

IPCC Working Group II progress & findings:

How has TE contributed,
and how could it contribute to the next round?

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With thanks to these contributors:

Chris Field (WGII co-chair), Graham Cogley (WGII AR5 Ch. 3), Richard Betts & Jonathan Overpeck (WGII AR5 Ch. 4), David Lobell (WGII AR5 Ch. 7), Wolfgang Cramer (WGII AR5 Ch. 18), Anna Michalak, Joe Berry, Mike Mastrandrea (WGII TSU co-director, science), & Eren Bilir (WGII TSU research assistant)

Outline of the talk

- Overview of the IPCC and its assessments
- WGII contribution to the Fifth Assessment Report
- Remote sensing in the WGII AR5

Fundamentals of IPCC assessment

- Comprehensive assessment
- Multiple layers of monitored scientific review
- Consensus approval *by governments*
- Policy relevant but not prescriptive



IPCC Plenary

IPCC Bureau

IPCC Secretariat

Working Group I

The Physical Science Basis

TSU

Working Group II

Climate Change Impacts, Adaptation and Vulnerability

TSU

Working Group III

Mitigation of Climate Change

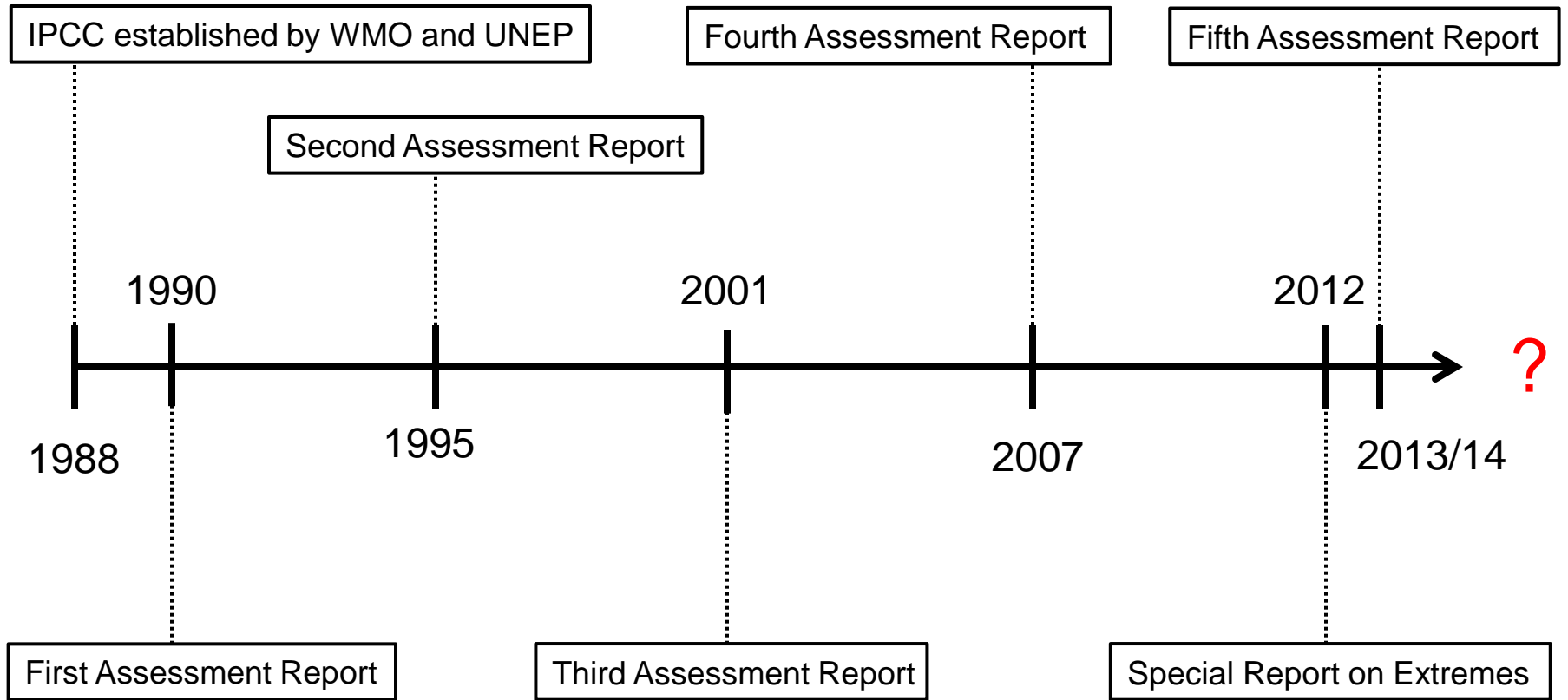
TSU

Task Force on National Greenhouse Gas Inventories

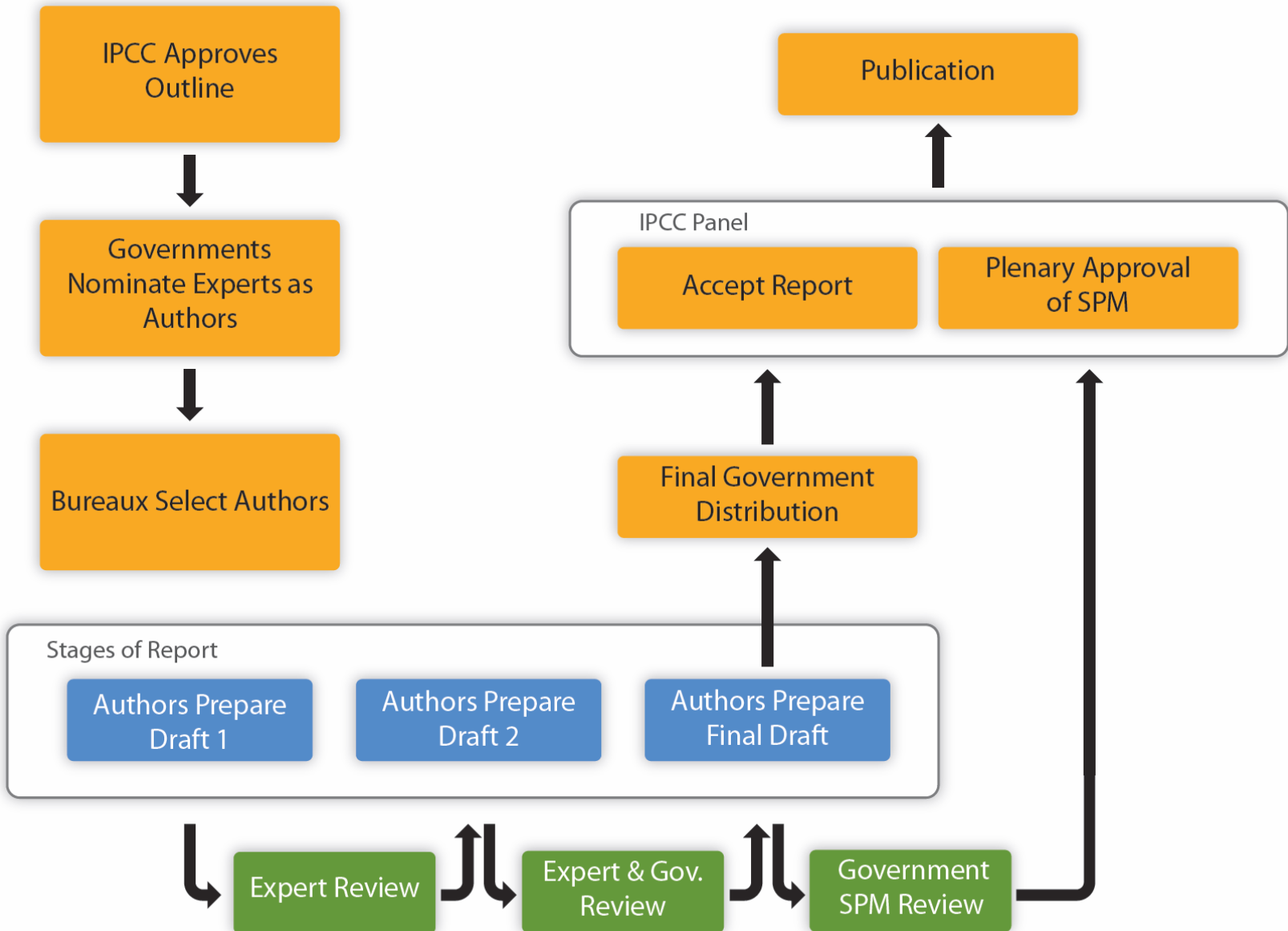
TSU

Authors, Contributors, Reviewers

Timeline of IPCC assessment reports

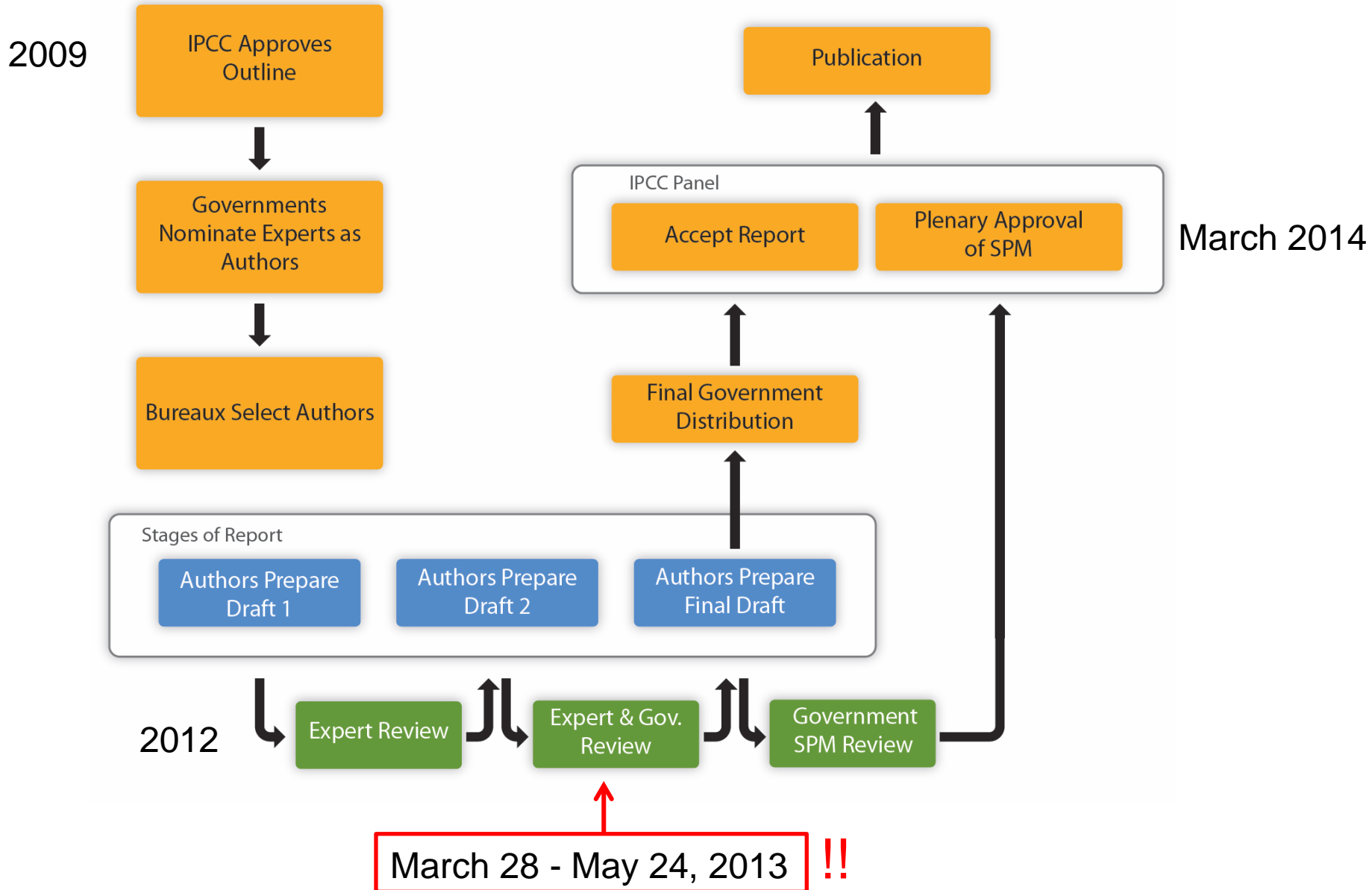


IPCC Process



The Working Group II contribution to the Fifth Assessment Report (WGII AR5)

