete results of IPCC reports.

In short – the degree of resource interdependence and its balance

Scientists primarily provide the knowledge that the Assessment Reports base their conclusions on. Moreover, they provide credibility and legitimacy for political decisions. Governments are interested in maintaining a minimum of scientific independence so that in the public perception, the IPCC process remains a credible endeavour based on scientific 'neutrality'. Only then can science unfold its legitimising potential for policymakers.

These policymakers, on the other hand, have a mandate that allows them to decide on the general scope of the reports as well as on the structure of the whole IPCC process and on the personnel leading it. A considerable share of governments' influence arises from their financial resources. Inter alia, these decide whether a government can bear the costs of housing a TSU and thereby strengthen its influence on the contents of IPCC reports.

Thus, both scientists and policymakers command resources that the respective other group is in need of: policymakers need scientists' knowledge and credibility to make and to implement appropriate policy-decisions that are perceived as legitimate. Scientists need governments' financial support and depend on these due to their authority to select personnel, to influence report contents, and to determine the underlying procedures. This result supports Skodvin's notion that political control is rather strong at the upper decision-making levels of the IPCC system and that scientific control is rather strong at its lower ones (Skodvin 1999b: 229).

A quantitative measurement of the relative weight of these resources can, of course, not be provided in this paper. However, the analysis implies that governments are slightly more influential in the IPCC process than scientists are. It is therefore concluded that the degree of resource interdependence between scientists and policymakers in the IPCC assessment process is high and that it is (only) moderately imbalanced in favour of governments.

7.1.4.2 Agenda-setters and veto players

As has been described above, the distribution of agenda-setters and veto players is an important supplement to the analysis of resource interdependence because the latter becomes more relevant if and as far as agenda-setters and veto players on the scientific side are in need of the resources commanded by the policy-making side, or vice versa (Skodvin, Gullberg et al. 2010: 854).

Agenda-setters and veto players on the scientific side

The approval of SPMs has repeatedly been discussed in this paper. Also with regard to agenda-setters and veto players it is relevant. The WG Co-Chairs who chair the respective Plenary Sessions and the participating Lead Authors can reject suggestions for amendments to the SPMs by government representatives if they assume that these suggestions would distort the basic reports (IAC 2010: 9, 23; IPCC 2008: 7). This implies veto power of the WG Co-Chairs and LAs – that is, of the leading scientists – in this important part of the assessment process.

Also agenda-setting power can be identified on the scientific side. For instance, CLAs and LAs have considerable influence on which viewpoints are represented in IPCC reports; a selection of these viewpoints is necessary because the entire range of scientific opinions can never be reflected in a single report. Via their supervision of the use of non peer-reviewed and unpublished literature that they exert together with Lead Authors, also the Review Editors have some agenda-setting power: by deciding which sources are used, they also route which topics and perspectives are considered in the final reports. This agenda-setting power of the REs furthermore indicates indirect agenda-setting power of the WG Co-Chairs because these are responsible for the selection of REs. By choosing Review Editors with particular points of view, the WG Co-Chairs might partly determine which information find access to IPCC reports and which do not. The same holds for author selection on which the WG Co-Chairs also have a significant impact (IAC 2010: 14, 16-8, 21, 60).

Finally, the IPCC Chair again plays an important role. Being "both the face and the leader of the organization", the Chair represents the IPCC more directly than any other individual actor (ibid.: 46; cf. also ibid.: 55). Thus, by choosing which points of view to represent, which topics to emphasize, and how to behave towards policymakers and the public, the Chair can deploy significant agenda-setting power within and beyond the IPCC.

Agenda-setters and veto players on the policy-making side

Some arguments of relevance to the question of agenda-setting and veto power on the policy-making side have already been brought forward in the context of the resources it commands. The following remarks shall explain how these arguments relate to agenda-setting and veto power.

Governments' huge bearing on the scope of the reports implies agenda-setting power because here, they literally set the agenda for the entire assessment process. Indirectly, they also do so when nominating and selecting the key scientists according to who seems most likely to act in accordance with their respective strategic interests. To a smaller degree, such an indirect agenda-setting power can also be awarded to the Government Focal Points since they participate in compiling lists of national experts that serve as a basis for the nomination and later selection of scientists contributing to IPCC reports. This argument is underlined by the impression that, especially in developing countries, these nominations sometimes seem to be motivated rather politically than scientifically (ibid.: 7, 10, 14).

The role of government representatives in the approval of SPMs implies both agenda-setting and veto power: with their right to propose amendments to the formulations of key findings in the SPMs they can exert influence on these important documents and thus modify their agenda even late in the process. This influence is limited, however, by the veto power of WG Co-Chairs and LAs in these sessions. Finally, veto power by government representatives is indicated by the fact that they are the ones to approve or to accept, respectively, the SPMs, the SYR, and the actual reports (ibid.: 7, 9-10, 23-4).

In short – the distribution of agenda-setters and veto players and its balance

Agenda-setting and veto power can be identified in both spheres involved in the IPCC process. On the scientific side, these seem to be concentrated on the lower decision-making levels. An example is the considerable degree of freedom of CLAs and LAs regarding the inclusion of scientific viewpoints in the reports. Also on the upper levels, scientific experts do have a say, e.g. in developing the scope of ARs and during the approval of the SPMs. However, these levels appear to be dominated by agenda-setters and veto players from the policy-making side who determine the general framework in which the reports are conducted and who are responsible for their final acceptance. Thus, the analysis of the distribution of agenda-setters and veto players does not indicate significant overall imbalance and supports Skodvin's diagnosis of "governmental control at the upper decision-making levels and scientific control at the lower decision-making levels of the system" (1999b: 229; cf. also IAC 2010: 10).

7.1.4.3 Conclusions regarding political feasibility

The above impression of a rather balanced distribution of agenda-setters and veto players with scientific agenda-setting and veto playing tending to be concentrated on the lower decision-making levels suggests that the conclusions that have been drawn based on the analysis of resource interdependence do not need to be reformulated fundamentally. Thus, the assumption of a relatively high degree of resource interdependence that is slightly imbalanced in favour of the policymakers who dominate the upper decision-making levels is confirmed.

Political feasibility of a policy-programme requires the influential actors to accept the decisions made. In the IPCC assessment process, governments on the one hand and scientists on the other hand have been identified as the most influential actors. The results obtained above suggest that the preconditions for political feasibility are basically fulfilled in the current IPCC process: both the distribution of resources and the configuration of agenda-setters and veto players indicate that neither the policy-making side nor the scientific side is significantly dominated by the other. A slight imbalance in favour of the policy-making side and differences between the decision-making levels of the IPCC system have been identified but in principle, both sides can introduce their interests during the assessment process. This increases the probability that both will accept the results of this process.

7.1.5 Scientific accountability

The three variables that cover aspects of scientific accountability are based on the approach presented by Sheila Jasanoff (2010) and refer to the individual scientist or expert, to scientific knowledge, and to committees that translate scientific findings for policy-makers.

7.1.5.1 Individual scientist or expert

With regard to the first body of accountability, attention will be paid to the role of scientific reputation in the selection of personnel for central positions within the IPCC assessment process and to cases on scientific misconduct.

A transparent selection of key scientists such as CLAs and LAs that guarantees “the participation of respected scientists” can be regarded as decisive for a credible assessment (IAC 2010: 14). Clear procedures in this regard are indispensable. However, the IPCC’s criteria for the selection of key actors, including CLAs, LAs, CAs, and Bureau members, have been perceived as imprecise. Additionally, a lack of orientation towards scientific qualification during the selection of authors and leading posts such as the Working Group Co-Chairs has been criticised, especially by scientists from developing countries (ibid.: xvi, 14, 24, 48).

As described before, the IPCC has clarified its procedures for the selection of CLAs and LAs recently and the WG and Task Force Bureaus are obliged to report to the Panel on their selection processes. CLAs and LAs (and additional experts where necessary and appropriate) now ought to be “known through their publications and works” (IPCC

2011d: 2). Here, the criterion of geographical representativeness[58] turns out to be a potential pitfall: it might outweigh scientific reputation and expertise as criterion for author selection if scientists are not involved in report sections that cover regional topics because they do not live or work in the particular region.[59] Recently, however, the IPCC has formally recognized the need to "engage experts from countries outside of the region when they can provide an essential contribution to the assessment" (ibid.; cf. also IAC 2010: 15).

Scientific expertise and "strong credentials (including high professional standing in an area covered by IPCC assessments)" (ibid.: 46) are important also in the selection of the IPCC Chair. To date, all IPCC Chairs have fulfilled that position part time, that is, held "significant professional responsibilities outside of the IPCC" (ibid.). This hints at a high degree of scientific expertise and reputation at the top of the organization. However, the simultaneous occupation of IPCC Chairs in non IPCC positions has also been criticised (ibid.: 48, 53).[60]

Besides the role of scientific reputation during the selection of IPCC personnel, cases of scientific misconduct are relevant to the degree to which the first body of scientific accountability materializes in the IPCC process. The error in the AR 4 regarding the melting rates of the Himalayan glaciers has already been mentioned. A lack of accuracy in the compilation of the respective chapter and in its review has been identified as a central reason for this error's appearance in the final report. Also the disclosure and dissemination of internal e-mails from the Climate Research Unit of the University of East Anglia in 2009 has damaged climate science's and, consequently, the IPCC's reputation in political communities and in public perception (ibid.: 2, 22, 54-5; Jasanoff 2010: 695). In response to these problems and in accordance with what the IAC review has recommended, the IPCC has recently established new procedures for the handling of possible errors (IPCC 2011d: 7).

