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# The Governance of Scientific Assessment in the Context of the Intergovernmental Panel on Climate Change

## Lessons for International Cooperation in Science, Technology and Innovation

*Yulia Yamineva*



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the context of the Intergovernmental Panel  
on Climate Change

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## Abstract

The Intergovernmental Panel on Climate Change (IPCC) has been an example of an effective science-policy interface in international environmental affairs. For its efforts “*to build up and disseminate greater knowledge about man-made climate change and to lay the foundations for the measures that are needed to counteract such change,*” the Panel was awarded the Nobel Peace Prize in 2007. The discussion paper outlines the main characteristics of the IPCC’s governance framework in relation to: institutional structure and decision-making; the assessment process; communication of assessment findings and outreach activities; the role of the IPCC in policymaking; as well as its role in capacity-building work. In doing so, it reflects the reforms made by the Panel between 2010 and 2012 in response to the external review of its processes and procedures called for after errors were found in the Fourth Assessment Report. The paper concludes with an overview of strengths and weaknesses of the IPCC model which may be useful for other multilateral research-related initiatives.



# Contents

## Abstract

## Abbreviations

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Climate change as a policy issue</b>	<b>1</b>
<b>3</b>	<b>Main characteristics of the governance of the Intergovernmental Panel on Climate Change (IPCC)</b>	<b>2</b>
3.1	Institutional structure and decision-making	2
3.2	The assessment process: participation, procedure and the role of governments	8
3.3	Communication of assessment findings and outreach activities	12
3.4	The role of the Intergovernmental Panel on Climate Change (IPCC) in the policy process	14
3.5	Capacity-building	17
<b>4</b>	<b>Summary and conclusions</b>	<b>19</b>

	<b>Bibliography</b>	<b>23</b>
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## Figures

Figure 1:	Structure of the IPCC	3
Figure 2:	The IPCC assessment process	9

## Tables

Table 1:	Main recommendations by the InterAcademy Council (IAC) on improving the IPCC's processes and procedures, and corresponding reforms made by the Panel between 2010 and 2012	7
Table 2:	Strengths and weaknesses of the IPCC's governance model	19

## Boxes

Box 1:	IPCC Products	8
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## Abbreviations

IAC	InterAcademy Council
IPCC	Intergovernmental Panel on Climate Change
OECD	Organisation for Economic Co-operation and Development
SBSTA	Subsidiary Body for Scientific and Technological Advice
SPM	Summary for Policy-Makers
TFI	Task Force on National Greenhouse Gas Inventories
TSU	Technical Support Unit
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WG	Working Group
WMO	World Meteorological Organization



## 1 Introduction

This discussion paper was prepared in order to contribute to the project of the Organisation for Economic Co-operation and Development (OECD) “Meeting Global Challenges through Better Governance of International Co-operation in Science, Technology and Innovation” of 2009–2012. As part of the project, an international group of expert teams analysed several case studies reflecting different modes of governance in international research cooperation: the Consultative Group on International Agricultural Research; the Bill and Melinda Gates Foundation; the Group on Earth Observations; the International Atomic Energy Agency; the Inter-American Institute for Global Change Research; the International Energy Agency’s Implementing Agreements; and the European Joint Programming Initiatives. The project put together conclusions and lessons learned on how to improve international cooperation on science, technology and innovation in order to better address global environmental, energy and public health challenges along with others (OECD 2012).

This discussion paper also presents a case study – on the governance of international scientific assessment in the context of the Intergovernmental Panel on Climate Change (IPCC). The paper is largely based on the author’s PhD research on the Panel, as well as the author’s continuous involvement with the IPCC process since 2007 as a contributor to the Earth Negotiations Bulletin of the International Institute for Sustainable Development – Reporting Services. The PhD thesis titled “The Assessment Process of the IPCC: a Post-Normal Science Approach” and defended at the University of Cambridge, UK, in October 2009, looked into the following characteristics of the Panel’s assessment process in detail: participation; the basis for the assessment and policy relevance; treatment of uncertainties; interdisciplinarity; and institutional learning. The post-normal science approach suggests that science-policy interfaces under high decision stakes and high uncertainties should be based on extended participation, plurality of views, incorporation of uncertainties, interdisciplinarity, reflexivity and mutual learning (Funtowicz / Ravetz 1996; Turnpenny / Lorenzoni / Jones 2009). The thesis concluded that there are only a few elements of such an approach in the Panel’s work.

## 2 Climate change as a policy issue

As a policy issue, climate change has its own specifics differentiating it from other concerns of the policy agenda. *First*, climate change has a truly global nature in its causes, impacts and possible responses. Caused by anthropogenic greenhouse gas emissions of the industrial era, climate change already impacts natural systems and also some human ones across the world (IPCC 2007c). Projected impacts of climate change include changes in water supplies, ecosystems, food safety, coastal areas, industry, human settlements and human health. All major emitters have to conduct mitigation policies in order for emission reductions to be meaningful at a global scale and in the long term. Mitigating climate change requires large transformation in almost all economic sectors and will impact multiple stakeholders. *Second*, addressing climate change is complicated by high uncertainties with regard to the severity and location of climate change impacts; the levels at which greenhouse gas emissions need to be stabilised; and the costs and effectiveness of mitigation policies. Much of this uncertainty is inherent to the phenomenon, due to many unknowns with regards to future economic growth, energy consumption and other variables.

*Third*, climate change impacts and policies are closely linked with the issues of development, and the debate on international responses within the United Nations has so far been shaped as a dichotomy of developed countries versus developing countries. However, neither of the two camps – developed and developing countries - is homogenous as both include a range of highly diverse countries in terms of greenhouse gas emissions, existing mitigation policies, and capacities to respond to climate change.

The IPCC is a science-for-policy institution solely devoted to climate change, including its scientific underpinnings, and societal, policy and economic implications.

### **3 Main characteristics of the governance of the Intergovernmental Panel on Climate Change (IPCC)**

This chapter first describes the institutional structure of and decision-making in the IPCC, including budgetary matters (3.1). It also covers the reforms made by the organisation between 2010 and 2012 in response to the recommendations of the external review of its processes and procedures. The subsequent sub-chapter (3.2) goes into detail about the core mandate of the IPCC – preparation of the assessments of scientific information in all areas related to climate change. The remaining sections of the chapter assess other governance dimensions related to the work of the IPCC, namely: communication of scientific findings and outreach activities (3.3), the role of the IPCC in the international policy-making process under the Convention on Climate Change (3.4), and finally, the Panel’s contribution to capacity-building in developing countries (3.5).

#### **3.1 Institutional structure and decision-making**

The IPCC was established by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988. By that time, significant scientific evidence on climate change had already been built up through convening the first World Climate Change Conference in 1979, a series of international workshops, and the work of the Advisory Group on Greenhouse Gases – a small group of experts set up by the WMO, UNEP and the International Council of Scientific Unions (Agrawala 1998a).

According to the mandate set out in the document “Principles Governing the IPCC Work” (IPCC 1998), activities of the IPCC are driven by the tasks assigned by the relevant resolutions and decisions of the decision-making bodies of its parent organisations - the WMO Executive Council and the UNEP Governing Council. The document also states that the Panel is to conduct work in support of the United Nations Framework Convention on Climate Change (UNFCCC) process.

