

**CHAPTER OUTLINES OF THE WORKING GROUP I CONTRIBUTION TO THE IPCC SEVENTH ASSESSMENT REPORT (AR7)**

*Version before final copyedit*

**Summary for Policymakers**

**Technical Summary**

**Chapter 1:**

**Framing, methods and knowledge sources**

Executive Summary

Frequently Asked Questions

- Framing, narrative and context of the AR7
- Key findings and gaps in AR6 WGI
- Knowledge sources
- Assessment of knowledge sources, including fitness for purpose
- Methodologies to integrate lines of evidence
- Emerging topics, models, and tools

**Chapter 2:**

**Large-scale changes in the climate system and their causes**

Executive Summary

Frequently Asked Questions

- Natural and anthropogenic radiative forcing and Earth energy imbalance
- Indicators of climate change and related methodologies
- Observed changes across the Earth system and their recent and longer-term context
- Changes in modes of climate variability and monsoons
- Assessment of model-simulated changes
- Attribution of large-scale changes

**Chapter 3:**

**Changes in regional climate and extremes, and their causes**

Executive Summary

Frequently Asked Questions

- Regions and spatial scales of analysis, including land and oceanic regions and typological areas such as mountains, low lying coastal areas, and polar, tropical, desert, and semi-arid regions
- Disparities in regional information availability, accessibility and gaps, and integration of multiple information sources, including Indigenous Peoples' knowledge and local knowledge, and paleo archives
- Advances and limitations in the assessment of regional climate change and extremes including models and observations
- Emerging regional and local process understanding, including regional interconnections and long-range transport
- Rapid and slow changes in regional and local climate, including changes in seasonality and extremes

- Slow onset events including regional sea level rise and desertification
- Indicators of regional climate change and related methodologies
- Attribution of regional and local changes
- Attribution of extreme events, including tropical cyclones, and compound events

## **Chapter 4:**

### **Advances in process understanding of Earth system changes**

Executive Summary

Frequently Asked Questions

- Biogeochemical cycle processes and budgets, including effectiveness of sinks and sources of greenhouse gases
- Short-lived climate forcers, connection to air quality and climate interactions
- Earth system energy budget and fluxes, heat storage and redistribution
- Water cycle processes and budgets
- Cryosphere processes including in high mountain and polar regions
- Ocean processes including sea level rise and ocean acidification
- Atmospheric processes, including circulation, weather patterns, monsoons, clouds and their interactions with atmospheric composition
- Land-surface processes, including biosphere
- Land-atmosphere-ocean interactions including monsoons
- Earth system feedbacks on multiple time scales
- Model process evaluation, including paleoclimate constraints

## **Chapter 5:**

### **Scenarios and projected future global temperatures**

Executive Summary

Frequently Asked Questions

- Description of scenarios (emissions, removals, and concentrations of GHGs and short-lived climate forcers; land cover and land use change)
- Use and evaluation of models and tools for the assessment of scenarios
- Global Earth system and climate sensitivity metrics and properties, relationship between carbon cycle, energy balance and global temperature
- Effects of non-CO<sub>2</sub> forcers on temperature and carbon budgets across time scales
- Global temperature projections on different time scales
- Global warming levels and associated time frames in scenarios
- Total, historical, and remaining carbon budgets

## **Chapter 6:**

### **Global projections of Earth system responses across time scales**

Executive Summary

Frequently Asked Questions

- Projected changes across the Earth system, its components and their ecosystems including long-term changes in cryosphere and sea level rise
- Projected changes as a function of time and of global warming levels

- Forcing-dependent responses arising from GHGs, short-lived climate forcers, and land use and land cover change
- Projected changes in biogeochemical cycles, including carbon sinks and pools
- Projected changes in modes of climate variability and monsoons
- Near-term information from multiple sources
- Uncertainties arising from forcings, models, internal variability, and process understanding

## **Chapter 7:**

### **Projections of regional climate and extremes**

Executive Summary

Frequently Asked Questions

- Regions and spatial and temporal scales of analysis, including land and oceanic regions and typological areas
- Projected regional and local changes in means, variability and seasonality including regional circulation, as function of time and global warming levels
- Projected regional and local changes in extreme and compound events on land and oceans, including, but not limited to tropical cyclones, oceanic events, extreme sea levels, drought, heat waves, sand and dust storms.
- Natural and anthropogenic drivers of regional changes and their feedbacks
- Influence of regional interconnection processes and long-range transport on projected changes
- Assessment of cascading uncertainties
- Advances and limitations of existing approaches and methodologies for regional climate assessment, including disparities of information production, availability, and accessibility

## **Chapter 8:**

### **Abrupt changes, low-likelihood high impact events and critical thresholds, including tipping points, in the Earth system**

Executive Summary

Frequently Asked Questions

- Definitions, characterization, time and spatial scales, reversibility
- Abrupt changes, low-likelihood high impact events and tipping points<sup>1</sup> within the Earth system components and their ecosystems, their drivers and occurrence conditions
- Evidence from and limitations of observations, models, paleoclimate and Indigenous Peoples' knowledge and local knowledge
- Local, regional and global climatic consequences relevant for impacts and risks, their magnitude, spatial extent, timing, reversibility, teleconnections, cascading and compounding effects
- Critical system-specific thresholds, including in the context of global warming levels, and early warning indicators

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<sup>1</sup> A critical threshold beyond which a system reorganizes, often abruptly and/or irreversibly (IPCC AR6 Glossary definition).

## **Chapter 9:**

### **Earth system responses under pathways towards temperature stabilization, including overshoot pathways**

Executive Summary

Frequently Asked Questions

- Global and regional Earth system responses to pathways towards temperature stabilization, including to global net-zero, negative and net-negative emissions, and long-term implications
- Pathway dependency of responses including in the context of overshoot and irreversible aspects
- Bio-geophysical capacity and limits of carbon dioxide removal (CDR) methods
- Global and regional Earth system responses to removals of carbon dioxide, methane or nitrous oxide
- Global and regional Earth system responses to different global and regional solar radiation modification (SRM) methods, including consequences and uncertainties

## **Chapter 10:**

### **Climate information and services**

Executive Summary

Frequently Asked Questions

- Usage of climate information from multiple lines of evidence and knowledge sources, including Indigenous Peoples' knowledge and local knowledge, for public awareness, impact and risk assessment, losses and damages, adaptation and mitigation
- Advances in climate information for climate services across timescales, including multi-hazard, early warning systems
- Methodologies to develop climate information, including co-design and co-production, to support impact and risk assessment, losses and damages, adaptation and mitigation
- Information on climatic impact-drivers and their changes to support impact and risk assessment, losses and damages, adaptation and mitigation, for systems and sectors across regions
- Physical effects of adaptation and mitigation measures on regional climate and extremes
- Gaps and disparities in available and accessible climate data, monitoring infrastructure, information and indicators for climate services, and their implications across spatial and temporal scales, across regions
- Climate information and services to reduce gaps and disparities in climate education and literacy, capacity, and training
- Case studies across regions

## **Annexes**

Cross Working Group Glossary

Technical Annexes

WGI Interactive Atlas

List of Acronyms

List of Contributors

List of Reviewers

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