Development of the WGII AR5



Roadmap of the Report

- | | | |
|------------------------------|--|--------------------------------|
| 1. introduction | 11. human health | 21. regional context |
| 2. decisionmaking | 12. human security | 22. Africa |
| 3. freshwater | 13. livelihoods & poverty | 23. Europe |
| 4. terrestrial
ecosystems | 14. needs & options | 24. Asia |
| 5. coasts | 15. planning & implementation | 25. Australasia |
| 6. ocean systems | 16. opportunities, constraints
& limits | 26. North America |
| 7. food | 17. economics | 27. Central & South
America |
| 8. urban areas | 18. detection & attribution | 28. Polar Regions |
| 9. rural areas | 19. key & emergent risks | 29. Small Islands |
| 10. economic sectors | 20. climate-resilient pathways | 30. Open Oceans |

Adaptation

Two volumes

Part A

- | | | |
|------------------------------|------------|--|
| 1. introduction | | 11. human health |
| 2. decisionmaking | | 12. human security |
| 3. freshwater | | 13. livelihoods & poverty |
| 4. terrestrial
ecosystems | Adaptation | 14. needs & options |
| 5. coasts | | 15. planning & implementation |
| 6. ocean systems | | 16. opportunities, constraints
& limits |
| 7. food | | 17. economics |
| 8. urban areas | | 18. detection & attribution |
| 9. rural areas | | 19. key & emergent risks |
| 10. economic sectors | | 20. climate-resilient pathways |

Part B

- 21. regional context
- 22. Africa
- 23. Europe
- 24. Asia
- 25. Australasia
- 26. North America
- 27. Central & South
America
- 28. Polar Regions
- 29. Small Islands
- 30. Open Oceans

Enhanced sectoral assessment

- | | | | |
|-----------------------------|------------|---|-----------------------------|
| 1. introduction | | 11. human health | 21. regional context |
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Enhanced assessment of oceans

- | | | |
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Adaptation

Enhanced assessment of adaptation

- | | | |
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Topics assessed in each sectoral and regional chapter

- Observed impacts, with detection and attribution
- Projected impacts and future risks
- Vulnerabilities and socio-economic contexts
- Multiple interacting stressors
- Adaptation experiences, needs, opportunities, barriers, & limits
- Thresholds and irreversible changes

Basis of the comprehensive assessment

- Scientific, technical, and socioeconomic information
 - journal literature
 - non-journal literature
- **August 31, 2013** -- WGII AR5 literature cutoff date for “accepted papers”

