



INTERGOVERNMENTAL PANEL
ON CLIMATE CHANGE

IPCC-XXI/Doc. 21
(05.XI.2003)

TWENTY-FIRST SESSION
Vienna, 3 and 6-7 November 2003

Agenda item: 5
ENGLISH ONLY

**CHAPTER OUTLINE OF THE WORKING GROUP I CONTRIBUTION
TO THE IPCC FOURTH ASSESSMENT REPORT (AR4)**

(Submitted by the Co-chairs of Working Group I)

This document is a revised version of WG-I: 9th/Doc. 3 and
has been adopted by the Ninth Session of Working Group I.

Working Group I Contribution to the IPCC Fourth Assessment Report Climate Change 2007: The Physical Science Basis

Summary for Policymakers

Technical Summary

1. Historical Overview of Climate Change Science

Executive Summary

- Introduction
- Progress in Observations
- Progress in Understanding of Radiative Forcing, Processes, and Coupling
- Progress in Climate Modelling
- Advances in Understanding Uncertainties

Appendix: Glossary of Terms

2. Changes in Atmospheric Constituents and in Radiative Forcing

Executive Summary

- Introduction
- Definition and Utility of Radiative Forcing
- Recent Changes in Greenhouse Gases
- Aerosols – Direct and Indirect Radiative Forcing
- Radiative Forcing due to Land Use Changes
- Contrails and Aircraft-Induced Cirrus
- Variability in Solar and Volcanic Radiative Forcing
- Synthesis of Radiative Forcing Factors
- GWPs and Other Metrics for Comparing Different Emissions

Appendix: Techniques, Error Estimation, and Measurement Systems

3. Observations: Surface and Atmospheric Climate Change

Executive Summary

- Introduction
- Changes in Surface Climate
- Changes in the Free Atmosphere
- Changes in Atmospheric Circulation
- Patterns of Variability
- Changes in the Tropics and Sub-Tropics
- Extra-Tropical Changes
- Changes in Extreme Events
- Synthesis: Consistency across Observations

Appendix: Techniques, Error Estimation, and Measurement Systems

4. Observations: Changes in Snow, Ice and Frozen Ground

Executive Summary

- Introduction
- Changes in Snow Cover and Albedo
- Sea Ice Extent and Thickness Changes
- Changes in Glaciers and Small Ice Caps
- Changes and Stability of Ice Shelves
- Changes and Stability of Ice Sheets
- Changes in Frozen Ground

Appendix: Techniques, Error Estimation, and Measurement Systems

5. Observations: Oceanic Climate Change and Sea Level

Executive Summary

- Introduction
- Changes in Ocean Salinity, Temperature, Heat Uptake, and Heat Content
- Biogeochemical Tracers
- Changes in Ocean Circulation and Water Mass Formation
- Sea Level: Global and Regional Changes

Appendix: Techniques, Error Estimation, and Measurement Systems

6. Paleoclimate

Executive Summary

- Introduction
- Proxy Methods and their Uncertainty
- Inferred Past Climate System Change
- Abrupt Climate Change
- Paleo-Environmental Model Evaluation and Sensitivity
- Synthesis: Insights into Climate System Behavior

Appendix: Guide to the Use of Paleoclimatic Information.

7. Couplings Between Changes in the Climate System and Biogeochemistry

Executive Summary

- Introduction to Biogeochemical Cycles
- The Carbon Cycle and the Climate System
- Global Atmospheric Chemistry and Climate Change
- Air Quality and Climate Change
- Aerosols and Climate Change
- The Changing Land Surface and Climate
- Synthesis: Interactions Among Cycles and Processes

8. Climate Models and their Evaluation

Executive Summary

- Advances in Modeling
- Evaluation of Contemporary Climate as Simulated by Coupled Global Models
- Evaluation of Large Scale Climate Variability as Simulated by Coupled Global Models
- Evaluation of the Key Relevant Processes as Simulated by Coupled Global Models
- Model Simulations of Extremes
- Climate Sensitivity
- Evaluation of Model Simulations of Thresholds and Abrupt Events
- Representing the Global System With Simpler Models

9. Understanding and Attributing Climate Change

Executive Summary

- Introduction
- Radiative Forcing and Climate Response
- Seasonal-to-Interannual Predictions of Climate Change and their Reliability
- Understanding Pre-Industrial Climate Change
- Understanding Climate Change During the Instrumental Era

Appendix: Methods used to assess predictability

Appendix: Methods used to detect externally forced signals (detection/attribution)

Appendix: Methods used to assess uncertainty

10. Global Climate Projections

Executive Summary

- Introduction
- Projected Radiative Forcing
- Timescales of Response
- Climate Change to 2100 and Beyond
- Sea Level Projections
- Scenarios and Simple Models
- Uncertainties in Global Model Projections

11. Regional Climate Projections

Executive Summary

- Introduction
- Evaluation of Regionalization Methods
- Alternative Simple Methods
- Projections of Regional Climate Changes
- Small Islands
- Uncertainties in Regional Projections

List of Authors and Reviewers

Index