In short

The analysis of the first body of accountability leads to the conclusion that so far, the leading scientists in the IPCC process have regularly been highly respected representatives of their fields. However, cases of conscious scientific misconduct as well as a lack of scientific accuracy can severely endanger scientific credibility. The IPCC's authority has to be evaluated as instable as far as it is only or mainly based on the scientific reputation of individual participants. Consequently, further accountability mechanisms are necessary.

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[58] Cf. the analysis of 'geographical representativeness of scientific bodies' in the institutional framework, pp. 47-8.

[59] This is most relevant in the context of the regional chapters of the WG II report.

[60] For example, possible conflicts of interest have been discussed with regard to the current IPCC Chair's functions in profit-oriented corporations (IAC 2010: 53).

7.1.5.2 Scientific knowledge

Scientific knowledge constitutes as a second body of accountability in Jasanoff's concept (2010: 696). It primarily refers to mechanisms that enable scientific communities and external observers to distinguish between reliable knowledge widely accepted among the relevant experts and fragmentary knowledge or mere guesswork by detached scientists. Therefore, scientific peer-review is particularly relevant in this context and the following explanations will focus on the role of (peer-) review in the IPCC assessment process.

Review and peer-review are central elements of the IPCC system because the organization generally does not conduct research on its own. Instead, it basically collects and evaluates scientific knowledge generated in different scientific communities. The review process for the IPCC assessments is comprehensive and in most cases guarantees that each peer-reviewed source of information enjoys "the benefit of independent scrutiny and quality control before it is used in the assessment" (IAC 2010: 16). Beneath the WG reports, also the SYR is subject to review by scientific experts and government representatives (ibid.: xiii-xiv, 8-9, 11, 18, 27).[61]

The IPCC records all review comments and the respective authors' responses to these, thereby allowing for an analysis of the actual review process after a report has been released. Even though this proceeding cannot make sure that all review comments are duly considered by the authors, it makes the handling of review comments transparent and retraceable. This transparency is further enhanced by the public availability of the comments and responses on the IPCC website after the respective report has been completed and accepted (IPCC 2011d: 6; IAC 2010: 22).

During the process of report preparation, the review comments are received by the respective LAs and ought to be considered in the compilation of successive drafts. At least two REs per chapter are responsible for making sure that this is done in accordance with IPCC rules. As was described earlier in this paper, the REs have not always performed successfully in this regard, not least because of a lack of authority and independence and because of unclear review procedures (ibid.: xiv, 9, 20-1, 60-1).[62]

A closer look at the review mechanisms in the IPCC assessment process reveals additional shortcomings. One that is inherent to most kinds of external review is the disproportionate representation of critical voices: confirmation of report contents is hardly ever explicated by reviewers which leads to a systematic imbalance between supportive and critical review comments (Skodvin 1999b: 186).

A more IPCC-specific weakness refers to non peer-reviewed and unpublished literature. Peer-reviewed literature is supposed to be the primary source of information used in IPCC reports. However, a huge amount of relevant information is included in non peer-

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[61] For a more detailed description of the IPCC's review mechanisms cf. the analysis of the 'involvement between science and politics' in the institutional framework, pp. 45-7.

[62] Recent amendments to the relevant IPCC rules have not improved this situation substantively; cf. also the analysis of the 'mechanisms for conflict resolution' in the institutional framework, pp. 48-9.

reviewed and unpublished literature.[63] These kinds of sources gain importance as "governments are often interested in topics for which there is little peer-reviewed scientific and technical literature, such as the costs of adaptation" (IAC 2010: 14). However, the use of such sources is problematic because they are not subject to systematic external scrutiny. This endangers the scientific validity and, consequently, the credibility of the respective section or even of the whole report, especially if key statements are affected (ibid.: 16, 34).

Linked to the use of non peer-reviewed and unpublished literature is the problem of insufficient public availability of information and data bases underlying the reports. Interested parties, then, cannot retrace the reasoning that key statements are based upon. Under such conditions, an actually external review is hardly possible (ibid.: 68).[64]

The question of public availability of data and information hints at another problem: the group of formal reviewers is limited to selected scientists and government representatives, excluding a huge amount of external expertise. Given that some parts of the assessments are still not subject to sufficiently serious review, an opening of the draft reports for broader review appears promising. This has been experimented with by some participating countries for AR 4. However, more reviewers inevitably produce more review comments. For example, the drafts of AR 4 received more than 90,000 review comments. The authors and Review Editors responsible for the consideration of these comments are, thus, increasingly overburdened with handling all comments appropriately (ibid.: xiv, 3, 18-20).

In short

The review mechanisms in the IPCC process are comprehensive – and have long been so (Agrawala 1998b: 623-4). Their significance can be summarised as follows: "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" (Skodvin 1999b: 185).

The IPCC has taken steps to further elaborate its procedures for report review (cf. also IPCC 2011d: 6) and in fact, a number of shortcomings have been identified that recommend a further advancement of the IPCC's review mechanisms. On the other hand, an uncurbed quantitative extension of the review system would cause new or intensify existing problems, particularly with regard to the capacity of author teams and Review Editors.

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[63] General statements about the quantitative significance of these kinds of literature are difficult because it differs considerably between the three Working Groups: for WGs II and III, non peer-reviewed literature is more important than for WG I (IAC 2010: 3-4, 8).

[64] The public availability of review comments cannot compensate for this lack of transparency.

7.1.5.3 Committees that translate scientific findings into policy-relevant forms

Jasanoff describes these committees as a third body of accountability. Bringing together expertise from science, industry, and other relevant spheres as appropriate, they are increasingly important in modern democracies and cooperate closely with politics (Jasanoff 2010: 696).

The transformation of scientific knowledge into forms that are relevant and practical for policymakers is a central characteristic of the IPCC. In fact, it has been said to have "sustained a working dialog between the world's governments and scientists since its inception in 1988" (IAC 2010: xii; cf. also ibid.: 43, 59). This shows that the passage of scientific knowledge into the political arena – including its transformation and the difficulties coming along with it – lies at the core of the uniqueness of the IPCC. In sum, the organization therefore reveals central characteristics of the kind of committee just described. However, the IPCC should not be imagined as a single committee since this would neglect its enormous internal heterogeneity.

A look inside the IPCC discloses several committees of the kind referred to by Jasanoff. Two of these shall be mentioned here. Already the first scoping of an AR is carried out by a group that can be described as such a committee because here, invited scientists develop the general outline together with non-scientific experts and government representatives. On this basis, the Bureau develops a detailed outline for approval by the Panel (ibid.: 13).

Another example has already appeared repeatedly in this analysis, namely the sessions for approval of the Summaries for Policymakers. All SPMs are approved line by line by government representatives together with scientists. Thus, in these sessions, scientific findings are literally translated into a policy-relevant form by experts with various backgrounds. The same holds for the approval of the body of the Synthesis Report, although this one is not approved line by line but section by section (ibid.: 9-11, 23-5).

In short

The translation of scientific findings into policy-relevant forms is a key characteristic of the IPCC and contributes to its uniqueness. At several stages during the assessment process, corresponding committees can be identified. These include scientists, non-scientific experts, and government representatives. The arguments brought forward above imply that the policy-making side is more influential in these committees than the scientific side, especially when it comes to the important decisions about report scoping, Synthesis Report, and Summaries for Policymakers. What counts most, however, is the result that Jasanoff's third body of accountability is provided by the IPCC system. This adds to the accountability mechanisms that have been identified in the context of individual scientists and, particularly, of (peer-) review during the assessment process.

7.1.6 Control variables

Both control variables investigated in this analysis are adopted from Tora Skodvin. They refer to the political malignancy of the problem at hand, operationalised via its incongruity, and to the state of knowledge, operationalised via the knowledge base's conclusiveness (Skodvin 1999b: 121). Both can hardly be influenced within the IPCC system so that they are not considered as regular independent variables.

7.1.6.1 Political malignancy

In this paper, the analysis of the problem's incongruity is restricted to the role of conflicting interests between different actors in the IPCC process. The more such interests exist in the process, the higher the degree of incongruity will be.

Mitigation of climate change and the adaptation to its negative consequences have become central topics on the political agendas of countries and the international community. Thereby, however, also the number of interested parties has grown and these have become more demanding: the more policy-decisions are influenced by climate-related issues, the more actors, including the general public, have an interest in critically observing and in influencing the scientific basis on which these decisions are made (IAC 2010: viii, xii, xv-xvi, 43, 46, 57, 63; Beck 2009: 185).

Conflicting interests not only arise because of an increased number of external stakeholders. Also within the IPCC controversies are likely because the participating governments pursue manifold priorities. This diversity of political agendas is further augmented by the growing importance of developing countries. These are privileged in the international climate protection regime because they are not subject to obligations to mitigate their GHG emissions considerably. At the same time, they become more powerful in the international arena because of their economic growth. Since this growth also accelerates GHG emissions, developing countries' influence not only increases politically but also with regard to their role as causers of anthropogenic climate change (IAC 2010: 3, 23, 43).[65]

Beneath the diversity of interests between governments, interests also vary on the individual level because "many thousands of people with different expertise, cultures, interests, and expectations" are involved in the conduct of the IPCC assessments (ibid.: 2). The associated conflicts are complicated by biased behaviour of individuals so that an effective policy to identify and avoid individual conflicts of interest is needed. Until recently, the IPCC did not have such a policy for the persons involved in the assessment process. Only the professional staff members of the Secretariat who are employees of WMO or UNEP were covered by conflict of interest and disclosure policies because these do have such policies. At its 33rd session, the IPCC has adopted a new conflict of interest policy and has dedicated further resources to its continuing advancement. This policy explicitly points to the close linkage between an effective and transparent handling of

[65] As was denoted initially, the emission of a number of GHGs constitutes the central component of anthropogenic climate change so that an increase in GHG emissions severely thwarts efforts to reduce human induced climate change (Skodvin and Fuglestvedt 1997: 351, 353, 357).

conflicts of interest and public trust in the IPCC and its products (IPCC 2011b: 1-2, Appendix 1; IAC 2010: 52-3).

