

1. Introduction

The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) to conduct assessments of the scientific basis for understanding the risk of human-induced climate change, its potential impacts, and options for adaptation and mitigation (WMO, 1988; IPCC, 1998).¹ An assessment is a process by which independent experts review and synthesize available scientific and technical knowledge relevant to climate change that is needed by policymakers to help make decisions (NRC, 2007). Thus, the IPCC assessment process sits at the interface between science and policy and necessarily involves both governments and scientists. Governments—the Member nations of WMO and UNEP—agree on the scope and outline of the periodic reports, nominate authors, review the results, and approve the Summaries for Policymakers. They also select the scientific leaders of the assessment process. More than a thousand volunteer scientists from around the world—often supported by their universities, government laboratories, and nongovernmental organizations—evaluate the available information on climate change and draft and review the assessment reports. The task is extraordinarily complex because of the broad scope of the assessment and the fact that it is assembled by a decentralized worldwide network of scholars.

IPCC assessments have been instrumental in informing national and international climate policy options (e.g., Hulme and Mahony, 2010) as well as in raising public awareness of climate change, which earned the IPCC a share of the Nobel Peace Prize in 2007.² However, amid an increasingly intense public debate over the science, impact, and cost of climate change, the IPCC has come under heightened scrutiny about its neutrality toward specific climate policies (e.g., Pielke, 2007) and the accu-

¹ The scientific and political motivations for establishing the IPCC are discussed in Hecht and Tirpak (1995), Agrawala (1998 a, b), and Bolin (2007).

² See http://nobelprize.org/nobel_prizes/peace/laureates/2007/.

BOX 1.1 Committee statement of task

The Committee will perform the following tasks:

1. Review the IPCC procedures for preparing assessment reports including, but not restricted to:
 - a. Data quality assurance and data quality control;
 - b. Guidelines for the types of literature appropriate for inclusion in IPCC assessments, with special attention to the use of non-peer-reviewed literature;
 - c. Procedures for expert and governmental review of IPCC materials;
 - d. Handling of the full range of scientific views; and
 - e. Procedures for correcting errors identified after approval, adoption, and acceptance of a report.
2. Analyze the overall IPCC process, including the management and administrative functions within IPCC, and the role of UNEP and WMO, the United Nations system and other relevant stakeholders, with a view to strengthen and improve the efficiency of the assessment work and effectively ensure the consistent application of the IPCC procedures.
3. Analyze appropriate communication strategies and the interaction of IPCC with the media to ensure that the public is kept apprised of its work.
4. Prepare a report on the outcome of the activities referred to above, including:
 - a. Methodology of the report preparation and measures taken to ensure high quality of the report findings;
 - b. Recommendations for amendments to the IPCC procedures;
 - c. Recommendations concerning strengthening the IPCC process, institutions and management functions;
 - d. Any other related recommendations; and
 - e. Outline of a plan for the implementation of recommendations.

racy and balance of its reports (e.g., PBL, 2010). The scrutiny reached a pinnacle in early 2010 when errors, including a highly publicized mistake in the melting rate of Himalayan glaciers, were discovered in the Fourth Assessment Report. The revelation of errors came on the heels of another highly publicized controversy in which the unauthorized release of e-mail exchanges between prominent climate scientists at the University of East Anglia and elsewhere, many of whom had contributed to IPCC assessments, purported to show attempts to misrepresent some climate data (e.g., Oxburgh et al., 2010). Although many scientists noted that neither the leaked e-mails nor the IPCC errors undermined the principal scientific findings regarding human contributions to climate change (Gleick et al., 2010), public opinion polls in the United States and United Kingdom showed that public confidence in climate science has waned (e.g., BBC, 2010; Jasanoff, 2010; Jowit, 2010).

In this context, Ban Ki-moon, Secretary-General of the United Nations, and Rajendra Pachauri, Chairman of the IPCC, requested that the Inter-Academy Council (IAC) conduct an independent review of IPCC processes and procedures used to produce assessments (Appendix A). The Committee established by the IAC was asked to review IPCC procedures for preparing assessment reports, the management and administrative structure of IPCC, and IPCC strategies for communicating with the media and public, and to make recommendations for strengthening the IPCC in these areas. The specific tasks to the Committee are presented in Box 1.1.

This report examines the procedures and processes used to carry out IPCC assessments; it does not examine climate change science or the validity of its representation in the assessment reports. It also does not consider the work of IPCC's Task Force on National Greenhouse Gas Inventories, which is not part of the climate assessment process.