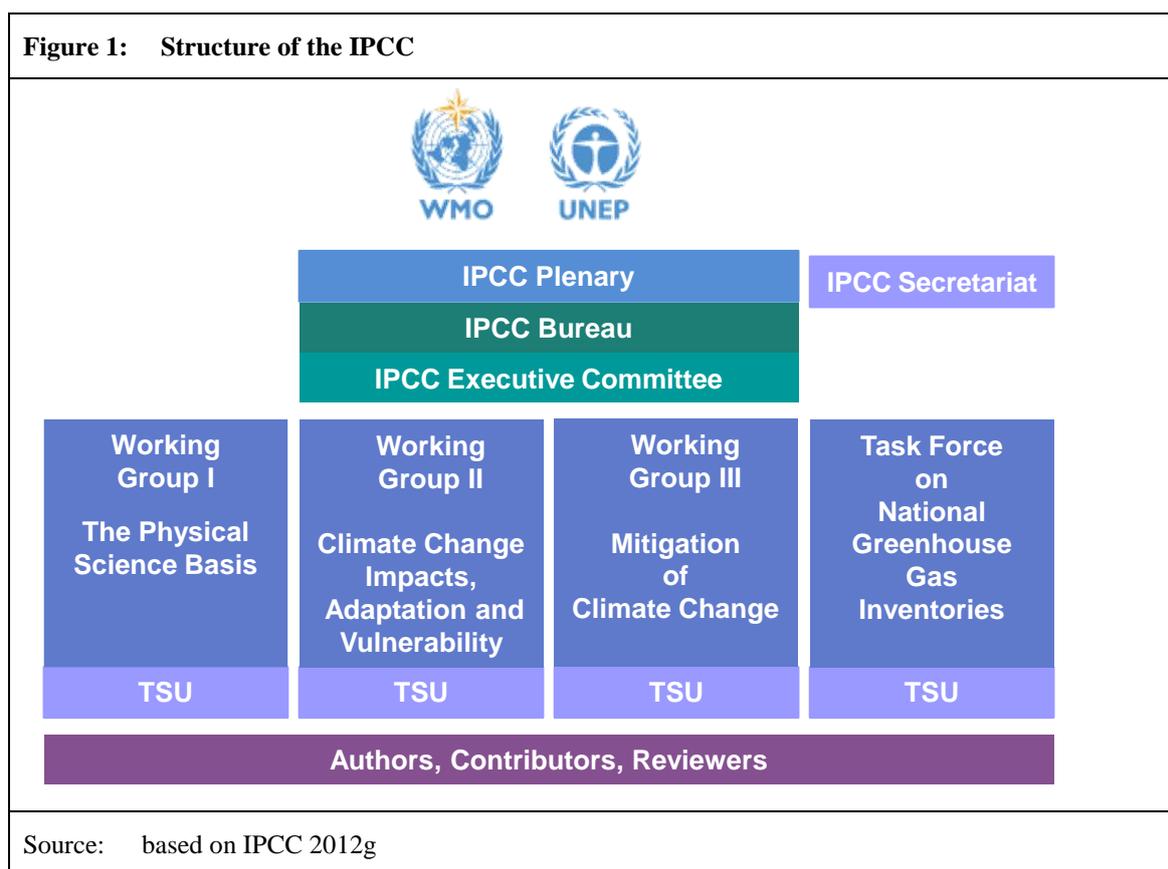
In accordance with the Principles, the IPCC conducts assessments of scientific literature on all aspects of climate change science and policies:

*“The role of the IPCC is to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation” (IPCC 1998, 1).*

The assessment of scientific literature differs from a literature review since it suggests a greater engagement with scientific knowledge and implies making judgments on the importance of research claims in the literature. The assessment of literature is also a more formalised process than a literature review and generally involves a significantly larger number of experts.

Thus, the Panel is neither a scientific institution nor a policy advisory body and instead occupies an intermediary position in the science-policy relationship. It is positioned outside of scientific inquiry as it does not produce new scientific knowledge or data; but it also remains outside actual decision-making on climate change as it does not make or recommend policy decisions. The IPCC strives to be policy relevant but not policy prescriptive, and its reports “*should be neutral with respect to policy*” (IPCC 1998). In assessing scientific literature on climate change mitigation and adaptation policies, the IPCC has to address, if necessary, scientific, technical and socio-economic factors relevant to the implementation of particular policies but in an objective manner (IPCC 1998).

The structure of the IPCC is complex and multi-layer and can thus appear confusing. As the Panel’s website puts it: the IPCC is “*a huge and yet very tiny organization*” (IPCC 2012g). Its structure is illustrated in Figure 1 below.



Intergovernmentalism is a key characteristic of the IPCC. The Panel is open to membership by any WMO or UN member nation, and there are currently 195 member countries (IPCC 2012g). Engaging governments in the scientific assessment of climate change was the underlying idea behind the establishment of the IPCC. By that time, developed countries had accumulated significant scientific expertise on climate change but many develop-

ing nations were sceptical of the idea that an international response was needed to address the problem caused by the overconsumption of resources in industrialised countries (Hecht / Tirpak 1995). It was vital therefore to involve developing-country governments and scientists in the international assessment panel, as “*global credibility demands global representation*” (Agrawala 1998b, 628). Gaining trust and acceptance of the science of climate change was crucial before governments worldwide could be engaged into negotiations on an international treaty to slow down global warming<sup>1</sup> (Hecht / Tirpak 1995; Agrawala 1998a, 617).

Governments make all major decisions, including those on institutional matters, work programmes and the budget of the Panel. They also approve outlines of reports, review assessment findings, and endorse final reports. **Plenary** meetings take place twice a year. Most delegates at IPCC meetings represent national ministries of the environment, specialised national agencies on climate change, and national meteorological agencies.

The IPCC work is organised into three **working groups** (WG), each addressing specific aspects of climate change. The WG I addresses the “Physical Science Basis of Climate Change”; WG II focuses on “Climate Change Impacts, Adaptation and Vulnerability”; and WG III on “Mitigation of Climate Change”. In addition to the three WGs, the Panel also has a “Task Force on National Greenhouse Gas Inventories” (TFI). The Task Force’s main objective is to develop and refine a methodology for the calculation and reporting of national greenhouse gas emissions and removals (TFI 2012).

The Panel is assisted in its work by the elected **Bureau** whose role is to provide guidance to governments on the scientific and technical aspects of the IPCC’s work, to advise on management and strategic issues, and to take decisions on specific issues (IPCC 2011b). The Bureau is typically composed of 30 members. The Bureau is elected at the beginning of each assessment cycle, that is every 5–6 years, and is formed on the basis of “*balanced geographic representation with due consideration for scientific and technical requirements*” (IPCC 1998). In the IPCC, the geographic balance is interpreted in relation to the six WMO regions: Africa; Asia; South America; North America, Central America and the Caribbean; the South-West Pacific; and Europe. Due to the complex task of achieving balanced regional representation in each of the WG Bureaux and among Vice-Chairs, the Bureau elections typically turn into several days of intensive consultations within and across regional groups. In the past, the Bureau elections rarely went smoothly and often became controversial primarily due to inconsistent and insufficient procedural rules (Yamineva 2010, 69–70; Muñoz / ten Have / Yamineva 2008; Yamin / Depledge 2004, 472). Recently, however, the Panel made significant changes to its procedures mainly with the aim of clarifying the process of nomination and election of the Bureau members (IPCC 2006b).

In 2011, the IPCC also established the **Executive Committee** “*to strengthen and facilitate timely and effective implementation of the IPCC Programme of Work in accordance with the IPCC Principles and Procedures, and the decisions of the Panel and advice of the Bureau*” (IPCC 2011a, 1). The Executive Committee consists of the highest level Bureau members – the IPCC Chair, IPCC Vice-Chairs, and WGs’ and TFI Co-Chairs. It also includes the IPCC Secretary and Heads of WG mini-secretariats called Technical Support Units as advisory members. The Committee is accountable to the Panel. The creation of

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1 The terms “global warming” and “climate change” are used interchangeably in this paper.

the Executive Committee essentially aims at making the IPCC management better in providing a coordinated response to urgent matters arising in-between the Panel's meetings. As such, the Executive Committee addresses burning issues related to IPCC products and its programme of work; undertakes outreach and communications activities; oversees the response to possible errors in completed assessment reports and other IPCC products, in line with the IPCC Protocol for Addressing Possible Errors; strengthens coordination among WGs and Task Forces in the preparation of IPCC products; and undertakes other work.

The Panel also has a small Secretariat of twelve staff members, hosted by the WMO in Geneva, Switzerland. The Secretariat supports the Panel, the IPCC Chair and other members of the Executive Committee and the IPCC Bureaux in the delivery of their mandate; manages the IPCC Trust Fund; organises and prepares documentation for meetings of the IPCC and its bodies; and performs other functions as agreed to in its Terms of Reference (IPCC 2012a). Since 2004, the Secretariat has been headed by the same person. Unlike in other UN bodies, the IPCC Secretary plays a more technical than political role: for instance, she/he does not represent the Panel to the outside world similar to the UNFCCC Executive Secretary. Instead, the Panel is represented by its Chair.

Each of the three WGs also has its own mini-secretariat, named Technical Support Unit (TSU), which provides support to respective WG Co-Chairs and Bureaux. The location of TSUs rotates with each assessment cycle according to the country of origin of the WGs' Co-Chairs. Because TSUs are financially supported by a host country, they are in practice almost exclusively situated in nations which are members of the OECD. For instance, for the Fifth Assessment cycle, which is now in its finalisation stage, the TSUs were hosted by institutions in Switzerland, the United States, Germany, the Netherlands and Japan. The fact that TSUs are based in developed countries adversely affects the engagement of developing-country scientists and science bureaucrats in the IPCC's work, the sense of developing-country ownership over assessment findings, and outreach activities; but few developing countries would be capable, or willing, to contribute significant financial resources to host such a Unit in their country.