In short

The range of interests involved in the IPCC process is wide and conflicts between the different actors are accordingly probable – on the individual as well as on the governmental levels. In recent years, this has intensified because climate change-related issues have become more important on the political agendas of single countries and of the international community at large. Moreover, developing countries have gained influence as political and economic actors and as emitters of GHGs.

It is thus concluded that the degree of problem incongruity and, consequently, of political malignancy in the current IPCC assessment process is high – an evaluation which is in line with Tora Skodvin's results from 1999 (Skodvin 1999b: 305). This, in turn, is not surprising because the characteristics of the problems that the IPCC tries to solve have not changed fundamentally since its establishment in 1988.

7.1.6.2 Conclusiveness of the knowledge base

The analysis of the knowledge base's conclusiveness is operationalised via the degrees of scientific uncertainty and dissent. Both factors are assumed to be correlated negatively with the conclusiveness of the knowledge base.

A high degree of uncertainty is characteristic of most scientific disciplines. Given the long time scales and the relevance of human interference with natural processes and phenomena, this uncertainty is particularly high in the context of climate science. The fact that the IPCC generally does not conduct own research but evaluates the results of existing research complicates the handling of uncertainty as "IPCC authors must rely on their subjective assessments of the available literature to construct a best estimate and associated confidence levels". Uncertainty leads to controversy over the evaluation of different points of view and alleged evidence and thus gives rise to conflicts and dissent (IAC 2010: 27; cf. also ibid.: vii, 2, 43, 46).

Since its second Assessment Report, the IPCC has established general guidance documents for the characterisation and communication of uncertainty.[66] These primarily aim at ensuring that uncertainty is presented transparently and that readers of the reports can evaluate particular statements and conclusions with regard to their scientific reliability. The guidance for AR 4 provides three different scales for characterising uncertainty. These are a qualitative level-of-understanding scale, a quantitative confidence scale, and a quantitative likelihood scale. The WGs used these scales differently because "The nature of the evidence presented, the extent to which the analysis is future-oriented, and the characterization of uncertainty varies greatly across Working Groups". Indeed, differences even occur within WG reports, e.g. between the Technical Summary and the SPM as well as between different chapters of the WG II report (ibid.: 29; cf. also ibid.: 27-8, 34).

[66] The importance of communicating scientific uncertainty to policymakers is accented by a number of authors (cf., among others, Bolin 1994: 28; Oppenheimer, O'Neill et al. 2007: 1505).

The different scales and their varied use within the ARs have been subject to a considerable amount of criticism, referring to redundancies and different interpretations of the verbal descriptions in the scales, to inconsistencies due to single WGs' alterations of the scales, and to the assignment of probabilities to imprecise statements. Moreover, the IPCC guidance has not always been followed adequately in the past (ibid.: 31-3, 35, 38-40, 61). Consequently, the IPCC has recently amended its procedures in order to harmonize the treatment of uncertainty across WGs. In AR 5, only two scales will be used, namely a qualitative confidence scale and a quantitative scale expressing uncertainty probabilistically (IPCC 2011d: 7-8; 2010a: 5, Appendix 4).

In short

The level of scientific uncertainty in climate science and thus in the IPCC process is high and in many respects, consensus among scientists is severely limited. These results imply a low level of conclusiveness of the knowledge base and the inconsistent handling of uncertainty within IPCC reports illustrates this diagnosis. This is in line with what Tora Skodvin concluded in the late 1990s (Skodvin 1999b: 305) which does not surprise because the nature of the knowledge base has not changed fundamentally since then.

7.2 Summary and results of the analysis

In the following paragraphs, the results of the previous analysis are summarised. For each of the independent and control variables, it is described which level(s) of effectiveness would result if all other variables were excluded. A graphical overview of these findings is provided at the end of this sub-section. On this basis, an evaluation of the overall effectiveness of the science-policy interaction in the current IPCC assessment process will be proposed as an answer to the research question underlying this thesis.

7.2.1 Independent variables

The first group of independent variables deals with the institutional framework. The overall degree of scientific autonomy seems to be rather low, due to the high influence of government representatives at the decisive points in the process. This indicates a low level of effectiveness. However, the level of scientific autonomy tends to increase towards the lower decision-making levels of the IPCC system.[67] This is important because it implies that the development of the knowledge base enjoys a relatively high degree of scientific autonomy which is a precondition of the acceptance of this knowledge base by scientists and policymakers (first level of effectiveness).

The degree of involvement between scientists and policymakers is high, with the influence of policymakers on the knowledge base being larger than that of scientists on the policy-decisions. Generally, such an imbalance is cumbersome with respect to a high level of effectiveness. However, policymakers' influence on the linking of the knowledge

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[67] Similar results have already been obtained by Skodvin and by Alfsen and Skodvin in the 1990s (Skodvin 1999b: 229; Alfsen and Skodvin 1998: 10).

base to valued policy-goals facilitates political acceptance of this knowledge base. Thus, a consensual problem diagnosis can be achieved (second level of effectiveness).

The degree of geographical representativeness and the participation of developing country scientists have increased in recent years, but actual proportionality is still far from being achieved. This endangers the acceptance of the whole process by developing countries, which is indispensable to the development of a consensual problem diagnosis (second level of effectiveness). Moreover, the representativeness of the knowledge base (first level) is questioned if scientists from large parts of the world cannot introduce their knowledge during the process.

Mechanisms for conflict resolution are important to reach the second level of effectiveness (consensual problem diagnosis). The existence of several arenas for an 'interactive dialogue' between scientists and policymakers indicates that the IPCC system provides a basic set of such mechanisms. The recent establishment of an Executive Committee further implies that an improvement of the IPCC's structures in this regard is underway. However, the analysis has also identified some weak points, primarily in the context of the Plenary Sessions for SPM approval. The overall reliability of these results is limited because a detailed investigation of informal positions of authority could not be conducted here.

The second group of independent variables includes the variety of scientific disciplines, points of view, and sources of information. Overall, the variety of scientific input in the IPCC assessment process has been identified as high. Ceteris paribus, this generally indicates a high level of effectiveness. However, an input that includes too many conflicting perspectives and viewpoints can become a problem for effective decision-making so that the relation between a varied scientific input and the effectiveness of the process is assumed to be (only) moderately positive.[68] The IPCC has excluded certain kinds of sources of information from consideration in its reports. This is primarily motivated by the goal of maintaining transparency and scientific reliability, but it shows that no unlimited widening of the scientific input is aspired. In sum, it is therefore concluded that the current IPCC process is capable of achieving a high level of effectiveness as far as the degree of variety of scientific input is concerned. Varied input raises the representativeness of the knowledge base (first level of effectiveness) and the participation of – and thus acceptance of the results by – scientists and policymakers (second level).

Leadership behaviour by individual actors underlies the third group of factors influencing the dependent variable. The provision of such behaviour is supposed to have a positive effect on the effectiveness of the process. Leadership to develop a knowledge base that is accepted by scientists and policymakers is primarily provided by CLAs, LAs, and REs. To date, these actors have in general been successful in this regard, despite some scattered criticism regarding their objectivity. This suggests that the first level of effectiveness is reached.

Leadership that aims at transforming the knowledge base into premises for policy-decisions is primarily provided by WG Co-Chairs and Lead Authors. These have the formal authority to balance conflicting interests in a way that is acceptable for scientists

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[68] In fact, the relationship is assumed to be inversely u-shaped as has been explained above (cf. footnote 37, p. 35).

and policymakers. Ceteris paribus, this indicates that the second level of effectiveness is reached. The actors' actual performance in this regard, however, largely depends on their individual skills and traits.

Finally, boundary role leadership has been investigated. In this regard, the institutional framework of the IPCC has been improved in recent years with clarified procedures for the Secretariat and the newly established Executive Committee being particularly relevant. Thus, individuals' provision of communicative links between science and policy-making has decreased in importance due to strengthened institutional appliances and an attainment of the second and third levels of effectiveness becomes more likely.

Overall, the analysis of individual leadership behaviour implies that the IPCC has improved its structures so that today it is less dependent on individual actors' abilities than it was in the past. Moreover, the IPCC's structure allows talented individuals to provide leadership. This is important because especially the persons leading the IPCC still have a considerable influence on the success of the whole organization and the ability to solve conflicts is still one of the most important skills that these should possess. Insofar, the actual performance of the IPCC continues to depend largely on individuals' abilities.

The fourth group of explanatory variables focuses on political feasibility which is assumed to be characteristic of an effective IPCC process. For this purpose, resource interdependence between scientists and policymakers and the distribution of agenda-setters and veto players in the assessment process have been looked at.