Current challenges facing the IPCC

Carrying out an intergovernmental climate assessment is an inherently difficult task. It involves many thousands of people with different expertise, cultures, interests, and expectations. The available information on climate change is extensive, multidisciplinary, and multinational in nature; extends across multiple spatial and temporal scales; is subject to different interpretations; and has a wide range of uncertainties. In fact, a great deal remains to be discovered. The processes and procedures for carrying out the assessment must be detailed but not overly prescriptive. And while government representatives must have an important role in the

assessment, they must carry out their role without asking scientists to address questions that are beyond the scientific frontier or distorting the scientific findings.

The IPCC assessment process is also complicated by several challenges that have arisen or become more acute in recent years. To begin with, the growing influence of developing nations has changed the geopolitical context for making decisions on climate change. And as the potential influence of IPCC assessments on government decisions that would affect the energy sector becomes increasingly clear, the IPCC finds itself in the heart of a political debate with serious economic consequences. This heated political context is amplified by a frenzied and often polarizing media environment, and communicating within this atmosphere has proved difficult.

The IPCC assessment task is further complicated by how far and how rapidly climate science has advanced in recent years. For example, the number of relevant publications that inform the drafting of an IPCC assessment grew from about 5,000 for 1991-1995 to about 19,000 for 2001-2005.³ At the same time, the complexity of the climate system and its impacts has become increasingly apparent. The IPCC has responded to these changes by adding authors and reviewers and allowing reports to lengthen (Figure 1.1). As a result, the number of authors has tripled and the length of the reports quadrupled from the first to the fourth assessment, despite serious efforts to set page limits. In addition, the number of reviewers has more than doubled, leading to a commensurate increase in the number of review comments to be addressed. Drafts of the Fourth Assessment Report drew more than 90,000 review comments.⁴ Despite this increase in complexity, the basic management and governance structure for administering the vast undertaking of an IPCC assessment—including an intergovernmental Panel, WMO and UNEP sponsorship, three Working Groups to carry out the assessment, a small Bureau to oversee the work of the Panel, and a permanent Secretariat to provide coordination and organizational support (Agrawala, 1998b)—has not changed since the first assessment.

The number of scientific disciplines involved in producing an IPCC assessment also presents a challenge given that the nature and maturity of the science varies across disciplines. Working Group I, which assesses the

³ Presentation to the Committee from Rajendra Pachauri, IPCC Chair, on May 14, 2010. All review comments on the Fourth Assessment Report are available at http://www.ipcc.ch/organization/organization_procedures.htm.

⁴ Ibid.

physical climate system, covers the natural science disciplines, including meteorology, hydrology, oceanography, ecology, and cryospheric science. The assessment relies on observations, global models, and peer-reviewed literature, and can draw on large numbers of practitioners with a long history of collaboration. In contrast, Working Group II, which deals with impacts of climate change and strategies for adaptation, and Working Group III, which addresses mitigation options, cover dominantly social science disciplines, such as geography, economics, political science, and sociology. Working Groups II and III rely more heavily on non-peer-reviewed literature (sometimes called gray literature) and involve a smaller, more diverse set of experts who may have less experience working on large international projects. The fact that scientific expertise for all three Working Groups resides predominantly in developed countries is an ongoing challenge for dealing with a global issue.

Committee approach and methodology

The IAC Committee operated independently from the UN and IPCC in conducting its review, and attempted to pursue a deliberative and consultative approach by obtaining information from a variety of sources within and outside of the IPCC, including from experts with divergent views of IPCC processes. The Committee included experts from several countries and from a variety of disciplines. Its first two meetings, held in Amsterdam and Montreal, included public webcast sessions of presentations by IPCC and U.N. officials and by scientists with different perspectives on IPCC processes and procedures.⁵ Subgroups of the Committee also held meetings in Brazil, China, and the United States, and a subgroup visited the IPCC Secretariat in Geneva as well.

The Committee also gathered input from experts with a variety of views on the IPCC assessment process via interviews and a widely distributed questionnaire (Appendix B). The questionnaire was sent to IPCC government representatives, scientific leaders of the fourth and upcoming fifth assessments, critics and proponents of the IPCC assessment process, and organizations with an interest in the content of the assessment reports, such as scientific societies and nongovernmental organizations. The questionnaire was also posted on the Committee's website so the general public could comment. More than 400 individuals, listed in Appendix C, provided input. The prevailing views of the questionnaire respondents

⁵ Audio recordings of the presentations are available at <http://reviewipcc.interacademycouncil.net/>.