The IPCC activities are funded through the voluntary contributions of governments and the United Nations. These contributions constitute the IPCC Trust Fund which supports the regular work of the Panel, including participation of eligible countries' representatives in the Panel's meetings and publication and translation of reports. Financial support for the participation of delegates from developing countries and countries with economies in transition constitutes a large share of the Panel's expenses: for instance, 85 representatives received such support to participate in IPCC-35 in June 2012 with expenses amounting to more than half of the total meeting budget (IPCC 2012f). Among the biggest contributors to the IPCC Trust Fund are Canada, the European Economic Community, Germany, Japan, Switzerland and the United States. The WMO, UNEP and UNFCCC also contribute to the Trust Fund. In addition, governments provide support through hosting IPCC sessions, authors' and expert meetings, as well as TSUs. There are other resources available to the IPCC: for example, the WMO hosts the IPCC Secretariat and, with UNEP, provides funds for two senior posts at the Secretariat. The total contributions to the IPCC budget in 2011 amounted to 8.6 million Swiss francs (IPCC 2012e).

As a UN institution, the IPCC admits observer organisations to its meetings. Any national or international non-profit organisation of governmental or intergovernmental nature,

qualified in matters covered by the IPCC, can be admitted as an observer organisation (IPCC 2006a). The admittance is subject to acceptance by the Panel. Representatives of observer organisations may attend sessions of the IPCC and its WGs, and nominate experts for the review of the IPCC reports, who however participate in their personal capacity. Organisations and agencies which are part of the UN system are considered to be participating organisations of the IPCC. Currently, the IPCC has 29 participating organisations among the UN and 65 observer organisations (IPCC 2012b).

Overall, the institutional structure and governance arrangements of the IPCC have undergone little change since its establishment until recently. In 2010, just three years after receiving the Nobel Peace Prize for its work, the Panel found itself under a massive fire of criticism which began with the discovery of an error in the Fourth Assessment Report relating to the projected year of the melting of Himalayan glaciers. It turned out that this particular assessment finding was solely based on a non-peer-reviewed NGO report which misquoted other sources. This cast doubt on the rigour and objectivity of other report findings. A public scrutiny of IPCC reports followed which identified several other, albeit minor, errors which nevertheless raised questions as to the use of unpublished papers in scientific assessments as well as the quality of the review process. In parallel, the media criticised the Chair of the IPCC, Rajendra Pachauri, for openly advocating certain climate policies – a role they thought incompatible with heading a scientific panel. This avalanche of criticism was already sufficient to question the credibility of IPCC reports in public eyes; but, in addition to that, the Panel's slow and inadequate response to media allegations and error-findings reflected shortcomings of its operational decision-making and communications.

All of these events led to an unprecedented initiative – the external review of the IPCC processes and procedures with the view to reforming them. This was conducted by the InterAcademy Council (IAC), a relatively little-known international association of science academies. The review was formally called for by the UN Secretary-General Ban Ki-moon along with the Chair of the IPCC Pachauri highlighting the Chair's active role and the Panel's own willingness to improve the way it worked. As a result, the IAC produced a report in August 2010 concluding that “*the IPCC assessment process has been successful overall*” (InterAcademy Council 2010, xii). At the same time, the report highlighted that the Panel needed to adapt to the changing demands of policy-makers and stakeholders and, in that regard, contained recommendations for the IPCC on how to improve its internal working arrangements.

The IPCC addressed these recommendations from October 2010 to June 2012 putting in place a number of reforms to its governance arrangements, assessment process, and outreach and communications work<sup>2</sup>. A summary of the main IAC's recommendations and reforms made by the Panel in response is contained in Table 1.

In sum, the IPCC followed nearly all recommendations made by the review of its processes and procedures, with the exception of those related to the Head of the Secretariat. While many governmental representatives and observers evaluated these reforms positively – noting increased clarity and transparency of the process – the utility of the changes made still needs to withstand the test of time.

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2 The Panel's website has a dedicated page summarising the reforms made by the IPCC to its processes and procedures in response to the IAC's recommendations (see IPCC 2012i).

<b>Table 1: Main recommendations by the InterAcademy Council (IAC) on improving the IPCC's processes and procedures, and corresponding reforms made by the Panel between 2010 and 2012</b>		
<b>Processes and procedures</b>	<b>The IAC's main recommendations</b>	<b>Corresponding IPCC reforms</b>
<b>Assessment process</b>	<ol style="list-style-type: none"> <li>1. Strengthening procedures for the use of non-peer-reviewed and unpublished literature.</li> <li>2. Authors should explicitly document that a range of scientific views is considered.</li> <li>3. More comprehensive and documented review process.</li> </ol>	<p>The IPCC addressed all of these recommendations through making relevant changes in its Procedures for the Preparation, Review, Acceptance, Adoption, Approval and Publication of IPCC Reports. In addition, the Panel adopted a Protocol for addressing possible errors although there was no specific recommendation for this.</p>
<b>Treatment of uncertainties</b>	<ol style="list-style-type: none"> <li>1. Each WG should use a qualitative scale of uncertainties based on the level of understanding, complemented by a quantitative scale based on probabilities where appropriate.</li> <li>2. Authors should provide a traceable account of how uncertainties are assessed.</li> </ol>	<p>The IPCC revised its earlier guidance note for authors on the treatment of uncertainties where it stipulated that authors should use either a confidence-based or a probability-based scale, and provide information on how uncertainties were assessed.</p>
<b>Governance and management</b>	<ol style="list-style-type: none"> <li>1. The IPCC should establish an Executive Committee to act on its behalf in-between Plenary meetings.</li> <li>2. Defining responsibilities and roles of all members of the Bureau.</li> <li>3. Electing an Executive Director to lead the Secretariat.</li> <li>4. Developing and adopting a rigorous Conflict of interest policy applicable to all involved in the preparation of assessment reports.</li> <li>5. Adopting a Communications strategy which should be based on transparency, rapid responses and relevance to stakeholders. The IPCC should also clarify its policy as to who can represent the Panel and speak on its behalf.</li> </ol>	<ol style="list-style-type: none"> <li>1. The Panel established an Executive Committee consisting of senior Bureau members. Heads of the Secretariat and TSUs participate as advisory members.</li> <li>2. The Panel adopted a document defining Terms of reference of the Bureau, and roles, responsibilities, and qualifications of Bureau members.</li> <li>3. The Panel decided that the head of the Secretariat should remain an appointed person rather than elected in accordance with the UN practices.</li> <li>4. The Panel adopted a detailed Conflict of interest policy and established a Conflict of interest committee responsible for its implementation.</li> <li>5. The IPCC adopted a Communications strategy along with establishing a Secretariat post of the Head of Media and Communications. The Communications strategy, among other issues, defines spokespeople for the Panel.</li> </ol>
Source: InterAcademy Council 2010, IPCC 2012i		

### 3.2 The assessment process: participation, procedure and the role of governments

The main activity of the IPCC is the preparation of periodic comprehensive assessments of scientific information in all areas related to the science of climate change, its impacts, and adaptation and mitigation options. To date, the Panel has produced four assessment reports: the First Assessment Report in 1990, the Second Assessment Report in 1995, the Third Assessment Report in 2001 and the Fourth Assessment Report in 2007. The Fifth Assessment Report is scheduled to be finalised between 2013 and 2014. Also, the IPCC prepares other products. Various different IPCC outputs are summarised briefly in Box 1.

#### Box 1: IPCC Products

**Assessment Reports.** An assessment report is in fact not just one report but the three separate reports of the Working Groups. In addition, these are complemented by a **Synthesis Report** which integrates the findings of all WGs into one document written in a non-technical style. Each of WG reports contains around twenty chapters and comprises up to a thousand pages. A WG report also includes a **Summary for Policy-Makers (SPM)** of about 20 pages, which is subject to line-by-line approval by the Panel. The reports themselves are not discussed in detail by governmental members of the Panel but are simply accepted. The Synthesis Report is a much shorter report of 30-50 pages. It also has an SPM approved by governments line-by-line.