The degree of resource interdependence in the current IPCC assessment process is evaluated as high and as slightly imbalanced in favour of the policy-making side. Agenda-setters and veto players can be found in both spheres with policymakers dominating the upper and scientists dominating the lower decision-making levels. Because the imbalance regarding resource interdependence is only moderate and because agenda-setters and veto players seem to be distributed similarly across science and policy-making (although they are distributed unequally among the different decision-making levels), the current IPCC process is evaluated as facilitating political feasibility. This indicates an effectiveness on levels two and three: in principle, both groups have sufficient influence during the process to make sure that their core requirements are satisfied (level two) and the slight dominance of policymakers increases the probability that these will accept the central statements in the IPCC reports as premises for their decisions (level three). Moreover, level one can be assumed to be reached as well, because scientists' authority during the development of the knowledge base in principle allows them to make sure that this knowledge base represents reliable state-of-the-art knowledge.

Beneath political feasibility, scientific accountability has been identified as an important element of effective science-policy interactions and three independent variables have been investigated in order to cover this element. The individual scientist or expert constitutes the first body of accountability. So far, the persons in leading IPCC positions have been highly respected in their fields. However, cases of scientific misconduct and errors in the reports that have been attributed to insufficient accuracy continuously challenge the IPCC's credibility. Hence, additional accountability mechanisms are needed. Scientific knowledge as the second body of accountability mainly refers to the degree of (peer-) review of report drafts. The review mechanisms in the IPCC system are elaborate and have recently experienced further advancement so that this second body is comprehensively provided for in the current IPCC process. Finally, "Committees that translate scientific findings into policy-relevant forms" (Jasanoff 2010: 696) constitute a third body of accountability. Such committees have been identified in the IPCC system, with policymakers tending to be more influential at crucial points than scientists.

In sum, these considerations suggest that also with regard to scientific accountability, the IPCC reaches all three levels of effectiveness: with the central role of (peer-) review in the process, the establishment of a representative knowledge base and policymakers' acceptance of its factual validity are probable (levels one and two). If policymakers capitalise on their influence in the committees that translate scientific findings into policy-relevant forms, it is likely that they will later also accept the results as premises for policy-decisions (level three).

7.2.2 Control variables

As control variables, political malignancy and the conclusiveness of the knowledge base have been analysed. Conflicts of interest between the different actors are widespread in the IPCC system and they tend to increase further. Thus, the degrees of incongruity and, consequently, of political malignancy are evaluated as high. Also the levels of scientific uncertainty and dissent in climate change-related issues are high, implying a low level of conclusiveness in the knowledge base.

The effectiveness of the science-policy interaction in the current IPCC assessment process is therefore lowered by both control variables: the high degree of political malignancy implies that governments' acceptance of the policy-implications arising from the knowledge base (third level of effectiveness) is improbable. To a lower degree, this malignancy also decreases the likelihood that policymakers accept the factual validity of the knowledge base (second level) and this knowledge base's representativeness (first level).

The low level of conclusiveness of the knowledge base suggests that the development of a knowledge base that is accepted throughout the scientific community as representing state-of-the-art knowledge (first level of effectiveness) is unlikely. This, in turn, is cumbersome with regard to policymakers' acceptance of this knowledge base's representativeness and factual validity as well as of the policy-implications derived from it (first, second, and third levels).

These results are in line with the ones obtained by Skodvin (1999b: 277-8, 293-4) and suggest two conclusions: firstly, it is improbable that the acceptance of the knowledge base by policymakers can be explained by the nature of the problem of climate change because this problem is characterised by a high degree of political malignancy. Thus, for political actors, the expected costs of accepting this knowledge base are likely to be higher than the expected benefits. Secondly, high degrees of uncertainty and dissent among scientists are typical of climate science. Such an uncertain field of knowledge is not likely to be considered as policy-relevant by policymakers.

In sum, therefore, the IPCC's success that is recognised by a number of scholars (cf., among others, Beck 2009: 13-4; IAC 2010: vii, xii, 43; Bolin 2007: 284) can hardly be explained by the nature of the problem and the characteristics of the knowledge base. This supports the conclusion that the explanatory variables investigated above are indeed relevant with regard to the dependent one.[69]

7.2.3 Dependent variable

Finally, conclusions can be drawn regarding the overall level of effectiveness of the science-policy interaction in the current IPCC assessment process. As the dependent variable, this effectiveness constitutes the central object of interest in the present paper.

The summary of the insights gained in the analysis of the independent variables has shown that these do not homogeneously indicate a particular level of overall effectiveness. This can hardly surprise given the wide range of factors of influence incorporated into the analytical model.

7.2.3.1 First level of effectiveness

The first level of effectiveness is defined as the existence of a knowledge base that represents state-of-the-art scientific knowledge in the relevant fields in a way that is accepted by scientists and policymakers. The results of the analysis of the variable 'scientific autonomy' as well as of the variables in the groups 'variety of scientific input', 'scientific accountability' (especially with regard to (peer-) review), and 'political feasibility' (especially with regard to the distribution of agenda-setters and veto players) indicate that this level is reached in the current IPCC assessment process. The variables in the group 'individual leadership behaviour' by and large support this impression, but the reliability of the results in the context of these variables is limited because individual actors' specific qualities could not be analysed in detail.

The only variable that questions the attainment of level one is the variable 'geographical representativeness'. Here, significant shortcomings are still obvious. Nevertheless, the IPCC has recently advanced in this regard and the problems that have been identified do not outweigh the results of the other variables.

> *Thus, in sum, it is concluded that the first level of effectiveness is reached in the science-policy interaction in the current IPCC assessment process.*

7.2.3.2 Second level of effectiveness

The second level of effectiveness requires the knowledge base to be linked to valued policy-goals in a way that is agreed upon by scientists and policymakers. The results of the variables 'involvement between scientists and policymakers' and 'mechanisms for conflict resolution' as well as the results in the groups 'variety of scientific input', 'political feasibility', and 'scientific accountability' indicate that this second level is attained in the IPCC process. Again, the results regarding 'leadership performance' are not definite, mainly because of the restrictedness of the available document base. However, the results tend to support the impression that level two is reached.

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[69] Of course, many other factors not covered in this analysis might be responsible for the results. This possibility, however, can never be prevented entirely since every analytical model needs to focus on a limited number of variables.

Like in the context of the first level of effectiveness, the variable ‘geographical representativeness’ draws a different picture, suggesting remarkable deficits regarding the establishment of a consensual problem diagnosis. Again, however, the fact that the IPCC has recently improved its respective procedures weakens this restraint.

> *Thus, in sum, it is concluded that the second level of effectiveness is reached in the science-policy interaction in the current IPCC assessment process.*

This result is in line with what Skodvin as well as Skodvin and Alfsen concluded earlier (Skodvin 1999b: 140-4; Skodvin and Alfsen 2010: 10).

7.2.3.3 Third level of effectiveness

The third level of effectiveness is characterised by policymakers’ acceptance of the policy-implications arising from the knowledge base. As explained above, an analysis of the actual influence of the knowledge base on policymakers’ decisions cannot be provided here. Nevertheless, some sound-standing assumptions can be formulated based on the results obtained above.

The variables in the group ‘political feasibility’ – especially the ‘distribution of agenda-setters and veto players’ – suggest that the third level of effectiveness is reached. The same holds for the variables in the group ‘scientific accountability’. The main reason for this estimate is that policymakers have significant influence on the form and contents of IPCC reports which increases the probability that they will accept these reports as premises for political decisions. Once again, the variables about ‘individual leadership’ support this impression but the reliability of their results is limited. Recent modifications of the respective IPCC procedures on the basis of the recommendations formulated by the IAC committee contribute to the high probability of level three being reached.[70]

> *Thus, in sum, it is assumed that after the adoption of many of the IAC recommendations by the IPCC, it is probable that the science-policy interaction in the current IPCC assessment process attains the third level of effectiveness.*

Skodvin (1999b: 140, 144) as well as Skodvin and Alfsen (2010: 10) conclude that this third level is not reached by the IPCC, at least not to a considerable degree.[71] Thus, the results obtained in the present paper differ from those derived in the mentioned analyses. However, both of these analyses have been conducted and published before the IAC review was conducted and, consequently, before the IPCC amended its procedures.[72] The above analysis has shown that these amendments are capable of enhancing the effectiveness of the science-policy interaction in the assessment process and the fact that these amendments have been approved by the Panel suggests that political acceptance of this interaction is likely to increase in the years to come. Consequently, also

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[70] The other independent variables do not suggest clearly whether this third level is attained or not.

[71] Bolin implicitly comes to a similar conclusion when he assumes that “It does not seem likely that even the modest goals of the Kyoto Protocol will then [in 2012, that is, at the end of the first commitment period of the Protocol] have been reached” (Bolin 2007: 215).

[72] The paper by Skodvin and Alfsen was released in January 2010 (Skodvin and Alfsen 2010: 1) and the compilation of the IAC review started in May 2010 (IAC 2010: ii-iii).

political acceptance of the policy-implications arising from the knowledge base, that is, a more comprehensive attainment of the third level of effectiveness, might be expected.

The following figure summarises the results of the analysis graphically by illustrating which variables indicate the fulfilment of which level of effectiveness. Again, possible interrelations between the independent variables and between these and the control variables are not included.