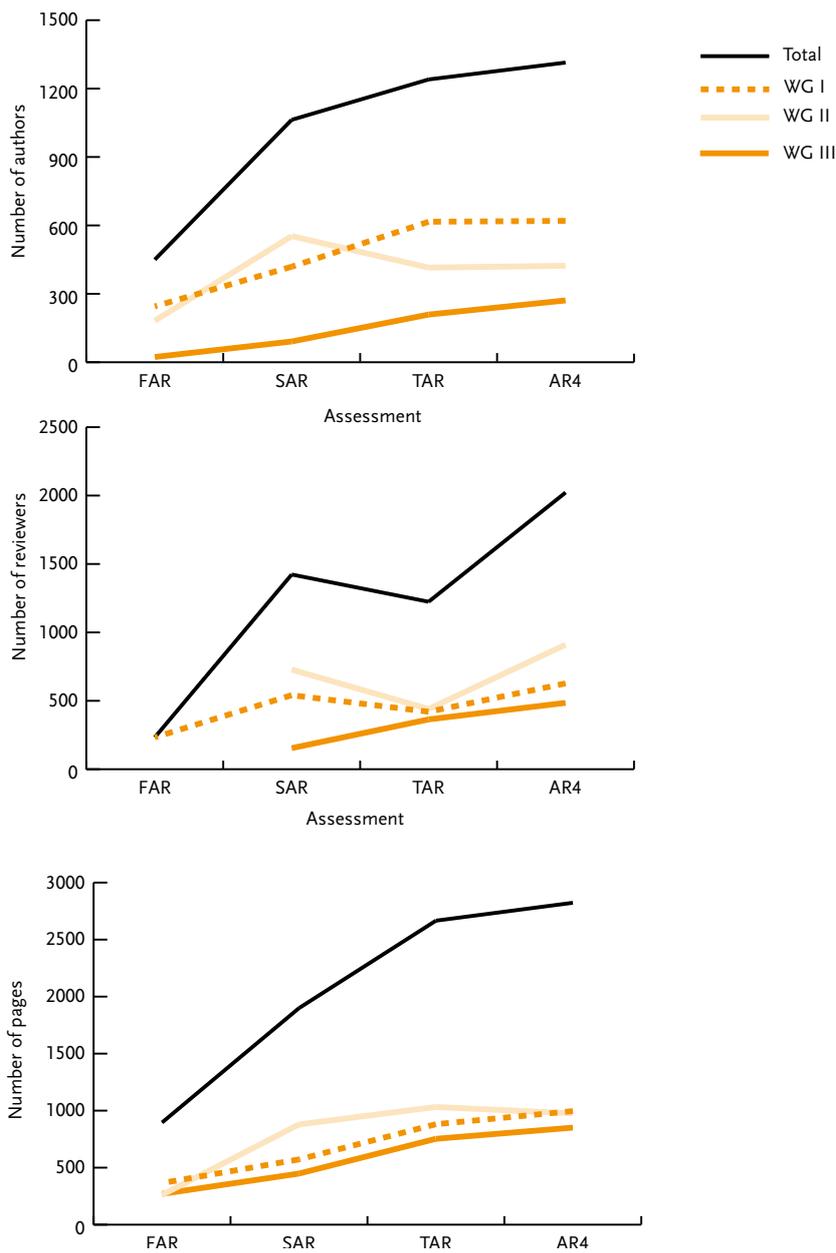


Figure 1.1 Trends in the number of authors (top) and reviewers (middle) and in the length of the Working Group (WG) reports (bottom) from the first assessment (FAR) to second (SAR), third (TAR) and fourth assessments (AR4). Authors who participated in two Working Groups for any given assessment are counted twice for that assessment. Reviewer names were not listed in the Working Group II or III reports for the first assessment.
 Source: Compiled from information in the assessment reports.

about the various steps in the IPCC assessment process are summarized in this report and a compilation of all of the responses, with identifiers removed, is available from the IAC.⁶

The IPCC Secretariat also supplied extensive information requested by the Committee. The Committee used this and other material to familiarize itself with IPCC's complex processes and procedures. To identify potential improvements to the assessment process, the Committee consulted published articles about the IPCC process. A growing body of literature on the characteristics of successful assessments—such as the relevance of the results to the target audience, the credibility of the analysis to the scientific community, and the legitimacy of the process to stakeholders (e.g., Cash et al., 2002; NRC, 2007)—was also taken into consideration.

