

Intergovernmental Panel on Climate Change

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Synopsis

An outline is given of the IPCC and its role in helping to lay out options and consequences of actions or lack thereof related to anthropogenic climate change. A description is provided of how the IPCC is set up and functions, the scientific assessment process, who participates, and the intergovernmental linkages, all of which lead to the IPCC reports every 5–7 years. The procedures are designed to provide policy relevant but not policy prescriptive scientific advice to policy makers and the public. The main findings are briefly described along with the recent controversy involving IPCC.

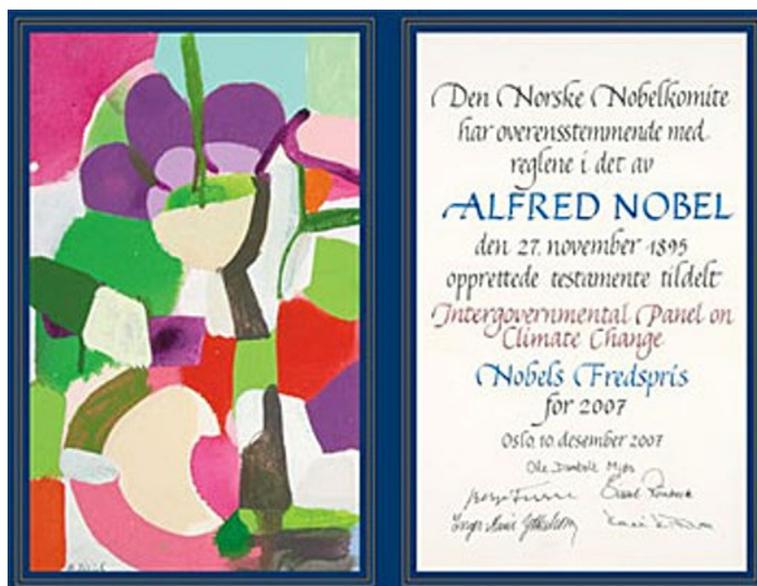
In 2007, the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), known as AR4, clearly stated that 'Warming of the climate system is unequivocal' and it is 'very likely' due to human activities. Later in 2007, the IPCC won the Nobel Peace Prize, jointly with Al Gore Jr. 'for their 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.' This article describes the IPCC and its role in society and politics.

The IPCC is an international organization that includes a panel of governments and a body of scientists from around the world convened by the United Nations jointly under the United Nations Environment Programme and the World Meteorological Organization (WMO) and initiated in 1988. Its mandate is to provide policy makers with an objective assessment of the scientific and technical information available about climate change, its environmental and socioeconomic impacts, and possible response options. The IPCC reports on all aspects of the science of global climate and the effects of human activities on climate in particular. Major assessments were made in 1990, 1995, 2001, and 2007 and are called the First, Second, and Third Assessment Reports (FAR, SAR, and

TAR) and AR4 for the Fourth Assessment Report. The Fifth Assessment report (AR5) was released in 2013.

Each new IPCC report reviews all the published literature over the previous 5–7 years and assesses the state of knowledge, while trying to reconcile disparate claims and resolve discrepancies, and document uncertainties. There is a 'technical summary' and a short 'summary for policy makers' (SPM) and the volume from each of the three working groups (WGs) has tended to run to about 1000 pages or so.

WG I deals with how the climate has changed and the possible causes. It considers how the climate system responds to various agents of change and the ability to model the processes involved as well as the performance of the whole system. It further seeks to attribute recent changes to the possible various causes, including the human influences, and thus it goes on to make projections for the future. WG II deals with impacts of climate change, vulnerability, and options for adaptation to such changes, and WG III deals with options for mitigating and slowing the climate change, including possible policy options. Each WG has two coauthors, one from a developing country and one from a developed one. Each WG is staffed by a small Technical Support Unit that is hosted by one of the coauthors of the WG.



The IPCC also includes a task force on National Greenhouse Gas Inventories (TFI) to oversee the National Greenhouse Gas Inventories Programme and to develop and refine an internationally agreed methodology and software for the calculation and reporting of national greenhouse gas emissions and removals and to encourage its use by parties of the United Nations Framework Convention on Climate Change (UNFCCC). The task group on Data and Scenario Support for Impacts and Climate Analysis was established to facilitate cooperation between the climate modeling and climate impacts assessment communities by increasing the availability of climate change-related data and scenarios for climate analysis and impacts, adaptation, vulnerability, and mitigation research.

The IPCC is an intergovernmental body. It is open to all member countries of the United Nations and WMO. Currently, 194 countries are members of the IPCC. Governments participate in the review process and the plenary sessions, where main decisions about the IPCC work program are taken and reports are accepted, adopted, and approved. The IPCC bureau members, including the Chair, are also elected by governments during the plenary sessions. The IPCC Secretariat in Geneva coordinates all the IPCC work and liaises with governments. Thousands of scientists from all over the world contribute to the work of the IPCC on a voluntary basis.