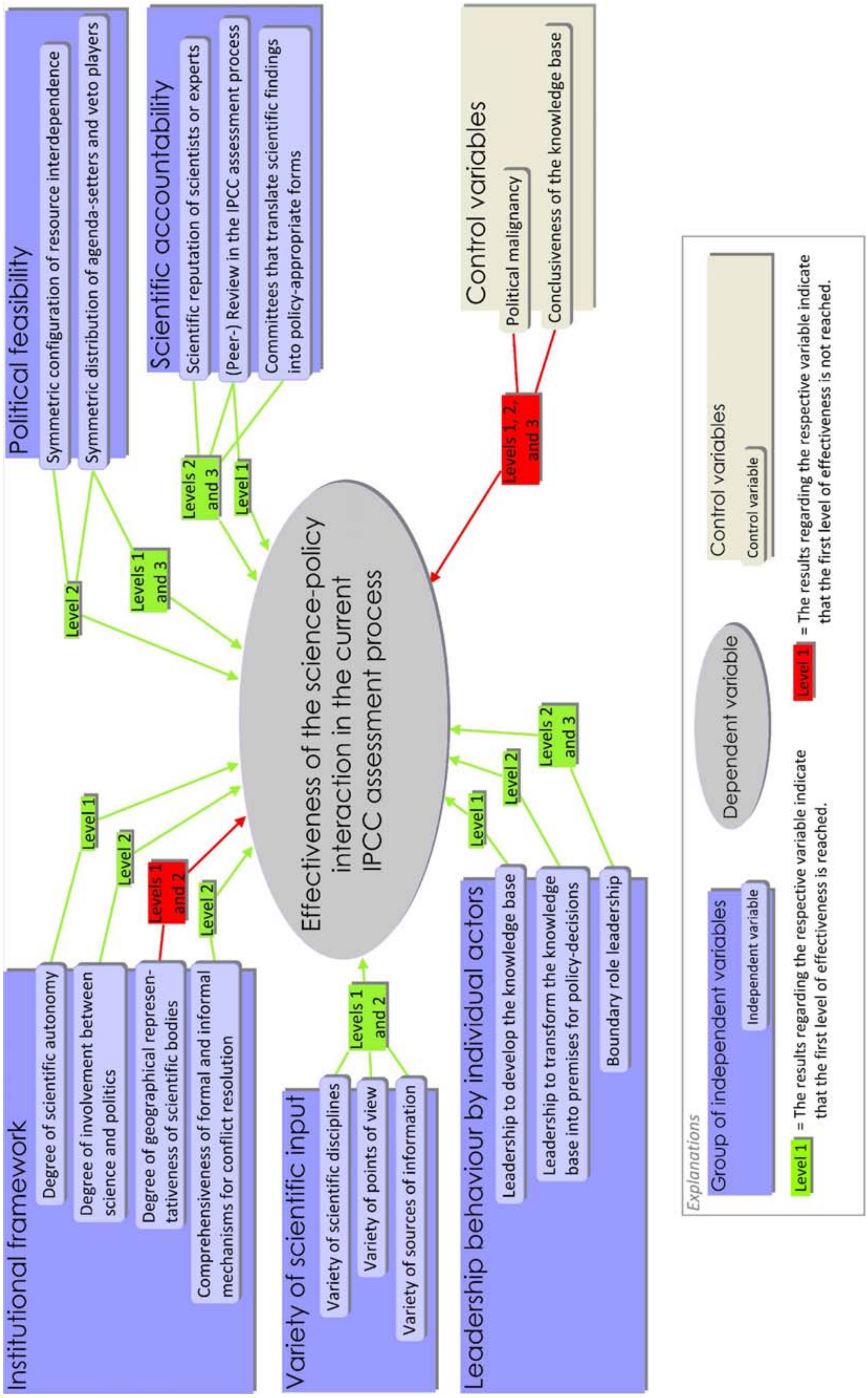

Figure 2 - Overview of the results of the analysis

7.2.4 An answer to the research question

At the beginning of this paper, the central research question has been formulated as follows:

> *How effective is the science-policy interaction in the current IPCC assessment process?*

Finally, an answer to this question can be proposed:

> *Overall, the current IPCC assessment process reaches a high level of effectiveness with regard to the science-policy interaction that is crucial to it. The first and second levels of effectiveness can reliably be assumed to be attained. Also the third level of effectiveness is likely to be reached, even though the confidence in this result is smaller than in the context of the first and second levels.*

In a rather unique manner, the IPCC combines elaborate scientific effort with political decision-making (for this impression cf. also IAC 2010: vii).[73] This is remarkable because it implies that the Intergovernmental Panel on Climate Change manages to integrate and separate scientists and policymakers simultaneously. The key to the IPCC's achievements in this regard seems to be that scientists have a relatively high degree of autonomy in the development of the knowledge base while policymakers can exert far reaching influence on the general structures and procedures governing the IPCC process and on the final formulation of key publications. This conclusion is in line with what Skodvin reasoned in her analysis of the IPCC in 1999 (Skodvin 1999b: 229, 300-1; cf. also ibid. 2000: 409) and parallels other authors' arguments when trying to explain the success of the IPCC (cf., among others, Bolin 2007: 248).

This final result of the present analysis does not mean, however, that the IPCC does not face significant challenges. In fact, the ever increasing variety of conflicting interests involved in the process and the augmenting of interrelations between climate politics and other policy-realms, such as energy and economic policies, generate ongoing hazards to the authority of the Intergovernmental Panel on Climate Change. Moreover, the growing significance of developing countries in the international political arena and as greenhouse gas emitters affects the patterns of influence within the IPCC.

Some more remarks on what lies ahead of both the IPCC and the scientific research that accompanies its development will be made in an outlook that completes this thesis. Prior to this, the next chapter provides a compact review of the proceeding applied in this paper.

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[73] Indeed, the IPCC has been discussed as a possible role model for intergovernmental and transnational assessments on other subject-matters, such as biodiversity (Biermann 2006: 105).

8 Review

Two objectives have been formulated for this thesis. Firstly, a comprehensive approach to the effectiveness of science-policy interactions in the realm of international climate politics was to be developed. The corresponding analytical model has been based on existing literature with Tora Skodvin's "Structure and Agent in the Scientific Diplomacy of Climate Change" (1999b) serving as point of origin. Several additional independent variables have been included in order to enhance the explanatory capacity of the original concept.

The generation of substantiated results with regard to the Intergovernmental Panel on Climate Change on the basis of this analytical model has been formulated as the second objective. For this purpose, the current IPCC assessment process has been analysed. The IAC review has proven to be an appropriate primary document here because it provides a lot of information on the variables of interest and because of its methodological quality and its high level of transparency. The fact that the IPCC has already implemented the vast majority of the proposals formulated by the IAC committee confirms this evaluation. By including the IPCC's documentation of its relevant Plenary Sessions into the analysis, it was tried to incorporate the modified structure and procedures of the organization to the highest possible degree.

Overall, the variables could be investigated on the basis of the documents available and a conclusion regarding the effectiveness of the process could be drawn. Insofar, the choice of a qualitative case study approach has been appropriate. It has allowed for an analysis both comprehensive enough to propose a well-founded answer to the research question and lean enough to be manageable within the limits of a master's thesis.

Also the combination of independent and control variables has proven to be sensible given their impact on the overall effectiveness. However, not all variables could be analysed in detail. Especially the investigation of factors dealing with actors' behaviour has been restricted by the available documents. Nevertheless, the relative importance of individual behaviour in comparison to the institutional setting of the IPCC assessment process could be evaluated. Further difficulties have arisen in the context of informal mechanisms for conflict resolution and particular actors' informal positions of authority. Moreover, possible interrelations between the independent variables and between these and the control variables could not be investigated in detail since this would have made the analytical model far more complicated.[74]

Despite the huge number of variables taken into account, the findings remain relatively general with regard to the third level of effectiveness. This is due to the fact that the adoption of the recommendations formulated in the IAC review by the IPCC took place shortly before this analysis was conducted so that the medium and long term effects of the amendments to the IPCC's structure and procedures can only vaguely be surmised in this paper.

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[74] As explained earlier in this paper, the marginality of these interrelations in the analysis is not as problematic in a qualitative case study as it would be in a purely quantitative analysis pursuing numerical and statistically reliable estimates (cf. p. 33).

Indeed, the analysis has been relatively superficial not only with regard to the third level of effectiveness, but at a number of points. This is the price one has to pay for the ambition to develop and apply a broad theoretical concept in a short period of time. The comprehensiveness of the analytical model, that is, the large number of explanatory variables, and the limitations faced by this project with regard to time and other resources thus seem to justify some degree of superficiality.

It is therefore concluded that on the whole, this paper has fulfilled its task and achieved the objectives that have been formulated initially. However, many questions have come up in the course of this examination that require and deserve further attention. Others have already been present in the beginning but still await a thorough investigation. Some of these questions will be drafted in the outlook that follows to complete this paper.

9 Outlook

At the very beginning of this paper, it was argued that "the IPCC process needs to affect humankind's understanding and handling of global climate change positively in order to 'deserve' the resources being devoted to it."[75] Given the central role of the interplay between science and politics in this process, the maintenance and further development of an effective science-policy interaction will thus be pivotal to the IPCC's continued relevance in international climate politics.

The present thesis points at a number of possible ways to achieve this goal. Among these are institutional mechanisms that allow for relative scientific autonomy in the development of a knowledge base despite political influence at decisive points during the assessment process; the guarantee of substantial participation of scientists (and policymakers) from developing countries; the provision of a varied scientific input that allows different perspectives and sources of information to access the Assessment Reports; a relatively balanced ratio of relevant resources commanded by scientists and policymakers, including agenda-setting and veto power; and comprehensive mechanisms for scientific accountability.