**Special Reports.** Special Reports are prepared according to the same procedures as the main assessment reports but focus on specific issues. Among the most recent Special Reports of the IPCC are the Special Report on Renewable Energy Sources and Climate Change Mitigation endorsed in 2011 and the Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation of 2012.

The Panel frequently decides on preparing these products at the request of the UNFCCC and other international regimes. The related Decision Framework stipulates general principles and a set of criteria for establishing priorities for such reports and papers. According to this document, the IPCC gives priority to the preparation of the main assessment report but if other products are requested, the Panel prioritises requests from the UNFCCC over others.

**Technical Papers.** Technical Papers also cover specific issues but do not contain new information and should be fully based on existing assessment material of the IPCC. There is an expedited procedure for the preparation of Technical Papers. Technical Papers are subject to expert and governmental review but do not need to be endorsed by the Panel. The latest Technical Paper related to Water and Climate Change and was compiled in 2008.

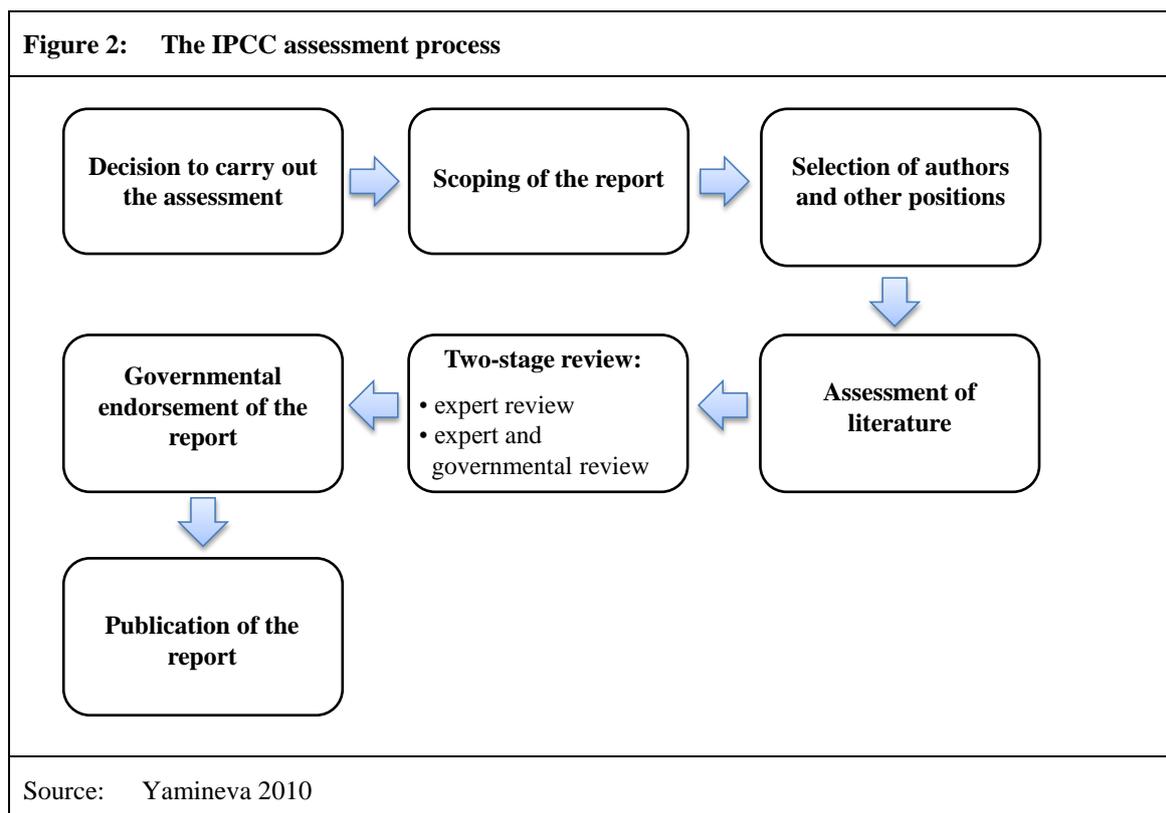
**Methodology Reports.** These IPCC products provide guidelines for the preparation of greenhouse gas inventories which are mainly used by Parties to the UNFCCC. The overview chapters of the methodology reports undergo expert and governmental review and section-by-section adoption by the Panel.

**Supporting Material.** This includes: proceedings of IPCC workshops and expert meetings; material, for example databases and software, commissioned by a WG or TFI Bureau in support of the assessment or methodology development; and guidance material (for instance, a Guidance Note for Lead Authors of the IPCC AR5 on Consistent Treatment of Uncertainties).

The IPCC usually organises workshops and expert meetings in the preparation of the assessment report on topics which have particular importance for the policy process but are scarcely covered in the literature. Proceedings of such workshops and expert meetings do not undergo governmental review and endorsement.

Assessment Reports as well as Special Reports, Technical Papers, and Methodology Reports are prepared in accordance with a clearly defined step-by-step system set in the Procedures for IPCC Reports (IPCC 1999). Understanding the process of preparing an assessment report is crucial for understanding the IPCC. The explanation below relates to the main assessment report but procedures also apply *mutatis mutandis* to other reports of the IPCC.

The preparation of the main assessment report follows a sequence of stages, outlined below in Figure 2. These stages form an assessment cycle typically lasting from five to seven years. The assessment cycle begins with a decision of the Panel to carry out the full assessment of literature. At this point, the Panel also decides on the timeline and main products, in particular on whether or not to prepare a Synthesis Report. A scoping process follows with the aim of outlining the main themes to be addressed in the report. For this, the IPCC holds scoping meetings with the involvement of selected experts and governmental representatives which result in draft outlines for each WG report. The Panel then approves the draft outlines in plenary and discusses other related issues, such as crosscutting themes.



Subsequently, the WG Bureaux start selecting potential authors and review editors. This process begins with the compilation of lists of experts identified by governments, observer organisations and WG Bureaux. From these lists, WG Bureaux select:

- Coordinating Lead Authors who are responsible for specific chapters of the report;
- Lead Authors who are responsible for specific sections in a chapter;
- Contributing Lead Authors who assist Lead Authors; and
- Review Editors who oversee the review process and ensure that all comments are given due consideration.

According to IPCC rules, in selecting authors, the WG Bureaux should aim to provide: a range of scientific, technical and socio-economic views and expertise; balanced geographical representation; engagement of scientists with and without previous experience with the IPCC; and gender balance. The WG Bureaux conduct the selection under the guidance and review of respective WGs.

In reality, meeting the selection criteria for the authorship, especially in relation to geographical balance, has always been a heavy challenge for the IPCC. In the preparation of the Fourth Assessment report, the representation of developing-country authors was at the level of 26 per cent. There were significant variations across WGs: only about 9 per cent of Coordinating Lead Authors for the WG I report on the science of climate change represented non-OECD countries while in WG II, which addresses adaptation aspects, representation was at 43 per cent.

For the Fifth Assessment Report, more than 830 Coordinating Lead Authors, Lead Authors and Review Editors from 85 countries have been selected (IPCC 2012h). Around 36 per cent of them represent developing countries and countries with economies in transition. Although these figures are an improvement from the past, the overall authorship is still dominated by scientists from the industrialised countries.

There are several barriers hindering a wider involvement of developing-country scientists in IPCC assessments. Importantly, authors and review editors are not remunerated for their work by the Panel. For the entire assessment process, they continue to be based in their home countries and perform IPCC responsibilities alongside regular work. While many authors from OECD countries receive support from their universities and institutions for participating in the IPCC assessment, this is not necessarily the case for developing-country scientists. Other serious obstacles to the engagement of developing-country scientists in the IPCC assessments include: lack of access to peer-reviewed journals, language difficulties, poor internet or phone connections, and visa issues. Also, the pool of potential authors from developing countries is simply smaller: in 2007 about 37 per cent of all researchers in the world were based in developing countries while in 2001 they were only 29 per cent (UNESCO 2010, 8).

Each WG organises occasional Lead Authors' meetings but most communication among authors during the assessment process takes place via the Internet and telephone. The Secretariat, TSUs and the WG Bureaux, in particular WG Co-Chairs, coordinate the assessment process.

Selected author teams conduct the assessment of scientific literature to prepare the first draft. In the Fifth Assessment Report, this process took around two years. The assessment mainly concerns peer-reviewed and internationally available literature but selected non-peer-reviewed or unpublished sources can also be included in the report providing the use is justified and conducted in accordance with the principles of openness and transparency. A detailed method for the use of such literature is specified in IPCC documents (IPCC 1999, 17).