The IPCC bureau comprises the IPCC chair, the IPCC vice-chairs, the co-chairs and vice-chairs of the WGs, and the co-chairs of the task force. The IPCC bureau is chaired by the IPCC chair. The purpose of the bureau is to provide guidance to the panel on the scientific and technical aspects of its work, to advise on related management and strategic issues, and to take decisions on specific issues within its mandate, in accordance with the principles governing IPCC work. Coordinating lead authors (CLAs) and lead authors (LAs) are selected by the relevant WG or task force bureau from those experts cited in nominations provided by governments and participating organizations, and other experts as appropriate, known through their publications and works, and taking into account both geography and gender. None of them is paid by the IPCC.

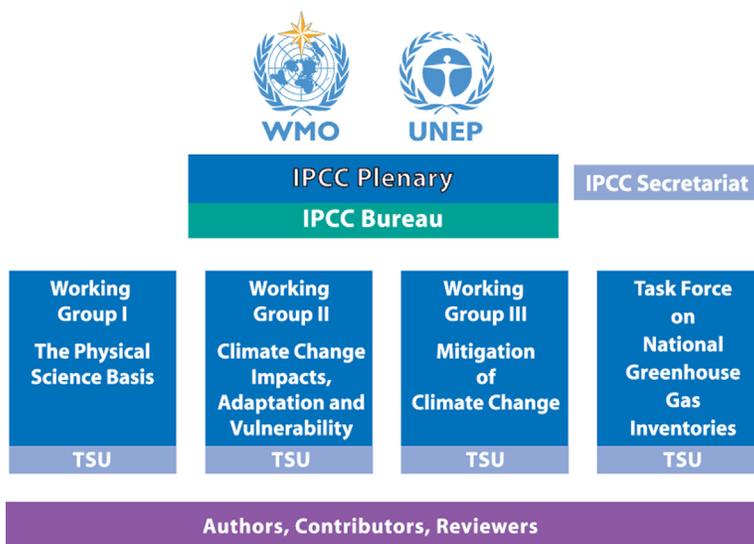
The IPCC starts a new assessment with a scoping process among experts, which leads to the proposed general outline of a report, highlighting also new features and cross-cutting matters. Policy makers and other users of IPCC reports are consulted in order to identify the key policy-relevant issues along with experienced scientists who can attest to the state and capabilities of the science. The outlines are subject to formal approval by the panel before work begins.

CLAs take overall responsibility for coordinating a major section of a report and the chapter that they are responsible for. For the first four reports, there were usually two CLAs per chapter. LAs work in teams to produce the content of the chapter. LAs may enlist contributing authors who provide additional technical information on specific subjects covered by the chapter. LAs are responsible for the production of designated sections of chapters. The essence of the LA task is to synthesize the scientific, technical, and socioeconomic information available in peer-reviewed and internationally available literature and in selected non-peer-reviewed literature.

Along with comprehensive assessment reports, the IPCC has produced several special reports and technical papers on topics of interest, as well as methodology reports. Many of these reports are prepared in response to requests from the UNFCCC or from other international organizations and conventions.

Each WG is made up of participants from the United Nations countries, and for the 2007 AR4 assessment, there were over 450 LAs, 800 contributing authors, and over 2500 reviewers from over 130 countries who provided over 90 000 review comments. The IPCC process is very open. Two major reviews are carried out in producing the report, a first review by experts and a second review by experts and governments. Climate 'skeptics' can and do participate, some as authors. All comments are responded to in writing and result in many changes in the report. The process is overseen by two or more review editors for each chapter.

As an example for the AR4 in WG I, there were 11 chapters and the report was 996 pages plus supplementary material



online. There were 140 LAs, hundreds of contributors, and two or three review editors for each chapter (26). There were also over 700 reviewers. For example, for Chapter 3 on observations, the CLAs were Kevin E. Trenberth and Philip D. Jones; there were 10 other LAs and 66 contributing authors. The published chapter ran to 101 pages plus online supplementary material, 47 figures (126 panels), 8 tables, and 863 references, making it the longest chapter in the report. In the expert scientific review, there were 2231 comments and another 1270 comments in governmental review, for a total of 3501 comments. Every comment and the writer were entered into a huge spreadsheet along with the response and actions taken in terms of changing the text.