The maintenance of an effective science-policy interaction is a continuous task. In order to perform successfully in this regard, the IPCC will have to demonstrate considerable adaptive capacity and flexibility. Only then will the organization be able to cope with the challenges it has to face. As denoted above, these challenges are manifold and range from increased public scrutiny and more diverse stakeholders to changing patterns of influence between industrialised and developing countries (cf. also Mitchell, Clark et al. 2006: 331; Beck 2009: 189-90; IAC 2010: viii, 43, 65). By assigning the IAC as an independent external body that conforms to high standards of scientific accuracy with the definition of what needs to be improved and by immediately responding to its proposals, the IPCC has recently demonstrated such adaptive capacity. The Panel's adoption of most of the recommendations indicates that the participating governments accept the proceeding and results of the IAC committee's work. Thus, this model of external review seems to be a promising option for future adaptations of the IPCC system to changing political, scientific, economic, and social environments.

The review of the analysis has pointed out that even though the central question could be answered, the effectiveness of the science-policy interaction in the current IPCC assessment process could not be investigated in all its facets. Most important in this regard are the actual impacts of the recent amendments to the IPCC structure and procedures on decisions to be made by governments. On the basis provided in this paper, future analyses might therefore focus on the concrete repercussions of the science-policy interaction in the IPCC process on international climate politics. For that purpose, analytical approaches would have to focus more on actual political decisions and their preparation in the arena of international climate politics than on the process of formulating and approving IPCC reports. This would sensibly supplement the insights gained here by figuring out to which extent policy-decisions are actually influenced by the

[75] Cf. p. 2.

knowledge base developed in the IPCC assessment process. The post-Kyoto negotiations with the manifold political, economic, financial, and social controversies they cause throughout the world provide many interesting points of contact for such analyses.

Another realm that promises interesting insights but has not been subject to a detailed analysis in this paper is the further development and implementation of an elaborate communications strategy by the IPCC. The improvement of the organization's communication with the media and the public has been identified by the IAC as an important field for near-time adaptations and at its 33rd Plenary Session, the IPCC has accepted an corresponding guidance as a basis for the further development of an appropriate schedule (IPCC 2011a: 1). This aspect does not primarily refer to the science-policy interaction and was therefore not part of the analytical model applied above. However, the IPCC's overall credibility and authority partly depend on its ability to communicate clearly and appropriately with the public. Therefore, a more thorough investigation of this aspect promises relevant results with regard to the future role of the IPCC in international climate politics.

Moreover, the analysis conducted in this paper had to neglect several differentiations due to its tight schedule. Some of these differentiations would deserve more focused investigation. For example, it would be interesting to find out how and to what extent the interests and behaviour of scientists and government representatives correlate with their respective disciplines or political origins, respectively. Moreover, the IPCC process is so complex that a differentiation between its manifold publications and bodies could depict particularities that the analysis conducted here had to ignore.

Finally, also a closer look at the interrelations between the independent variables and between these and the control variables could be worthwhile since it promises deepened insights into the dynamics and patterns of influence within the model developed and applied above.

One could find a huge number of further aspects that would have deserved a (more) thorough analysis in this paper, such as the role of political accountability in the assessment process. These further aspects will not be discussed in detail here. Instead, the concluding remark is left to the insight that the science-policy interaction in the current IPCC assessment process is a multilayer object of research that can – and needs to – be analysed from many different perspectives and with many different research questions in mind. It is hoped that the present paper contributes to satisfying this need by providing a comprehensive but still manageable approach to the effectiveness of science-policy interactions and some comprehensible conclusions regarding this effectiveness in the context of the current IPCC assessment process.

10 References

Ackoff, Russel L. and Fred E. Emery (1972): On purposeful systems. Chicago, New York.

Agrawala, Shardul (1998a): Context and early origins of the Intergovernmental Panel on Climate Change. In: Climatic Change. Vol. 39 (no. 4): pp. 605-20.

Agrawala, Shardul (1998b): Structural and process history of the Intergovernmental Panel on Climate Change. In: Climatic Change. Vol. 39 (no. 4): pp. 621-42.

Agrawala, Shardul (1999): Early science-policy interactions in climate change: lessons from the Advisory Group on Greenhouse Gases. In: Global Environmental Change. Vol. 9 (no. 2): pp. 157-69.

Alfsen, Knut H. and Tora Skodvin (1998): The Intergovernmental Panel on Climate Change (IPCC) and scientific consensus. How scientists come to say what they say about climate change. Oslo, CICERO Center for International Climate and Environmental Research.

Backhaus, Klaus, Bernd Erichson, Wulff Plinke, and Rolf Weiber (2008): Multivariate Analysemethoden. Eine anwendungsorientierte Einführung. Berlin, Heidelberg.

Bechmann, Gotthard and Silke Beck (1997): Zur gesellschaftlichen Wahrnehmung des anthropogenen Klimawandels und seiner möglichen Folgen. In: Jürgen Kopfmüller and Reinhard Coenen (eds.): Risiko Klima. Der Treibhauseffekt als Herausforderung für Wissenschaft und Politik. Frankfurt (Main): pp. 119-57.

Bechmann, Gotthard and Silke Beck (2003): Gesellschaft als Kontext von Forschung. Neue Formen der Produktion und Integration von Wissen. Klimamodellierung zwischen Wissenschaft und Politik. Karlsruhe, Forschungszentrum Karlsruhe GmbH.

Beck, Silke (2009): Das Klimaexperiment und der IPCC. Schnittstellen zwischen Wissenschaft und Politik in den internationalen Beziehungen. Marburg.

Biermann, Frank (2006): Whose experts? The role of geographic representation in global environmental assessments. In: Ronald B. Mitchell, William C. Clark, David W. Cash, and Nancy M. Dickson (eds.): Global environmental assessments. Information and influence. Cambridge: pp. 87-112.

Biermann, Frank (2007): Nord-Süd-Beziehungen in der Weltumweltpolitik: Globale Interdependenz und institutionelle Innovation. In: Klaus Jacob, Frank Biermann, Per-Olof Busch, and Peter H. Feindt (eds.): Politik und Umwelt. Wiesbaden: pp. 115-32.

Bimber, Bruce and David H. Guston (1995): Politics by the same means. Government and science in the United States. In: Sheila Jasanoff, Gerald E. Markle, James C. Petersen, and Trevor Pinch (eds.): Handbook of science and technology studies. Thousand Oaks, London, New Delhi: pp. 554-71.

Boehmer-Christiansen, Sonja (1994a): Global climate protection policy: the limits of scientific advice. Part 1. In: Global Environmental Change. Vol. 4 (no. 2): pp. 140-59.

Boehmer-Christiansen, Sonja (1994b): Global climate protection policy: the limits of scientific advice. Part 2. In: Global Environmental Change. Vol. 4 (no. 3): pp. 185-200.

Bolin, Bert (1994): Science and policy making. In: Ambio. Vol. 23 (no. 1): pp. 25-9.

Bolin, Bert (2007): A history of the science and politics of climate change. The role of the Intergovernmental Panel on Climate Change. Cambridge.

BPB, Bundeszentrale für Politische Bildung: Dossier Klimawandel. Retrieved 18th August 2011, from http://www.bpb.de/themen/W4I2EB,0,0,Klimapolitik.html.

Brunner, Ronald D. (1996): Policy and global change research. A modest proposal. In: Climatic Change. Vol. 32 (no. 2): pp. 121-47.

Cash, David W., William C. Clark, Frank Alcock, Nancy M. Dickson, Noelle Eckley, and Jill Jäger (2002): Salience, credibility, legitimacy and boundaries: linking research, assessment and decision making. John F. Kennedy School of Government, Harvard University.

Clark, William C., Ronald B. Mitchell, and David W. Cash (2006): Evaluating the influence of Global Environmental Assessments. In: Ronald B. Mitchell, William C. Clark, David W. Cash, and Nancy M. Dickson (eds.): Global Environmental Assessments. Information and influence. Cambridge: pp. 1-28.

Cozzens, Susan E. and Edward J. Woodhouse (1995): Science, government, and the politics of knowledge. In: Sheila Jasanoff, Gerald E. Markle, James C. Petersen, and Trevor Pinch (eds.): Handbook of science and technology studies. Thousand Oaks, London, New Delhi: pp. 533-53.

de Bruijn, Hans J. A. and Ernst F. ten Heuvelhof (1999): Scientific expertise in complex decision-making processes. In: Science and Public Policy. Vol. 26 (no. 3): pp. 179-84.

de Jong, Martin (1999): Institutionalised criticism: the demonopolisation of scientific advising. In: Science and Public Policy. Vol. 26 (no. 3): pp. 193-9.

Engels, Anita and Tina Ruschenberg (2008): The uneven spread of global science: patterns of international collaboration in global environmental change research. In: Science and Public Policy. Vol. 35 (no. 5): pp. 347-60.

Flick, Uwe (2007): Qualitative Sozialforschung. Eine Einführung. Reinbek.

Göbel, Elisabeth (2002): Neue Institutionenökonomik. Konzeption und betriebswirtschaftliche Anwendungen. Stuttgart.

Haas, Peter M. (1992): Introduction: epistemic communities and international policy coordination. In: International Organization. Vol. 46 (no. 1): pp. 1-35.

Hellström, Tomas (1998): Risk-based planning. Institutional uncertainty in the science-policy interface. Göteborg.