In assessing literature, authors are required to reflect a range of scientific, technical and socio-economic views. For instance, they should clearly recognise divergent scientific views and relevant arguments. To reflect existing uncertainties, authors should use a specially designed approach detailed in the Guidance Note on Uncertainties (IPCC 2010).

Draft assessment reports are subject to a two-stage review. The first draft undergoes a review by experts. After addressing their comments, authors prepare a second draft which then undergoes another round of review – by experts and governments. This is followed by the preparation of the final draft of the report.

Concurrently to the preparation of the main report, the WG Co-Chairs, usually with Coordinating Lead Authors, prepare the respective draft Summaries for Policy-Makers (SPM) of the WG reports. Draft Summaries are also subject to a simultaneous expert and governmental review. After draft, SPMs are revised and, before they go for approval in a plenary meeting, governments can again submit written comments on the documents.

Regarding the selection of experts for expert review, it is conducted by WG Bureaux and based on the same principles as for authors and review editors: expert reviewers should represent a wide range of scientific, technical and socio-economic views and expertise, and countries. To provide for independence and objectiveness, expert reviewers should not be involved in the preparation of a chapter they review. The WG Bureaux should provide “*a wide circulation process [...] to involve as many experts as possible in the IPCC process*” (IPCC 1999, 7). The WG Bureaux mainly draw a selection from the same lists of experts nominated by governments and observer organisations but experts from outside those lists can also volunteer to review the reports through an open process of online self-registration.

The goals of the review are to ensure that the reports include “*the latest scientific, technical and socio-economic findings and are as comprehensive as possible*” (IPCC 1999, 6). The review process should be objective, open and transparent. Experts review the draft reports and provide comments on the accuracy, completeness and the overall scientific, technical, and socio-economic balance of the drafts.

Expert and government review of IPCC assessment reports are massive undertakings which lead to thousands of comments and last for almost two years. For illustration, in the Fifth Assessment Report the number of experts involved in the review of the first draft ranged from 563 to 659 for each WG, resulting in between 16,124 and 21,400 comments for each WG draft report (IPCC 2012c).

After the review stage is completed, the final drafts of the WG reports and their Summaries are submitted to WGs for governmental endorsement. Governments endorse IPCC products in three ways. Full WG reports are *accepted* by WGs in plenary in their entirety without discussion but Summaries for Policy-Makers are discussed by WG members in detail and *approved* line-by-line. The three WG reports are also formally accepted by the full IPCC in plenary before they officially become IPCC reports but the body is not authorised to make any corrections. The Synthesis Report is endorsed by the IPCC in a plenary meeting: its SPM is approved line-by-line, similarly to WG SPMs, and the full report is *adopted* section-by-section.

The WG reports are not finalised simultaneously. Instead, the IPCC adopts a staggered approach so that findings of WG I can be incorporated into the reports of WG II and III. For this reason, the WG I contribution to the Fifth Assessment Report was finalised in September 2013 followed by the endorsement of the WG II report in March 2014 and the WG III report in April 2014. The Synthesis Report will be finalised in October 2014.

Among all IPCC products, the SPMs are the most well-known and most widely cited ones. Presenting overviews of the most important scientific findings for policy in a non-technical language, which are approved by a representative panel of governments, they become the reference material for policy-makers and stakeholders in the UNFCCC process and at national level. The IPCC meetings where governments approve an SPM thus

attract a considerable media and expert attention from across the globe. Such meetings typically last from three to four days and involve long hours and sleepless nights of discussions on the text of a Summary. The WG SPM should be fully based on the underlying WG report and hence all proposed changes should reflect the report and ultimately scientific literature. In addition, the IPCC – being a UN panel – operates on the basis of the consensus rule: according to its Principles, the IPCC and WGs in approving, adopting and accepting reports “*shall use all best endeavours to reach consensus*” (IPCC 1998). Generally, a large share of the discussions among governments while approving SPMs of WG reports relate to clarifying scientific findings and their communication. However, some discussions also have a strong political flavour, and governments’ positions on including/excluding information or highlighting one finding over another are easily traced back to their negotiating positions in the UNFCCC process. To explain this, one of the authors involved in the preparation of the Fourth Assessment Report said that the goal of the governmental approval is to agree “*on the common understanding of what at maximum you can get through from the science and to soften the language to the extent it is acceptable to some countries but not too much so that it is [also] acceptable to the others*” (Yamineva 2010). In this sense, the SPMs of IPCC reports are political documents as much as they are summaries of scientific findings.

### 3.3 Communication of assessment findings and outreach activities

After the IPCC report is formally endorsed by the Panel, it goes for release to the outside world. Electronic versions of all IPCC Assessment Reports, Special Reports and Technical Papers are available to everyone online. The IPCC products are published and disseminated for free among governmental delegates, authors and observer organisations of the IPCC. The working language of the IPCC is English but according to the UN rules, IPCC reports and papers are also translated into the other five UN languages: French, Spanish, Arabic, Chinese, and Russian.

The IPCC conducts a variety of outreach activities to disseminate and publicise the findings of its assessment reports. The IPCC Chair regularly addresses the Conference of the Parties – the main decision-making body of the UNFCCC – at its opening and provides updates on the IPCC work. The Secretariat also organises exhibits, workshops and side events at UNFCCC meetings as well as other UN meetings on environmental affairs and international conferences. These activities mainly relate to completed assessment reports and technical papers as well as progress on the next assessment report.

The IPCC meetings, in particular those which finalise assessment reports, attract significant media attention from around the world, and the IPCC Secretariat organises press conferences and briefings. In addition, sessions of the Panel are covered by the International Institute for Sustainable Development – Reporting Services which monitors developments in the UN processes on environment and development.

The WG Technical Support Units conduct a large share of outreach activities related to their respective mandates and products. Recently, outreach activities for IPCC reports also included regional events focusing on both generic assessment findings and their regional implications which are organised in cooperation with countries and international partners. For instance, the Special Report on Managing the Risks of Extreme Events and Disasters

to Advance Climate Change Adaptation has been publicised through a series of regional outreach events in countries like Pakistan, Senegal, Brazil, and India, among others.

Despite many activities, the communication aspect of the IPCC work has been heavily criticised in the past. There are at least two reasons for that. The *first* relates to general difficulties in communicating the science of climate change to a non-scientist audience. This is because the IPCC reports are written in a highly technical style and may appear cryptic to people who do not hold the relevant scientific expertise. By providing an SPM in a non-technical language, the IPCC already addresses this difficulty. At the same time, the Summaries still fall short of communicating scientific findings to a lay person. Communicating with the general public has largely been ignored by the IPCC in the past. In this regard, the introduction of Frequently Asked Questions alongside the WG I SPM in the Fourth Assessment Report can be considered as a step forward to better communication of assessment findings. Further difficulties occur with regard to communicating different types of uncertainties of the science of climate change. The policy-making community expects concrete and certain guidance in order to make relevant decisions while the scientific community operates in the language of available scientific evidence. It is often impossible for scientists to make a one-hundred-per-cent certain statement, and hence decisions have to be made under uncertainty. For this, effective communication of scientific uncertainties is crucial. Among expert bodies, the IPCC has developed a ground-breaking approach to communicating scientific uncertainties which is primarily based on the strength of the supporting scientific evidence and the level of agreement in literature. Yet, the research has found that non-scientists still have difficulties in interpreting the IPCC uncertainty estimates (see Marx et al. 2007; Budescu / Broomell / Por 2009). The approach also has shortcomings when it comes to communicating uncertainties in social sciences (Yamineva 2010).

The *second* reason relates to the internal workings of the IPCC in relation to communications and outreach work. Until recently, the Panel simply did not communicate well with the outside world as to how it works, what the assessment process involves, and what a language on uncertainties meant. The Secretariat was understaffed and lacked professional expertise on communications and the Panel's top-down bureaucratic structure did not allow it to react swiftly to criticisms and error-findings. These inefficiencies led to a rather clumsy response to allegations of scientific misconduct at the beginning of 2010 which inevitably damaged the IPCC's reputation.