Framing themes emerging in the assessment

Risk in the context of climate change



nature and severity of physical hazard



vulnerability



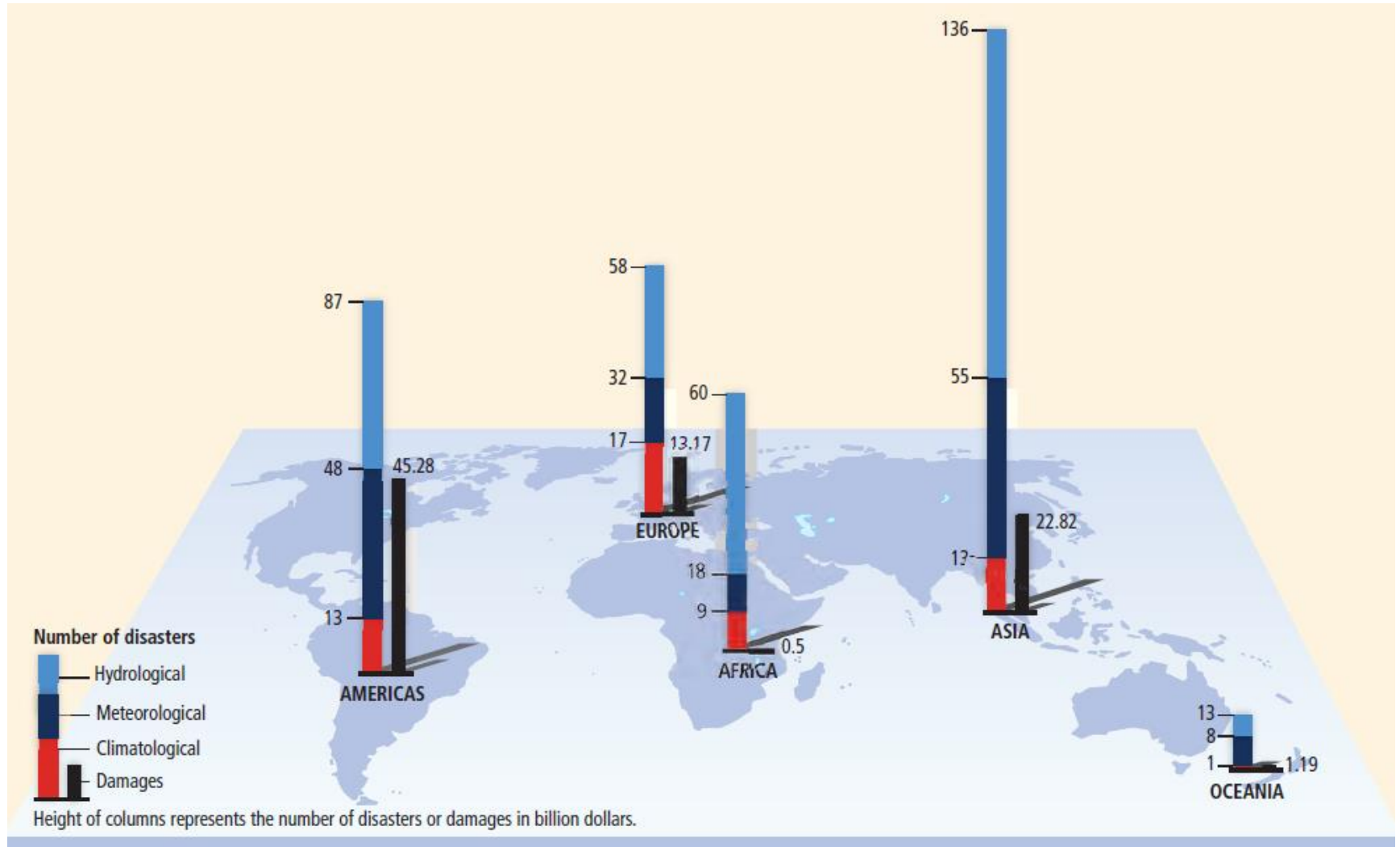
exposure

Impacts of climate change are often experienced through extremes, not just mean changes



The IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation

Most regions of the world are vulnerable to climate change but in different ways



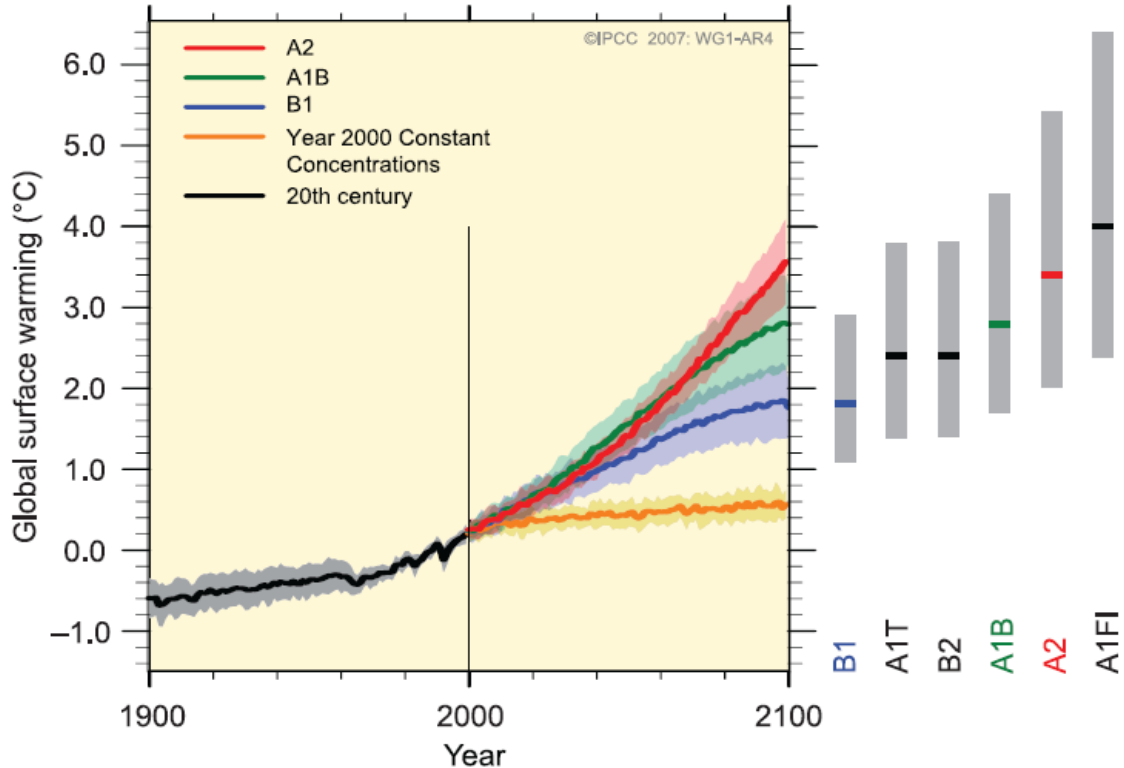
Limiting global temperature increase to 2°C is not a guarantee for preventing “dangerous anthropogenic interference”