Hoppe, Robert (1999): Policy analysis, science and politics: from 'speaking truth to power' to 'making sense together'. In: Science and Public Policy. Vol. 26 (no. 3): pp. 201-10.

IAC, InterAcademy Council: About the IAC. Retrieved 11th August 2011, from http://www.interacademycouncil.net/CMS/3239.aspx.

IAC, InterAcademy Council: Bylaws. Retrieved 11th August 2011, from http://www.interacademycouncil.net/CMS/3239/5602/5628.aspx.

IAC, InterAcademy Council: IAC governance. Retrieved 11th August 2011, from http://www.interacademycouncil.net/CMS/3239/5602.aspx.

IAC, InterAcademy Council: IAC in brief. Retrieved 13th August 2011, from http://www.interacademycouncil.net/CMS/3239/5933.aspx.

IAC, InterAcademy Council: IAC statutes. Retrieved 11th August 2011, from http://www.interacademycouncil.net/?id=10240.

IAC, InterAcademy Council: InterAcademy Council. Retrieved 12th August 2011, from http://www.interacademycouncil.net/.

IAC, InterAcademy Council: Statement by IAC. InterAcademy Council comments on the adoption of many of committee's recommendations by IPCC on May 13 in Abu Dhabi. Retrieved 12th August 2011, from http://reviewipcc.interacademycouncil.net/IACAbuDhabiMay2011.html.

IAC, InterAcademy Council (2010): Climate change assessments. Review of the processes and procedures of the IPCC. Amsterdam.

IPCC, Intergovernmental Panel on Climate Change: History. Retrieved 9th August 2011, from http://www.ipcc.ch/organization/organization_history.shtml.

IPCC, Intergovernmental Panel on Climate Change: Home. Retrieved 13th August 2011, from http://ipcc.ch/.

IPCC, Intergovernmental Panel on Climate Change: IPCC Scholarship Programme. Retrieved 23rd August 2011, from http://ipcc.ch/ipcc-scholarship-programme/ipcc_scholarshipprogramme.shtml.

IPCC, Intergovernmental Panel on Climate Change: Organization. Retrieved 10th August 2011, from http://www.ipcc.ch/organization/organization.shtml.

IPCC, Intergovernmental Panel on Climate Change: Principles and procedures. Retrieved 10th August 2011, from http://ipcc.ch/organization/organization_procedures.shtml.

IPCC, Intergovernmental Panel on Climate Change: Publications and data. Retrieved 13th August 2011, from http://www.ipcc.ch/publications_and_data/publications_and_data.htm.

IPCC, Intergovernmental Panel on Climate Change: Reports. Retrieved 10th August 2011, from http://ipcc.ch/publications_and_data/publications_and_data_reports.shtml.

IPCC, Intergovernmental Panel on Climate Change: Secretariat and Technical Support Units. Retrieved 10th August 2011, from http://ipcc.ch/organization/organization_secretariat.shtml.

IPCC, Intergovernmental Panel on Climate Change: Structure. Retrieved 10th August 2011, from http://ipcc.ch/organization/organization_structure.shtml.

IPCC, Intergovernmental Panel on Climate Change: Supporting Material. Retrieved 10th August 2011, from http://ipcc.ch/publications_and_data/publications_and_data_supporting_material.shtml.

IPCC, Intergovernmental Panel on Climate Change: Working Groups/ Task Force. Retrieved 12th August 2011, from http://ipcc.ch/working_groups/working_groups.shtml.

IPCC, Intergovernmental Panel on Climate Change (1990): Climate change. The IPCC Impacts Assessment. Report prepared for IPCC by Working Group II. Edited by W. J. McG. Tegart, G. W. Sheldon, and D. C. Griffith. Canberra.

IPCC, Intergovernmental Panel on Climate Change (1996): Appendix B to the principles governing IPCC work. Financial procedures for the Intergovernmental Panel on Climate Change (IPCC). Adopted at the twelfth session of the IPCC (Mexico City, 11-13 September 1996).

IPCC, Intergovernmental Panel on Climate Change (2008): Procedures for the preparation, review, acceptance, adoption, approval and publication of IPCC reports. Appendix A to the principles governing IPCC work. Adopted at the fifteenth session (San Jose, 15-18 April 1999), amended at the twentieth session (Paris, 19-21 February 2003), twenty-first session (Vienna, 3 and 6-7 November 2003), and twenty-ninth session (Geneva, 31 August - 4 September 2008).

IPCC, Intergovernmental Panel on Climate Change (2010a): Decisions taken by the Panel at its 32nd session. With regards to the recommendations resulting from the review of the IPCC processes and procedures by the InterAcademy Council (IAC). Busan, Republic of Korea, 11-14 October 2010. Geneva.

IPCC, Intergovernmental Panel on Climate Change (2010b): Understanding climate change. 22 years of IPCC assessment. Geneva.

IPCC, Intergovernmental Panel on Climate Change (2011a): IPCC 33rd session, 10-13 May 2011, Abu Dhabi. Decisions taken with respect to the review of IPCC processes and procedures. Communications strategy.

IPCC, Intergovernmental Panel on Climate Change (2011b): IPCC 33rd session, 10-13 May 2011, Abu Dhabi. Decisions taken with respect to the review of IPCC processes and procedures. Conflict of interest policy.

IPCC, Intergovernmental Panel on Climate Change (2011c): IPCC 33rd session, 10-13 May 2011, Abu Dhabi. Decisions taken with respect to the review of IPCC processes and procedures. Governance and management.

IPCC, Intergovernmental Panel on Climate Change (2011d): IPCC 33rd session, 10-13 May 2011, Abu Dhabi. Decisions taken with respect to the review of IPCC processes and procedures. Procedures.

IPCC WG III, Intergovernmental Panel on Climate Change Working Group III: Special Report on renewable energy sources and climate change mitigation (SRREN). Retrieved 10th August 2011, from http://srren.ipcc-wg3.de/.

IPCC WG III, Intergovernmental Panel on Climate Change Working Group III: Working Group III organization. Retrieved 3rd July 2011, from http://www.ipcc-wg3.de/organization-and-tsu.

Jasanoff, Sheila (1990): The fifth branch. Science advisers as policymakers. Cambridge, London.

Jasanoff, Sheila (2010): Testing time for climate science. In: Science. Vol. 328 (no. 5979): pp. 695-6.

Kern, Kristine, Stefan Niederhafner, Sandra Rechlin, and Jost Wagner (2005): Kommunaler Klimaschutz in Deutschland – Handlungsoptionen, Entwicklung und Perspektiven. Berlin, Wissenschaftszentrum Berlin für Sozialforschung.

Kettner, Mathias (1993): Scientific knowledge, discourse ethics, and consensus formation on public policy issues. In: René von Schomberg (ed.): Science, politics and morality. Scientific uncertainty and decision making. Dordrecht: pp. 161-80.

Lakatos, Imre (1978): The methodology of scientific research programmes. In: John Worrall and Gregory Currie (eds.): Philosophical papers volume 1. Cambridge, London, New York, Melbourne: pp. n.s.

Leake, Jonathan (2009a): Climate change data dumped. Released 29th November 2009. In: The Sunday Times of London. Retrieved 23rd August 2011, from http://www.timesonline.co.uk/tol/news/environment/article6936328.ece.

Leake, Jonathan (2009b): The great climate change science scandal. Leaked emails have revealed the unwillingness of climate change scientists to engage in a proper debate with the sceptics who doubt global warming. Released 29th November 2009. In: The Sunday Times of London. Retrieved 23rd August 2011, from http://www.timesonline.co.uk/tol/news/environment/article6936289.ece.

Litfin, Karen T. (1994): Ozone discourses: science and politics in global environmental cooperation. New York.

Mayring, Philipp (2002): Einführung in die qualitative Sozialforschung. Eine Anleitung zu qualitativem Denken. Weinheim, Basel.

Mayring, Philipp (2008): Qualitative Inhaltsanalyse. Grundlagen und Techniken. Weinheim, Basel.

Merkel, Wolfgang W. (2009): Trickserei-Vorwürfe. Kein Climategate – Forscher verteidigen Klimadaten. Released 4th December 2009. In: Welt Online. Retrieved 25th August 2011, from http://www.welt.de/wissenschaft/umwelt/article5430418/Kein-Climategate-Forscher-verteidigen-Klimadaten.html.

Mitchell, Ronald B., William C. Clark, and David W. Cash (2006): Information and influence. In: Ronald B. Mitchell, William C. Clark, David W. Cash, and Nancy M. Dickson (eds.): Global Environmental Assessments. Information and influence. Cambridge: pp. 307-38.

Morello, Lauren (2010): Climate science panel apologizes for Himalayan error. Released 21st January 2010. In: The New York Times. Retrieved 25th August 2011, from http://www.nytimes.com/cwire/2010/01/21/21climatewire-climate-science-panel-apologizes-for-himalay-25267.html.

Naughton, Philippe (2009): 'Climategate' at centre stage as Copenhagen opens. Released 17th December 2009. In: The London Times. Retrieved 23rd August 2011, from http://www.timesonline.co.uk/tol/news/environment/article6947199.ece.

Nowotny, Helga (1993): A new branch of science, Inc. In: René von Schomberg (ed.): Science, politics and morality. Scientific uncertainty and decision making. Dordrecht: pp. 63-84.

Nowotny, Helga, Peter Scott, and Michael Gibbons (2001): Re-thinking science. Knowledge and the public in an age of uncertainty. Oxford.