Strengthening communications was therefore a logical recommendation in the report of the IAC Review of IPCC Processes and Procedures, which the Panel attempted to address vigorously. The Secretariat is now equipped with a Senior Communications Manager assisted by an information and communications specialist. Even more importantly, the IPCC developed and adopted a Communications strategy in 2012 detailing the goals of communications, its principles, activities, audiences, methods and tools, and resources (IPCC 2012d). In accordance with the Principles of the IPCC Work and the Communications strategy, the communications should be: based on the grounds of objectiveness and transparency; policy relevant but not policy prescriptive; drawn from the IPCC reports; and timely and audience-appropriate. They should also recognise the unique nature of the IPCC and contain consistent messages. The document states that those speaking on behalf of the IPCC should "*refrain from public statements that could be interpreted as advocacy and compromise the IPCC's reputation for neutrality*" (IPCC 2012d). The Communica-

tions strategy also identifies IPCC spokespeople stating who can speak on behalf of the Panel and when, as well as issues of governance and management. The strategy clearly distinguishes between communications with regard to planned activities, for instance launching reports, and rapid responses to media enquiries or breaking stories.

Although it is too early to reflect on the impact of new arrangements and especially the Communications strategy on the work of the IPCC, it can be said that some positive effects are already apparent. The website has improved significantly in terms of contents, consistency and navigation and now provides more up-to-date information on the workings of the Panel. Also, the IPCC as a whole became more efficient and responsive to requests for information. The ongoing finalisation of the Fifth Assessment Report will serve as a major test of the new communications and outreach framework in the IPCC.

### 3.4 The role of the Intergovernmental Panel on Climate Change (IPCC) in the policy process

The IPCC reports are the most authoritative and comprehensive source of scientific information on climate change. Through its assessments of literature, the Panel has become the main provider of scientific knowledge to the UNFCCC negotiations. In fact, it is due to the IPCC's First Assessment Report of 1990 that the Convention itself came into being. The Report's findings confirmed the seriousness of climate change, prompting the Panel to call for an adequate international response, and this led the UN General Assembly to establish the Intergovernmental Negotiating Committee to conduct negotiations on a climate convention (Agrawala 1998b, 634; Yamin / Depledge 2004, 23). The IPCC played both a substantive and symbolic role during the negotiations of the new convention through providing relevant assessment findings and preparing a supplementary report to the First Assessment Report reaffirming its statements (Agrawala 1998b, 635). The Intergovernmental Negotiating Committee's negotiations resulted in the adoption of the UNFCCC in 1992, which to date has been ratified by 195 nations. The Convention's objective is to stabilise "*greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system*" (UNFCCC 1992). Under the framework agreement, all countries made general commitments to address climate change taking into account their national conditions, with developed countries also agreeing to non-binding commitments to reduce their greenhouse emissions.

After the adoption of the Convention on Climate Change, the IPCC continued to play a significant role in the development of the international climate change regime. The consequent Panel's assessments helped trigger major developments in the international climate change negotiations. For instance, the Second Assessment Report which asserted that "*the balance of evidence suggests a discernible human influence on global climate*" (IPCC 1995, 4) forced the political pace of the negotiations on the Kyoto Protocol to the Convention adopted in 1997 (Yamin / Depledge 2004, 24). The Protocol is an instrument setting legally-binding individual emission reduction targets for developed countries alongside several flexibility mechanisms to assist those countries in achieving emission reduction targets and a related compliance system. The Kyoto Protocol entered into force in 2005 and currently has 192 Parties (UNFCCC 2012b).

At the time of the completion of the Third Assessment Report, the UNFCCC regime was going through a crisis with the divide between developed and developing countries growing bigger. While the latter continued focusing on the implementation of existing commitments by developed countries, the former began advocating for extending commitments to reduce emissions to developing countries. Coupled with the complexity of the negotiations on details of the Kyoto Protocol regime, this led to the failure of the Hague conference in 2000. The subsequent United States' rejection in 2001 to ratify the Kyoto Protocol put the international climate change regime on the verge of collapse. According to some scholars, the IPCC's conclusions of 2001 reiterating anthropogenic climate change played their role in preventing the UNFCCC regime from disintegrating (Yamin / Depledge 2004, 27).

The Fourth Assessment Report again came out at a decisive moment of the UN negotiations on a future international policy framework to climate change. In a stronger tone than before, the Report concluded that the warming trend was "*unequivocal*" (IPCC 2007b, 5) and it was with more than 90 per cent likelihood due to the observed increase in anthropogenic greenhouse gas concentrations (IPCC 2007b, 10). The IPCC also provided new details on impacts of climate change, and mitigation and adaptation policies and measures. Consequently to the finalisation of the Fourth Assessment Report in November 2007, at their annual meeting in December 2007, the Parties to the UN Climate Change Convention approved a process to negotiate a new international agreement to respond to climate change. The negotiating process was set to be concluded at the fifteenth Conference of the Parties in Copenhagen, Denmark, in December 2009. The establishment of a new process was a significant step in the development of the international climate change regime because, for the first time, the process would engage both developing nations and the United States in negotiating a future agreement (Depledge 2008, 154). The Fourth Assessment Report impacted this step forward by highlighting the reality of anthropogenic climate change and the urgency of an international response. It also provided detailed information on the necessary emission reductions in developed countries and possible mitigation actions by developing countries (Metz et al. 2007, 776). The related numbers, although a highly dispute matter in the UNFCCC negotiations (Appleton et al. 2007, 15), have been widely referenced by policy-makers.

The climate change conference in Copenhagen in 2009 did not lead to agreement on a new comprehensive pact but instead dived into mutual accusations between developed and developing countries as well as procedural scandals (Akanle et al. 2009). It was only a year later, at the next Annual Meeting in Cancun, that Parties to the UNFCCC were able to agree on several key blocks of a future international framework on climate change. In 2011, the conference in Durban launched a new negotiation process through a subsidiary body – the *Ad Hoc* Working Group on the Durban Platform for Enhanced Action – to develop "*a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties*" by 2015 which would come into effect after 2020 (UNFCCC 2012a).

The next assessment report by the IPCC will be finalised between 2013 and 2014 and will therefore be closely watched by governments worldwide. The newest assessment findings by the Panel on the science of climate change and mitigation and adaptation options should inform the negotiations on a new treaty on climate change, including in the context of pre-2020 and post-2020 emission reductions. Furthermore, the Fifth Assessment Report

will contribute to the first review of the adequacy of the long-term global goal for emission reductions to reduce global greenhouse gas emissions to maintain the temperature increase below 2°C above pre-industrial levels. The review was agreed upon by the UNFCCC at the Cancun conference in 2010 and will take place between 2013 and 2015 (UNFCCC 2011, 137–138). The intrigue here is that several nations which are particularly vulnerable to the impacts of climate change support strengthening the global goal under the Convention to keep the temperature increase at 1.5°C which would imply greater emission reductions.

The history of the role of the IPCC's reports in the UN climate change negotiations reflects the fact that the UNFCCC has been the main client of the IPCC, and the Panel's assessment reports have been informing the policy process on the latest scientific findings. Yet there are no formal governance arrangements regulating the relationship between the UNFCCC and the Panel (Yamin / Depledge 2004, 479). In practice, the IPCC findings are addressed in the Subsidiary Body for Scientific and Technological Advice (SBSTA) – one of the two permanent subsidiary bodies of the Convention. The IPCC Chair regularly informs the SBSTA about the Panel's work, with the IPCC Secretary and Bureau members also attending the UNFCCC meetings. Sometimes, they are invited to speak or comment at UNFCCC meetings on issues related to report's findings. Parties can also ask the Panel to hold workshops and briefings on particular assessment conclusions as part of official meetings.

In terms of agenda setting, the UNFCCC can invite the IPCC to assess scientific literature on a specific topic but whether or not to respond to such invitation is the prerogative of the Panel to decide. In principle the IPCC can make a decision not to conduct such an assessment due to budgetary, time or institutional constraints, or other workload. Institutionally therefore, the IPCC is an autonomous body which decides on its workings and agenda independently from the UNFCCC. In practice, the Panel has been very responsive to requests from the UNFCCC for additional assessment work, recognising the Convention as the main user of its reports.

Over the years, however, the UNFCCC has not always embraced the IPCC conclusions on the latest science of climate change. It is no rarity for climate change negotiators to disagree on what exactly the implications of the IPCC's findings are for the international regime.<sup>3</sup> In the complex tangle of divisive positions and the difficult history of negotiations between developed and developing countries in the UNFCCC, the IPCC's findings are sometimes used selectively by countries to justify existing political choices. Despite the sober warnings of the past IPCC reports, the UN regime on climate change still falls far short of their recommendations.