A final meeting was held near London, where the Committee completed drafting its report. Following a peer review by 12 experts, the Committee finalized this report in August 2010. The IAC Board approved its publication.

Overview of the IPCC assessment process

Participants

The IPCC comprises representatives of 194 governments who meet annually to make major decisions about IPCC's procedures, work plan, and other matters (Box 1.2). To date, three Working Groups established under the IPCC have carried out the scientific and technical assessment of climate change:

- Working Group I assesses the physical scientific aspects of the climate system and climate change, including attribution of past change and projections of future change.
- Working Group II assesses the vulnerability of socioeconomic and natural systems to climate change, negative and positive consequences of climate change, and options for adapting to it.
- Working Group III assesses policy and technology options for mitigating climate change through, for example, limiting or preventing greenhouse gas emissions and enhancing activities that remove them from the atmosphere.

6 See <http://www.interacademycouncil.net/>.

BOX 1.2 Roles of participants in IPCC assessments

Panel (194 representatives of Member nations of WMO and/or UNEP)—Determines the IPCC structure, principles, procedures, work program, and budget; nominates and elects the IPCC Chair and Bureau members; agrees on the scope, outline, and work plan for an assessment report; nominates authors and reviewers; approves the Summaries for Policymakers; and accepts the reports

Government Focal Points—Coordinate IPCC activities in their country, including providing a list of national experts and compiling review comments from different government agencies

Observer organizations (80 UN bodies, intergovernmental organizations, and nongovernmental organizations)—Nominate authors and reviewers and, at the invitation of the IPCC Plenary, provide input on the scope of the assessment reports

IPCC Bureau (31 members, including the IPCC Chair, three IPCC Vice Chairs, seven Working Group Co-chairs, 18 Working Group Vice Chairs, and two Co-chairs of the Task Force on National Greenhouse Gas Inventories (not discussed in this report)—Provide guidance and lead the author teams through preparation of an assessment report. The roles of Bureau members are not formally defined, but include the following:

- **IPCC Chair**—Plan, oversee, and guide all IPCC activities, including scoping and writing of the Synthesis Report; reporting to the governing bodies of WMO, UNEP, and the United Nations Framework Convention on Climate Change; and speaking for the IPCC
- **IPCC Vice Chairs**—Perform the duties of the Chair in his/her absence and other duties as mutually agreed
- **Working Group Co-chairs**—Lead the selection of authors and reviewers and the preparation, review, and finalization of their Working Group report
- **Working Group Vice Chairs**—Assist the Working Group Co-chairs, bring together regional efforts and approaches, and stimulate networking on relevant regional issues

Coordinating Lead Authors—Ensure that major sections of the report are completed and conform to style standards, and that cross-cutting scientific or technical issues are addressed in a coherent way

Lead Authors—Synthesize material for their chapter in a consistent style and revise drafts in response to reviewer comments

Contributing Authors—Provide text, graphs, or data for incorporation into the report by Lead Authors

Review Editors—Assist in identifying expert reviewers, ensure that review comments receive appropriate consideration by Lead Authors, and ensure that controversial issues are reflected adequately in the report

Expert reviewers—Comment on the scientific and technical accuracy, completeness, and balance of the draft reports

Government reviewers—Comment on the accuracy, balance, and clarity of the draft report and its consistency with the Working Group mandate

Technical Support Units (one for each Working Group, each with five to 10 full-time positions, and for the Synthesis Report)—Coordinate and administer the activities of the Working Groups and Synthesis Report writing team, including communicating with authors and reviewers, organizing author meetings, compiling and editing drafts, and coordinating the review process

IPCC Secretariat—Plan, oversee, and manage IPCC activities, including organizing sessions of the IPCC Plenary and Bureau, facilitating Bureau elections, assisting with travel of developing-country scientists, communicating with governments, managing the budget and website, paying expenses, and coordinating report publication and outreach

Sources: IPCC (1992, 1999, 2006), <http://www.ipcc.ch/index.htm>.