Summaries for policy makers are prepared after the first expert review rather than concurrently with the main reports. They undergo one round of expert and government review. Each point undergoes not only the careful scrutiny of the scientists but also government officials and nongovernmental organizations. A second opportunity for comments by governments takes place as input to the approval process. The SPM is then approved line-by-line by governments in a major meeting, which takes place over 3 or 4 days. Those participating include government representatives (typically more than 120 countries are present), several nongovernmental organizations as observers, and typically 40–50 scientists. Simultaneous translation occurs throughout the meeting into English, French, Spanish, Russian, Chinese, and Arabic, per UN practice.

United Nations rules require a unanimous consensus to be sought. Negotiations occur over wording to ensure accuracy, balance, clarity of message, and relevance to understanding and policy. The strength is that it is a consensus report but the process also makes it a conservative report. The rationale is that the scientists determine what can be said, but the governments determine how it can best be said.

The IPCC process is dependent on the good will of the participants in producing a balanced assessment. However, by the time of the SAR, it appeared that there were attempts to blunt, and perhaps obfuscate, the messages in the report by certain nations. This led to protracted debates over wording on even bland and what should be uncontroversial text. The result was that the schedule of the meetings quickly became disrupted so that extra evening sessions were scheduled. During the limited breaks that did occur, authors of the report worked with delegates in side meetings to craft revised text for submission to the plenary. In many ways the meeting became one of endurance. In spite of these trials and tribulations, the result is a reasonably balanced consensus summary. However, the SPM did tend to grow in size relative to the initial draft length during the course of the meeting and usually became more technical than desirable.

The role of the IPCC is to provide policy relevant but not policy prescriptive scientific advice to policy makers and the general public. IPCC scientists, with all kinds of value systems, ethnic backgrounds, and from different countries, gather together to produce the best consensus description of what they jointly understand and with appropriate statements about confidence and uncertainty. The strength of the IPCC report is not just the solid scientific credentials but also the open process by which it is created.

Some Findings

The scientific evidence brought up by the first IPCC Assessment Report of 1990 unveiled the importance of climate change as a topic deserving a political platform among countries to tackle its consequences. It therefore played a significant role in leading to the creation of the UNFCCC, the key international treaty to reduce global warming and cope with the consequences of climate change. The UNFCCC was ratified in 1994 by 194 countries.

The SAR was the time when the IPCC first attracted more focused attention of policy makers in a major way when the statement coming out of the intergovernmental meeting and the SPM was 'The balance of evidence suggests a discernible human influence on global climate.' This statement was carefully crafted after much debate and compromise. The SAR provided key input into the adoption of the Kyoto Protocol in 1997. The Kyoto Protocol was finally ratified in February 2005 by 164 countries, and eventually by Australia, but not by the United States.

In the TAR, WG I presented an improved understanding of climate processes, forcing agents, and feedback and addressed the question of human influence on climate. Since the SAR, the evidence became much stronger – from the continuing record warmth, the improved paleorecord that provides context, improved modeling and simulation of the past climate and improved statistical analysis. Projections of future climate were based on new scenarios and a wider range of models. WG II updated impacts, vulnerabilities, coping strategies and adaptation, and implications for sustainable development. WG III assessed mitigation options, their costs and co-benefits as well as barriers, opportunities, and policy instruments. It also placed climate change mitigation in the context of sustainable development. The most contentious paragraph in the TAR WG I SPM was the concluding one on attribution. After much debate the following was carefully crafted in the summary statement for the TAR: "There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities."

In AR4, WG I provided a new knowledge on human and natural drivers of climate, a detailed assessment of past paleoclimate changes and causes, and stronger evidence on attribution of climate change; it also included some regional aspects and observations of trends in other variables such as ocean warming, temperature extremes, and wind patterns. WG II further assessed observational evidence of impacts of climate changes and identified vulnerable places and people. Projections were made concerning impacts of future warming trends, taking into consideration different possible developments and stresses from other effects of global change. WG III further evaluated emissions trends, mitigation options, and how stabilization of greenhouse gas concentrations in the atmosphere might be achieved, along with associated costs in the near and longer term. Sustainable development policies were considered along with the relationship between mitigation and adaptation. A more consistent evaluation of uncertainty and risk was attempted. AR4 WG I carefully stated that "Warming of the climate system is unequivocal as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising

global average sea level" and Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations. Here 'very likely' is deemed to mean more than 90% probability of occurrence.

AR5 will put greater emphasis on assessing the socioeconomic aspects of climate change and implications for sustainable development, risk management, and the framing of a response through both adaptation and mitigation. It will aim to provide more detailed information on regions, including on climate phenomena such as monsoons and El Niño.

Controversy

Following the SAR in 1995, a controversy broke out after completion of the report because of publicized charges (*Wall Street Journal*) that changes were made by the convening LA of Chapter 8, Dr. Ben Santer, to 'deceive policy makers and the public into believing that the scientific evidence shows human activities are causing global warming.' Santer indeed made changes in the chapter as instructed and as an outcome of the intergovernmental approval meeting and associated changes in the SPM. The charges were completely unfounded, but the lack of IPCC oversight of this process led to the introduction of review editors in subsequent reports.