Apart from strong and conflicting political interests involved, there are also other difficulties impacting the role of the IPCC in the policy process. These difficulties relate to the limits as to what type of scientific information the IPCC can provide to the policy community, illustrating inherent problems in science-policy relationship. While scientists seek for facts and evidence, policy-makers have to make value judgments. The IPCC positions itself as a provider of facts, not value judgments. This is for instance

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3 For example, the UNFCCC negotiators could not agree on the implications of the Second Assessment Report for the UN climate change regime (Lohan / Forner 2005, 160).

reflected in its principle of providing policy relevant but not policy prescriptive information. However, in real life, the boundary between policy relevant and policy prescriptive scientific findings is not always as distinct and easy to navigate. One of the most vivid examples is the notion of dangerous climate change. This is reflected in the Convention's ultimate objective, defined in Article 2, as to stabilise greenhouse gas concentrations "*at a level that would prevent dangerous anthropogenic interference with the climate system [...] within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner*" (UNFCCC 1992). The Convention's objective is normative in nature and supposes making value judgments as to when anthropogenic interference with the climate system becomes dangerous. The Article in this regard refers to both the impacts of climate change and associated greenhouse gas concentrations, and also sets three broad criteria against which climate change can be assessed as "*dangerous*": adaptability of ecosystems, food production, and sustainable economic development. In the UNFCCC itself, dangerous climate change, particularly when it comes to concentration targets, is a highly political matter to discuss. The associated benchmark of 2 degrees Celsius was only agreed on in 2010 (UNFCCC 2011) and also remains a controversial issue. For the IPCC, the notion of dangerous climate change has always been a challenge too, because the Panel is expected to produce relevant assessment findings to aide a policy-maker in deciding what climate change is dangerous. In the recent assessments, the Panel framed the issue in two ways: through (1) linking specific impacts with different levels of greenhouse gas concentrations and evaluating the probability of their occurrence, and by (2) identifying key vulnerabilities. In both cases, authors faced the challenge of providing meaningful policy relevant information while trying to avoid making value judgements.

The discussion above on the role of the IPCC in the policy process and the impact of its reports on decisions made in the UNFCCC shows the complex dynamics of the science-policy relationship with political interests involved, the importance of effective communication of scientific findings, and the difficulties of remaining a policy relevant but not policy prescriptive body.

### 3.5 Capacity-building

The positive role of the IPCC in capacity-building of developing-country scientists and governmental officials receives little mention in the media and scholars' reports. This is unjustified since in reality the IPCC has done a great deal of capacity-building work on the science of climate change within developing countries. Although capacity-building activities are not the main objective of the IPCC's work, they constitute directly or indirectly a significant part of its undertakings.

*First*, the Panel has on board 195 country members which implies almost universal representation of nations. Their actual participation in the IPCC meetings is vital, given that the governments decide on the outline of the reports, details of the assessment process and, most importantly, approve the Summaries of the reports in a plenary session. For this reason, the IPCC provides financial support to developing-country delegates to participate in the meetings of the Panel, WGs and WG Bureaux. In the Fourth Assessment, this financial assistance accounted for half of the Panel's budget. For example, 120 representatives of

governments from developing countries participated in finalising the Synthesis Report at IPCC-27 and their journeys were covered by the IPCC budget at a total cost of 480,000 US dollars (IPCC 2007a). The importance of the participation of governmental bureaucrats from various countries, who are responsible for formulating climate policy and/or expert advice, on a scientific assessment panel cannot be underestimated. By bringing the latest scientific findings on global climate change to them, the Panel helps build their knowledge and expertise. This effect is even more apparent for representatives of smaller developing countries where research on climate change is scarce due to insufficient research capacities.

*Secondly*, the IPCC strives for geographical balance among authors, review editors and expert reviewers of its assessment reports. Geographical representativeness among authors has been the concern of the IPCC since its establishment, and the participation of developing-country scientists in the assessment of literature and expert review has been consistently increasing ever since. It is one of the basic principles for the selection of authors that there should be balanced representation of scientists from developing and developed countries and countries with economies in transition (IPCC 1999, 5). In each chapter, there should be at least one, and normally two or more, authors from developing countries. Also, typically, for each chapter, one Coordinating Lead Author is selected from a developing country.

Participation of developing-country experts in the assessment process through work on writing teams as well as attendance at workshops and authors' and expert meetings helps increase research capacity in non-OECD countries. Importantly, the Panel through its Trust Fund provides financial support to developing-country scientists to attend authors' and expert meetings, and workshops. Other arrangements to facilitate the participation of scientists from developing countries in the assessment process are also in place, such as for instance free access to peer-reviewed journals for WG I authors in the Fourth Assessment Report (Gutierrez / Johnson / Yamineva 2009). In addition, the IPCC encourages young researchers to participate in the assessment process. For example, one of the criteria for the selection of authors is that they should represent "*a mixture of experts with and without previous experience in IPCC*" (IPCC 1999, 5).

Recently, the IPCC also established a scholarship programme with the money received from the Nobel Peace Prize awarded to the Panel in 2007 and other financial contributions that followed. The aim of the programme is to provide scholarship awards to young researchers from developing countries with the preference given to students from the Least Developed Countries and Small Island Developing States. Scholarship holders can pursue studies in the selected areas related to the science of climate change, and options for mitigation and adaptation. In 2011, the IPCC awarded nine postgraduate scholarships and in 2013 – fifteen.

Also, the IPCC process indirectly prompts international non-profit organisations to conduct relevant work to build the capacity of developing-country scientists for publishing peer-reviewed research and to ultimately participate effectively in the IPCC assessment of scientific literature. One such example was a series of writeshops organised by the Stockholm Environment Institute from 2010 to 2011 providing training to developing-country scientists on publishing peer-reviewed articles on the issues of the environment and development (Rockström 2011).

## 4 Summary and conclusions

The IPCC has been an example of how an international effort in consolidating scientific knowledge on climate change can shape the policy debate and continuously influence the policy-making process. Although a small number of errors were found in the Fourth Assessment Report, the external review of the Panel’s processes and procedures concluded that, overall, the institution is a successful science-policy interface. In addition, the Panel has strengthened its review procedures and governance, making it a more solid, responsive and transparent international organisation. Indeed, its efforts are highly praised in the scientific and policy community, and the model of the IPCC is often considered an example for other science-policy interfaces on global environmental issues. For instance, the Intergovernmental Platform on Biodiversity and Ecosystem Services, established in 2012, bears many similarities to the IPCC.

The governance model of the IPCC has many unique features which, on the one hand, enabled the body to become an influential voice of climate science in the policy-making community but, on the other, also allows critics to pinpoint a too-close engagement of governments in scientific assessment and their attempts to shape findings according to political interests. The following table (Table 2) summarises the strengths and weaknesses of the governance model of the Panel, with the text below providing more detail on this.

<b>Characteristics of the IPCC governance model</b>	<b>Resulting strengths</b>	<b>Resulting weaknesses</b>
<b>1. Neither a research organisation nor a policy advice body</b>	The IPCC has autonomy and relative independence from the UNFCCC process	In reality, many governmental representatives are the same in both processes Also: it is hard to separate clearly policy-relevant information from policy prescription, especially when it comes to mitigation and adaptation policies
<b>2. Intergovernmental nature</b>	Governments are involved in approving the main assessment findings which legitimises them and provides a sense of shared ownership	High politicisation of the approval process where governments sometimes highlight, water down, or reject particular findings depending on what suits their interests
<b>3. Global representation</b>	Wide membership and involvement of scientists from developing countries ensures international legitimacy of IPCC assessment findings	Geographic representation among scientists involved is hard to ensure for a variety of reasons
<b>4. Assessment is based primarily on peer-reviewed literature</b>	Ensures scientific integrity and rigour of findings	Ignores other types of knowledge, for example traditional knowledge about adaptation to climate change Peer-reviewed literature on some issues is scarce or non-existent Most peer-reviewed literature originates in OECD countries
<b>5. Provides a big interdisciplinary picture of global climate change</b>	Comprehensive assessment of knowledge including the science of climate change, impacts and vulnerability, and adaptation and mitigation options	Long, cumbersome process Few policy-makers read full reports The model is poorly suitable for novel policy issues
Source: Author’s own compilation		