Assessment reports

IPCC assessment reports are intended to provide a comprehensive, objective analysis of the available literature on the nature and causes of climate change, its potential environmental and socioeconomic impacts, and possible response options. The IPCC policy is to use only available scientific and technical information in the assessments. The IPCC itself does not conduct research to support the process, although expert meetings and workshops may be held in advance of an assessment to provide input on specific issues (e.g., emission scenarios),⁷ and the leading modeling centers around the world contributed model output to support Working Group I in the fourth assessment.⁸ The primary source of information is intended to be peer-reviewed literature. Where such literature is not available, appropriately considered and documented non-peer-reviewed literature (e.g., industry journals, workshop proceedings, reports of governments and international organizations) may be used. Although policymakers are the primary target audience, the reports are intended to be policy relevant, not policy prescriptive, and to present the range of thoughtful scientific viewpoints.

The results of the assessment are published in four volumes: three Working Group reports and a Synthesis Report. Each Working Group report includes chapters on specific topics; a Technical Summary of the chapter contents; and a Summary for Policymakers, which highlights the key findings of the assessment. Although the scientists determine the content of the Summary for Policymakers, the final wording is negotiated with government representatives for clarity of message and relevance to policy. The Technical Summary provides a more detailed overview of the scientific basis for those findings and also a road map to the chapters of the underlying report. The Synthesis Report is a much shorter document that integrates the findings of the three Working Group reports and summarizes the climate change issues of concern to policymakers in a nontechnical style.

⁷ See reports of workshops and expert meetings at http://www.ipcc.ch/publications_and_data/publications_and_data_supporting_material.htm.

⁸ The effort was initiated and coordinated by the World Climate Research Programme's Working Group on Coupled Modeling. See http://cmip-pcmdi.llnl.gov/cmip3_overview.html?submenuheader=1.

The IPCC assessment process in brief

The IPCC assessment process begins with an evaluation of lessons learned from the previous assessment and the identification of future needs of participating governments. These are discussed in one or more scoping meetings among scientists, other experts, and government representatives. The process gets under way in earnest when the Panel elects the IPCC Chair, the Co-chairs of the three Working Groups, and the rest of the Bureau. The Panel, in consultation with the newly elected Working Group Co-chairs, establishes the broad mandate of the Working Groups and the time frame for the reports (Figure 1.2). The Bureau helps develop a more detailed outline for the report and, most importantly, oversees its preparation (Box 1.2). Once governments have approved the outline and work plan, the Working Group Co-chairs and Vice Chairs select the Coordinating Lead Authors and Lead Authors responsible for the scientific and technical content of their report (Box 1.2).

Coordinating Lead Authors and Lead Authors meet twice to draft the Working Group reports, enlisting text, figures, or other input from Contributing Authors as needed. Each report undergoes two formal reviews and one or more informal reviews. Informal reviews of early text are provided by a small number of scientists, often other authors. The first complete draft of the Working Group report is formally reviewed by experts with a range of views, expertise, and geographical representation nominated by governments, observer organizations, and the Bureau. The expert reviewers are asked to comment on the accuracy and completeness of the content and the overall balance of the draft (Box 1.2). The Lead Authors meet to respond to the review comments, usually in the presence of the Review Editors, and prepare the second draft. The Review Editors are responsible for ensuring that review comments and controversial issues are handled appropriately (Box 1.2). The second draft is reviewed by the same experts and by government representatives, who are asked to comment on the accuracy, clarity, and balance of the draft and its consistency with the Working Group mandate. The authors and Review Editors take into consideration the review comments in preparation of the final draft. After the Working Group report is completed, the Summary for Policymakers is approved, line by line, in a session chaired by the Working Group Co-chairs and attended by government representatives of all Panel members. The final Working Group report is then forwarded to the Panel for acceptance.