Following the TAR, the main controversy centered on the paleoclimate reconstruction of northern hemisphere temperature for the last millennium that has the shape of an ice hockey stick with the blade as the upturn in the twentieth century. It has been used by some as a symbol of the human influence on climate. Dr. Michael Mann was the leader of the group that produced the 'hockey stick' and has come under considerable but unjustified criticism.

After the 2007 IPCC reports, in the lead up to the political Conference Of the Parties (COP) meeting in Copenhagen in December 2009 (COP-15), some controversies broke out that involved the IPCC. Disparagingly called 'climate gate,' some emails and personal information about individuals were illegally taken from the University of East Anglia through a hacking incident. Subsequently, there was selective publication of some of the stolen emails taken out of context and charges were made of data tampering and other wrongdoing. The material published was related to the work of the Climatic Research Unit and Professors Phil. Jones and Keith Briffa in particular. As Jones was a CLA of Chapter 3 of WG I in AR4 and both contributed to the chapter on paleoclimate, many of the emails involved IPCC matters and authors. There were several things in the emails that were obviously not for public consumption and possible abuses of the freedom of information act were revealed. Charges were brought against both Jones and Mann. Several official enquires in both the United Kingdom and the United States cleared them both of any wrongdoing.

The 2007 IPCC report itself has been scrutinized along with all of the comments and responses to the comments. Two minor errors have been found: both in WG II. These were on (1) Himalayan glaciers melt (correct in WG I) and (2) the area of the Netherlands below sea level. Unfortunately, these were played up and exaggerated in the media, and the IPCC was

slow to respond and did not handle the charges well by defending its processes.

Scientists have been found innocent of the charges made against them, and the basic science and all the main IPCC conclusions are unaffected. However, the criminals who stole the emails have not been brought to justice and those who misused the information and carried out the disinformation campaign were the real offenders. Unfortunately, their tactics have influenced the political process.

The adverse publicity concerning the IPCC raised concerns in some quarters regarding the continuing credibility of the IPCC assessments themselves and the processes and procedures underlying them and led to an investigation. In August 2010, the prestigious InterAcademy Council (representing scientific academies around the world) issued a report reviewing the procedures of the IPCC and made a number of recommendations for changes. They noted the need for the IPCC to update procedures, the need to have an executive committee to deal with issues such as minor corrections and to respond promptly to matters arising, to upgrade review oversight of reports, improve ways of communicating uncertainty, and improve communication in general.

Summary

The WG I findings might be summarized as follows. Climate changes have occurred in the past naturally, over decades to millennia for various reasons. However, humankind is performing a great geophysical experiment by modifying the Earth's environment in various ways and changing the climate. Legitimate debates go on about the extent and rate of these changes, and what, if anything, to do about them but that the experiment is underway is not in doubt. The human-induced environmental changes of most relevance are in land use (e.g., farming, building cities), storage and use of water (dams, reservoirs, and irrigation), generation of heat, and combustion of fossil fuels. The latter, in particular, pollutes the atmosphere and alters the balance of radiation on Earth through both visible particulate pollution (called aerosols) and gases that change the composition of the atmosphere. The latter are referred to as greenhouse gases because they are relatively transparent to incoming solar radiation, while they absorb and reemit outgoing infrared radiation, thus creating a blanketing effect, which results in warming. Global warming and associated climate change are expected as a result and indeed are already occurring. The planet is unequivocally warming. Projections into the future indicate potentially dire consequences for ecosystems and human existence and well-being, sooner or later.

Given these findings, a key question is what should be done about them? The options include (1) do nothing, (2) mitigate or stop the problem, (3) adapt to the changes as they happen, or some combination of these. WG II deals with the first and the third option and WG III deals with option 2. Different value systems come into play in deciding what to do, and it is not the role of IPCC to decide, but it is the role of IPCC to lay out the options and likely consequences. Considerations include those of population growth, equity among developed and developing countries,

inter-generational equity, stewardship of the planet, vested interests, environmental concerns, and the precautionary principle (which suggests that it may be better to be safe than sorry). In rationally discussing options, it is helpful to recognize different points of view and that they are all legitimate. This problem is truly a global one, as the atmosphere is a global commons. It cannot be solved by one nation acting alone. IPCC helps to lay out the options and consequences of actions or lack of actions.

The IPCC website is <http://www.ipcc.ch>. Some of the material above comes from the IPCC website. A listing of IPCC procedures is at http://www.ipcc.ch/organization/organization_procedures.shtml#.T9Ipk5iwWP8.

Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author and do not necessarily reflect those of the National Science Foundation.

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Further Reading

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