Climate change 2001: The scientific basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change

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Background

The earth's climate system has demonstrably changed since the pre-industrial era, with some of these changes attributable to human activities. The consequences of climate change pose a serious challenge to policy-makers. Hence they need an objective source of information about climate change, its impacts and possible response options. Recognising this, the World Meteorological Organization (WMO) and the United Nations Environmental Programme jointly established the Intergovernmental Panel on Climate Change (IPCC) in 1988. The terms of reference of the IPCC include:

(i) to assess available scientific and socio-economic information on climate change and its impacts, and the options for mitigating climate change and adapting to it; and

(ii) to provide, on request, scientific/technical/socio-economic advice to the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC).

The IPCC is organised into three Working Groups and a task force on national greenhouse inventories. Working Group I (WGI) addresses the scientific aspects of the climate system and climate change, Working Group II (WGII) assesses the impacts of and adaptation to climate change, and Working Group III (WGIII) addresses the options for the mitigation of climate change. From 1990, the IPCC has produced three major Assessment Reports (1990, 1996, and 2001), and Special Reports, Technical Papers, methodologies and other products that have been widely used by policymakers, scientists and other experts. More information about IPCC can be found on the IPCC website (http://www.ipcc.ch).

Components of the Third Assessment Report

The WGI report (IPCC 2001) on the scientific basis of climate change is the first part of *Climate change 2001, the Third Assessment Report* (TAR) *of the IPCC*. Other companion assessment volumes have been produced by WGII *(Impact, adaptation and vulnerability)* and by WGIII *(Mitigation)*. As well as the underlying chapters, each volume contains a "Summary for Policymakers" and a "Technical Summary" to maximise the ease of utility of the report. In addition, a Synthesis Report has been produced, drawing from all IPCC reports scientific and socio-economic information relevant to nine questions addressing particular policy issues raised by the UNFCCC.

Production of the WGI contribution to the TAR

The WGI TAR was compiled between July 1998 and January 2001, by 122 lead authors. In addition, 515 contributing authors submitted draft text and information to the lead authors, and 21 review editors oversaw the production of the report. The draft report was circulated for review to experts, with 420 reviewers submitting valuable suggestions for improvement. This was followed by review by governments and experts, through which several hundred more reviewers participated. All the comments received were carefully analysed and assimilated into a revised document for consideration at the session of the IPCC WGI held in Shanghai, from 17 to 20 January 2001, with delegates from 99 countries and 50 scientists representing the lead authors. There the "Summary for Policymakers", drafted by a team of 59 authors, was approved word by word, and the underlying report accepted.

Scope of the WGI contribution to the TAR

The WGI TAR analyses the current body of observations, which gives a collective picture of a warming world. The TAR describes the increasing concentrations of atmospheric greenhouse gases and assesses the effects of these gases and atmospheric aerosols in altering the radiation balance of the earth–atmosphere system. The TAR assesses the understanding of the processes that govern the climate system and, by studying how well the new generation of climate models represents these processes, assesses the suitability of the models for projecting climate change into the future. A detailed study is made of human influence on climate, concluding that there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities. Projections of future climate change are presented using a wide range of scenarios of future emissions of greenhouse gases and aerosols. Both temperature and sea-level are projected to continue to rise throughout the twenty-first century for all scenarios studied.

Finally, the report looks at the gaps in information and understanding that remain and how these might be addressed. All this information is structured into 14 chapters with 881 pages in total (Table 1).

The TAR takes very seriously the uncertainty that surrounds its findings and tries to consistently indicate the degree of confidence of its results by providing quantitative estimates of uncertainty or estimating statistical significance at the 0.05 (5%) level. Where this is not possible, the following words have been used where appropriate to indicate judgmental estimates of confidence: 'virtually certain' (greater than 99% chance that a result is true); 'very likely' (90–99% chance); 'likely' (66–90% chance); 'medium likelihood' (33–66% chance); 'unlikely' (10–33% chance); 'very unlikely' (1–10% chance); 'exceptionally unlikely' (less than 1% chance).

Table 1 Chapter structure of *Climate change 2001: The scientific basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change*

Contents	Co-ordinating lead authors	Lead authors	Contributing authors	References quoted
Summary for Policymakers	Prepared by a team of 59 experts with contributions from many authors and reviewers			
Technical Summary	2	18	34	0
1 The Climate System: an Overview	1	3	0	5
2 Observed Climate Variability and Change	2	8	139	780
3 The Carbon Cycle and Atmospheric Carbon Dioxide	1	9	49	482
4 Atmospheric Chemistry and Greenhouse Gases	2	10	57	291
5 Aerosols, their Direct and Indirect Effects	1	10	45	470
6 Radiative Forcing of Climate Change	1	8	32	391
7 Physical Climate Processes and Feedbacks	1	10	56	475
8 Model Evaluation	1	9	63	437
9 Projections of Future Climate Change	2	7	30	190
10 Regional Climate Information – Evaluation and Projections	2	7	49	368
11 Changes in Sea Level	2	6	28	290
12 Detection of Climate Change and Attribution of Causes	2	4	28	168
13 Climate Scenario Development	2	4	6	254
14 Advancing our Understanding	1	3	0	20
Appendix I: Glossary	1 editor	Many contributors		12
Appendix III: SRES Tables	Contributions from many authors			4
Appendix III: Contributors to the IPCC WGI TAR				
Appendix IV: Reviewers of the IPCC WGI TAR				
Appendix V: Acronyms and Abbreviations				
Appendix VI: Units				
Appendix VII: Some Chemical symbols				
Appendix VIII: Index				

Note: Numbers do not match those in the text due to some authors contributing to more than one chapter.

Final remarks

Finally, the TAR is:

(i) the most up-to-date description of the knowns and unknowns of the climate system and related factors;
(ii) based on the knowledge of the international expert communities;
(iii) produced by an open and peer-reviewed professional process; and
(iv) based upon scientific publications.

In addition, the TAR findings are summarised in terms useful to decision-makers. While the assessed information is policy-relevant, the IPCC does not establish or advocate public policy.

Reference

IPCC (2001) *Climate change 2001: The scientific basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change* (Houghton, J. T., Ding, Y., Griggs, D. J., Noguer, M., Van der Linden, P. J., Dai, X., Maskell, K. and Johnson, C. A. (Eds.)) Cambridge University Press, Cambridge and New York

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