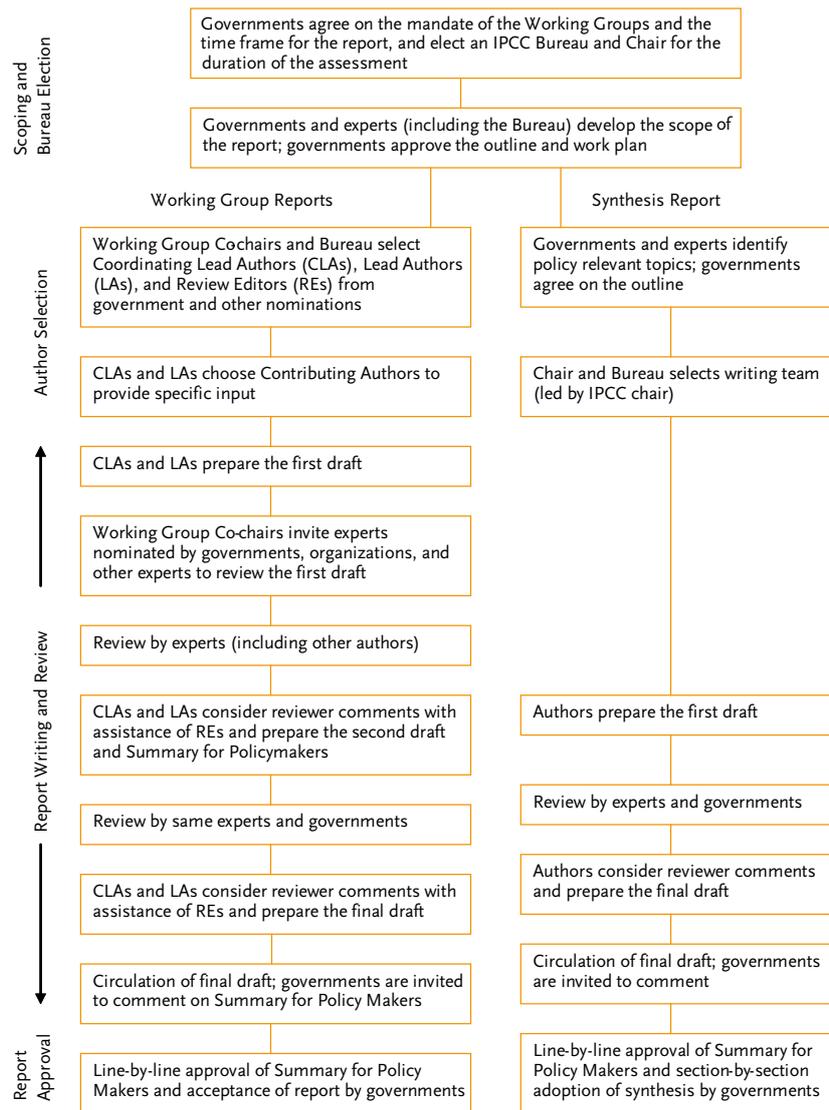


Figure 1.2 Process for preparing an IPCC Assessment Report. The initial steps (scoping and Bureau election) take place over a few years and several meetings. In this diagram, ‘governments’ are representatives of ministries or federal agencies and ‘experts’ are generally scientists from academia, government agencies, the private sector, and nongovernmental organizations. In general, the IPCC Secretariat facilitates the work of the Panel and supports scoping, Bureau election, government nominations, and report approval. The Technical Support Units assist the Working Group Co-chairs and Synthesis Report writing team and support author selection and report writing and review.

Preparation of the Synthesis Report begins after the Working Group reports are under way. Governments determine the most important policy-relevant topics and the report outline, and then a writing team—led by the IPCC Chair and including Coordinating Lead Authors of the Working Group reports and other experts—drafts the report. The draft report is reviewed by experts and governments, whose responsibilities include checking for consistency between the Synthesis Report and the Working Group reports. The Summary for Policymakers is approved line by line, and the synthesis is approved section by section by the Panel in Plenary session.

Organization of this report

This report is intended to inform discussions at the 32nd session of the IPCC Plenary, which will be held in South Korea in October 2010, and work on the fifth assessment and subsequent assessments. For this report to be considered at the IPCC Plenary, it had to be delivered to the United Nations by August 30, 2010, for distribution to Member governments. Consequently, the Committee had only four months since its formation in late April to gather and analyze information, deliberate, and produce a peer-reviewed report. Given these time constraints, there are necessarily issues that could not be addressed in this report. Consequently, the Committee focused on the assessment process and how it is managed, and only touched on the relationship of the IPCC with WMO and UNEP.

This report reviews the IPCC assessment process and recommends ways to strengthen it. Chapter 2 evaluates the major elements of the IPCC assessment process. Excerpts of the relevant IPCC procedures are given in Appendix D. Chapter 3 examines how uncertainty was characterized and communicated in the Fourth Assessment Report and recommends ways to improve IPCC's uncertainty guidelines for subsequent assessments. Chapter 4 discusses IPCC governance, management, and communications. Chapter 5 summarizes the Committee's conclusions and identifies issues that could benefit from additional study. Appendix A provides the letters of request for an IAC review of IPCC's processes and procedures. The questionnaire seeking community input on these processes and procedures is given in Appendix B, and a list of the 400-plus individuals who contributed written or oral comments is given in Appendix C. Biographical sketches of Committee members are given in Appendix E, and a list of acronyms and abbreviations is given in Appendix F.