*First*, the nature of the IPCC differs from other science-for-policy institutions such as those discussed in the OECD report “Meeting Global Challenges through Better Governance of International Co-operation in Science, Technology and Innovation” (OECD 2012). The Panel is not a research organisation that produces scientific knowledge or coordinates and promotes international scientific collaboration, similar to other organisations analysed in the OECD project. Further, the IPCC has no mandate to provide policy advice like, for instance, the International Energy Agency or the Bill and Melinda Gates Foundation. Instead, the place of the IPCC is somewhere in-between science and policy because the Panel assesses the already-existing scientific literature for its relevance to the international policy of addressing climate change. This is a significant characteristic of the IPCC’s model of governance that it does not produce or coordinate research on climate change and it cannot provide policy advice. The role of the IPCC is to serve as an intermediary between the science of climate change and the international climate change policy-making process under the UNFCCC. The Panel translates the latest scientific findings of mostly peer-reviewed literature into policy-relevant but not policy prescriptive information to provide the basis for policy decisions. Due to this special role, from the start, the governance arrangements of the IPCC were such as to ensure its autonomy and scientific independence from the UNFCCC where the main political decisions are made. The Panel is a self-ruled body which decides on its procedures and agenda itself. It has its own distinct institutional personality and interacts with the UNFCCC on an equal basis. Even though the UNFCCC can invite the IPCC to provide scientific information on a specific issue, this request has to be first considered by governmental members of the Panel as to the suitability and feasibility of such work. The mandate and institutional arrangements of the IPCC are different from other multilateral environmental regimes where science-for-policy bodies are often either elements of the policy-making process and/or have a policy advisory role.

At the same time, although the governance arrangements seemingly ensure the autonomy and independence of the IPCC from the policy-making process, in reality the two processes are intimately intertwined. Many governments are represented by the same people in both processes and it is not infrequent that lead negotiators from the UNFCCC play an active role in approving IPCC assessment findings. As for the separation of the Panel from research, again although formally the institution does not generate research, it does influence research agendas and questions informally through its most active authors who are often renowned academics and involved in various science associations. The same goes for a policy relevant but not policy prescriptive role. This intermediary role can be hard to ensure. A clear boundary between research and policy advice may be difficult or even impossible to draw, especially with regard to mitigation and adaptation options. An analysis of the effectiveness of different mitigation policies is prescriptive in its conclusions by nature. One can even claim that the more policy relevant the information is, the more prescriptive it becomes.

The *second* important characteristic of the IPCC’s model is its intergovernmental nature. This is not a panel consisting of scientists but governments, and this unique characteristic of the IPCC is its main strength and the secret behind its success in effective science-policy communication. Governments are engaged not only in the running of the organisation but also in the actual assessment process through endorsing the scope of assessment reports, nominating authors and, most importantly, through the line-by-line approval of the assessment summaries. As a result of close involvement of governments at various stages of the assessment process, they become *co-makers* of the IPCC conclusions together with scientists rather than simply recipients of knowledge. This legitimises assessment

findings, and cultivates a sense of shared ownership and responsibility among governments over findings, which is highly important for the UN climate change negotiations. As some interviewees noted, after the formal endorsement of the assessment report, governments cannot discard or ignore its conclusions on the grounds that they are made by scientists.

At the same time, the assessment process in the IPCC is carefully crafted in such a way that it ensures the independence of scientists involved in the assessment of literature. The reports of the Panel are prepared by authors who are selected for their scientific expertise in various fields relevant to climate change. The role of governments at this stage remains limited to providing comments which may, or may not, be incorporated into the report at the discretion of review editors who are also scientists. Governments only approve line-by-line the Summaries of the full assessment reports. In doing so, they are not entirely free as to what information to insert or highlight as their every claim should be fully based on the underlying assessment which is prepared by scientists. The clear boundaries of governmental intervention in the assessment process of the IPCC are highly important because they are intended to guarantee the scientific integrity of the assessed findings.

Yet, the same characteristic of the IPCC, its intergovernmental nature, is also a weakness as it can lead to the politicisation of the scientific assessment process. The IPCC reports play an important legitimising role in the international climate change negotiations. For this reason, governments with high stakes pay close attention to the work of the Panel and actively engage in its deliberations. Although governments are limited in their freedom to make changes to a summary of assessment findings as these have to be based on the underlying scientific assessment, there still remains a room to highlight, water down, or reject particular conclusions depending on what fits political agendas. This can undermine the scientific integrity of the assessment reports. Because members of the Panel have to come to an agreement, some assessment conclusions as a result become too conservative as they reflect the lowest common denominator. Also, because governments constitute the Panel, the process is less inclusive of other stakeholders. Although experts can be involved in their personal capacity, overall the role of civil society, business and other stakeholders in the IPCC is minimal.

The *third* characteristic of the governance model of the IPCC is the global representation of both governments - members of the Panel - and scientists involved in the assessment. The membership of the Panel includes governments of virtually all UN members and hence has a truly global nature. As a UN body, the IPCC operates on the basis of the consensus rule and all members, whether they are a large developed country or a small developing state, have equal rights in decision-making. Geographic representation, with a special attention paid to balance between developed and developing countries, is also a principle for the selection of scientists to prepare assessment reports. The inclusive nature of the Panel is a fundamental factor for the credibility and legitimacy of the IPCC's findings.

Although in theory, the institutional arrangements ensure equal and representative participation of nations in the IPCC, in practice governments have differing resources and capacities to participate in the assessment process. The size of governmental delegations at meetings is one example. Many developing countries are represented by just one person while developed countries have a capacity to bring up to twenty people to important meetings. This matters because key sessions where the Panel discusses draft reports line-by-line involve long working hours, night consultations and parallel meetings. The approval of the draft Summary for Policy-Makers of the Working Group III report in the Fourth

Assessment Report required about fifty hours of intensive discussions taking place in just four days. Hence, small delegations have a limited capacity to participate fully in the meetings of this type. Also, it is mostly developed and some large developing countries that provide comments on draft reports at the review stage.

The same is true for geographical representation among scientists engaged in the assessment process. Although the Panel strives for balanced representation of authors from developed and developing countries and has the necessary arrangements in place, the reality is that the majority of authors come from developed countries, especially in WG I. There are several reasons for that imbalance, including: lack of remuneration for an author's job, lack of access to peer-reviewed journals, language difficulties, internet communication and visa problems, and insufficient expertise or training. The imbalance also reflects a deeper asymmetry in the current state of scientific knowledge production: most researchers are based in OECD countries and the majority of peer-reviewed articles originate from there.

The *fourth* element relates to the basis of IPCC assessments which is primarily peer-reviewed scientific literature. Non-peer-reviewed sources like analytical reports by governments or think tanks can also be included provided they undergo a critical assessment by authors. The strict requirements for the basis of the assessment aim to ensure the scientific integrity, rigour and objectiveness of findings as well as reliance on the best available science. This model however supposes that a significant body of peer-reviewed research exists on various aspects of climate change at hand. This makes it less appropriate for issues little researched by academics, including novel policy issues. The IPCC has no mandate to conduct research on the matters of interest for policy-makers or to fill the gaps in the literature. Although there are procedures for including non-peer-reviewed work into reports, such sources are secondary and little welcomed by governments.

The *fifth* characteristic of the IPCC is that it produces comprehensive assessments of the entire body of scientific knowledge available to date. This spans atmospheric sciences, oceanology, development studies, economics, law and many other disciplines both within natural and social sciences. The resulting assessment reports come in massive volumes of several hundreds of pages becoming a reference material both for scientists and policy-makers. Yet this also implies a highly bureaucratic and cumbersome assessment process taking about six to seven years. The process involves hundreds of scientists and other experts from around the globe. Science-policy interface of this scale is therefore a colossal task requiring huge organisational effort, and significant resources including finance. Critics point out that there is little utility in producing massive volumes of assessment material and there is more demand for targeted, up-to-date knowledge of specific issues.

In sum, the IPCC model, being in many ways unique among science-policy interfaces, has both strengths and weaknesses. The model was shaped in many ways by the characteristics of climate change as a policy issue: (1) the global nature of a problem demands an international political and policy response within the United Nations; (2) the high degree of uncertainty about scientific aspects; (3) the complex problem which requires an interdisciplinary input; (4) the need to establish trust in scientific findings – which in the past were mainly generated in developed countries – among developing countries; and (5) the conflicting political, economic and development interests. This context of the establishment and functioning of the IPCC should be kept in mind by scholars and practitioners who are working on improving the scientific input into international policymaking processes.

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