NRC, National Research Council (2007): Analysis of global change assessments: lessons learned. Washington, D.C.

Oppenheimer, Michael, Brian C. O'Neill, Mort Webster, and Shardul Agrawala (2007): The limits of consensus. In: Science. Vol. 317 (no. 5844): pp. 1505-6.

Parry, Martin L., Osvaldo F. Canziani, Jean P. Palutikof, Paul J. van der Linden, and Clair E. Hanson (2007, eds.): Climate change 2007 – impacts, adaptation and vulnerability. Contribution of Working Group II to the fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge.

Pearce, Fred (2010): Climate chief admits error over Himalayan glaciers. Released 21st January 2010. In: New Scientist. Retrieved 23rd August 2011, from http://www.newscientist.com/article/dn18420-climate-chief-admits-error-over-himalayan-glaciers.html.

Pinkau, Klaus (2006): Möglichkeiten und Grenzen naturwissenschaftlicher Politikberatung. In: Heidelberger Akademie der Wissenschaften (ed.): Politikberatung in Deutschland. Wiesbaden: pp. 33-46.

Revkin, Andrew C. (2009a): Hacked e-mail data prompts calls for changes in climate research. Released 27th November 2009. In: The New York Times. Retrieved 25th August 2011, from http://www.nytimes.com/2009/11/28/science/earth/28hack.html?ref=andrewcrevkin.

Revkin, Andrew C. (2009b): Hacked e-mail is new fodder for climate dispute. Released 20th November 2009. In: The New York Times. Retrieved 25th August 2011, from http://www.nytimes.com/2009/11/21/science/earth/21climate.html.

Richter, Rudolf and Eirik G. Furubotn (2003): Neue Institutionenökonomik. Eine Einführung und kritische Würdigung. Tübingen.

Rutgers, Mark R. and Maarten A. Mentzel (1999): Scientific expertise and public policy: resolving paradoxes? In: Science and Public Policy. Vol. 26 (no. 3): pp. 146-50.

Salter, Liora (1988): Mandated science: science and scientists in the making of standards. Dordrecht, Boston, London.

Schmitt, Stefan (2010): IPCC-Bericht: 2350 oder 2035? Eine Chronologie des "Gletscherfehlers". Eine Falschaussage gelangte in den IPCC-Bericht. Trotz Protest wurde sie nie mehr korrigiert. Released 28th January 2010. In: Die Zeit. Retrieved 23th August 2011, from http://www.zeit.de/2010/05/U-IPCC-Kasten.

Schönwiese, Christian-Dietrich (2008): Klimatologie. Stuttgart.

Skodvin, Tora (1999a): Science-policy interaction in the global greenhouse. Institutional design and institutional performance in the Intergovernmental Panel on Climate Change (IPCC). Oslo, CICERO Center for International Climate and Environmental Research.

Skodvin, Tora (1999b): Structure and agent in the scientific diplomacy of climate change. An empirical case study of the Intergovernmental Panel on Climate Change (IPCC). Oslo.

Skodvin, Tora (2000): Revised rules of procedure for the IPCC process. An editorial essay. In: Climatic Change. Vol. 46 (no. 4): pp. 409-15.

Skodvin, Tora and Knut H. Alfsen (2010): The Intergovernmental Panel on Climate Change (IPCC): outline of an assessment. Oslo, CICERO Center for International Climate and Environmental Research.

Skodvin, Tora and Jan S. Fuglestvedt (1997): A comprehensive approach to climate change: political and scientific considerations. In: Ambio. Vol. 26 (no. 6): pp. 351-8.

Skodvin, Tora, Anne Therese Gullberg, and Stine Aakre (2010): Target-group influence and political feasibility: the case of climate policy design in Europe. In: Journal of European Public Policy. Vol. 17 (no. 6): pp. 854-73.

Spiegel Online (2010): IPCC-Debatte. Rettet den Weltklimarat! Retrieved 16th August 2011, from http://www.spiegel.de/wissenschaft/natur/0,1518,673765,00.html.

Torrance, Wendy E. F. (2006): Science or salience: building an agenda for climate change. In: Ronald B. Mitchell, William C. Clark, David W. Cash, and Nancy M. Dickson (eds.): Global Environmental Assessments. Information and influence. Cambridge: pp. 29-56.

Traufetter, Gerald (2010): Recherchepanne. Weltklimarat schlampte bei Gletscher-Prognose. Released 19th January 2010. In: Spiegel-Online. Retrieved 13th August 2011, from http://www.spiegel.de/wissenschaft/natur/0,1518,672709,00.html.

Underdal, Arild (2002): One question, two answers. In: Edward L. Miles, Arild Underdal, Steinar E. Andresen, Jorgen Wettestad, Jon Birger Skjaerseth, and Elaine M. Carlin (eds.): Environmental regime effectiveness: confronting theory with evidence. Cambridge: pp. 3-45.

van Eeten, Michel J. G. (1999): 'Dialogues of the deaf' on science in policy controversies. In: Science and Public Policy. Vol. 26 (no. 3): pp. 185-92.

von Schomberg, René (1993a): Controversies and political decision making. In: ibid. (ed.): Science, politics and morality. Scientific uncertainty and decision making. Dordrecht: pp. 7-26.

von Schomberg, René (1993b): Political decision making in science and technology: a controversy about the release of genetically engineered organisms. In: Technology in Society. Vol. 15 (no. 4): pp. 371-81.

Weingart, Peter (1999a): Climate coalitions: the science and politics of climate change. In: Minerva. Vol. 37 (no. 2): pp. 103-4.

Weingart, Peter (1999b): Scientific expertise and political accountability: paradoxes of science in politics. In: Science and Public Policy. Vol. 26 (no. 3): pp. 151-61.

Weingart, Peter (2001): Die Stunde der Wahrheit? Zum Verhältnis der Wissenschaft zu Politik, Wirtschaft und Medien in der Wissensgesellschaft. Weilerswist.

Weingart, Peter (2006): 'Demokratisierung' der wissenschaftlichen Politikberatung – Eine Antwort auf die Legitimationsdilemmata im Verhältnis von Wissenschaft und Politik? In: Heidelberger Akademie der Wissenschaften (ed.): Politikberatung in Deutschland. Wiesbaden: pp. 73-84.

11 Appendix

11.1 IAC review committee

This first part of the appendix lists the members of the review committee established by the InterAcademy Council for the conduct of the review of the IPCC's processes and procedures and the staff members who assisted this committee (IAC 2010: vi).

Members of the review committee

Harold T. Shapiro, Chair, Princeton University, USA

Roseanne Diab, Vice Chair, Academy of Science of South Africa, South Africa

Carlos Henrique de Brito Cruz, State of São Paulo Research Foundation and University of Campinas, Brazil

Maureen Cropper, University of Maryland and Resources for the Future, USA

Fang Jingyun, Peking University, China

Louise O. Fresco, University of Amsterdam, The Netherlands

Syukuro Manabe, Princeton University, USA

Goverdhan Mehta, University of Hyderabad, India

Mario Molina, University of California, San Diego, USA, and Center for Strategic Studies in Energy and the Environment, Mexico

Peter Williams, The Royal Society, UK

Ernst-Ludwig Winnacker, International Human Frontier Science Program Organization, France

Zakri Abdul Hamid, Ministry of Science, Technology, and Innovation, Malaysia

Staff members for the review of the IPCC

Anne Linn, Study Director, National Research Council, USA

Tracey Elliott, The Royal Society, UK

William Kearney, National Research Council, USA

Stuart Leckie, The Royal Society, UK

Tu Nguyen, InterAcademy Council

Jason Ortego, National Research Council, USA

Greg Symmes, National Research Council, USA

11.2 IAC reviewers and review monitors

This second part of the appendix lists the names and professional positions of the experts who reviewed the IAC committee's report before it was completed as well as the names and positions of the review monitors who supervised the reviewers' work (IAC 2010: ix-x).

Report reviewers

Édouard Brézin, Professor Emeritus, Département de Physique, Laboratoire de physique théorique de l'École Normale Supérieure, Paris, France

Trudy Ann Cameron, Professor of Environmental and Resource Economics, University of Oregon, USA

Anthony Clayton, Professor, Institute for Sustainable Development, University of the West Indies, Jamaica

Paul Crutzen, Professor, Max Planck Institute for Chemistry, Mainz, Germany

José Goldemberg, Professor, Instituto de Eletrotecnica e Energia, Universidade de São Paulo, São Paulo, Brazil

Brian Hoskins CBE, FRS, Director, Grantham Institute for Climate Change, Imperial College London; Royal Society Research Professor and Professor of Meteorology, University of Reading, UK

Liu Shaw Chen, Professor and Director, Academia Sinica Center for Environmental Changes, Taiwan-China

R. A. Mashelkar, CSIR Bhatnagar Fellow, National Chemical Laboratory, Pune, India

Keto Elitabu Mshigeni, Vice Chancellor, Hubert Kairuki Memorial University, Dar es Salaam, Tanzania

Matti Saarnisto, Past Secretary General, Finnish Academy of Science and Letters; former Professor of Geology and Paleontology, University of Helsinki, Finland

Shigeo Yoden, Professor of Meteorology, University of Kyoto, Japan

John Zillman, Former Director, Australian Bureau of Meteorology; former President, World Meteorological Organization

Review monitors

Kurt Lambeck, Past President, Australian Academy of Science; Professor of Geophysics, Australian National University, Canberra, Australia

Ralph Cicerone, President, US National Academy of Sciences, Washington, D.C., USA