- Risks of extremes have already changed
- Climate change impacts are widespread and consequential
- “Danger” requires judgments about risk beyond IPCC scope



Near-term investments in mitigation don't yield much near-term benefit in decreased impacts

MULTI-MODEL AVERAGES AND ASSESSED RANGES FOR SURFACE WARMING



- Era of climate responsibility
 - Next few decades
- Era of climate options
 - Second half of 21st century (and beyond)

Global CMIP3
IPCC AR4 WGI

Facilitating smart decision making is not just about reducing uncertainty about impacts

- Managing risks of climate change
- Decisionmaking under uncertainty
- Limits to adaptation
- Transformation towards climate resilience

Remote sensing in the WGII AR5

Opportunity for contribution

WGII AR5 Expert and Government Review

Through **May 24, 2013**

E-mail tsu@ipcc-wg2.gov to participate
www.ipcc-wg2.gov/

Assessment based on remote sensing in the WGII AR5

Assessment based on remote sensing in the WGII AR5

Freshwater resources

- Glacier mass balance (Ch. 3, 22, 24, 27)
- Groundwater depletion (Ch. 18)
- Decline in snow cover extent (Ch. 18, 21)

Assessment based on remote sensing in the WGII AR5

Terrestrial ecosystems: phenology

- Shifts in seasonal activities of terrestrial species (Ch. 4, 18, 24)
 - Increasing measurement coverage since the AR4
 - Advance of spring events (earlier greening)
 - Delayed senescence in autumn
 - Longer growing season

Assessment based on remote sensing in the WGII AR5

Terrestrial ecosystems: biome shifts

- Shifts in the boreal-tundra biome (Ch. 4, 18, 24, 28)
 - Increase in shrub growth in many areas of the Arctic tundra
 - Fire and insect disturbance
 - Primary production and microbial respiration
 - Vegetation composition and phenology
 - Tree line
 - Active layer depth and permafrost thaw
- Changes in the Amazon (Ch. 4, 18, 27)

Assessment based on remote sensing in the WGII AR5

Terrestrial ecosystems: land cover and change

- Land cover trends (Ch. 4)
- LUCC and climate change as multiple, simultaneous stressors on ecosystems, complicating attribution of impacts (Ch. 4)

Assessment based on remote sensing in the WGII AR5

Terrestrial ecosystems: biomass and carbon stocks

- Measurements of forest carbon stock (Ch. 4)
- Forests currently a net sink for carbon at the global scale (Ch. 4)
- Terrestrial ecosystems currently net carbon sinks over much of northern hemisphere and parts of southern hemisphere (Ch. 4, 24)

Assessment based on remote sensing in the WGII AR5

Coastal systems

- Extent of coral bleaching (Ch. 5, 18)
- Surface area of vegetative habitats (Ch. 5)
- Area of atoll islands (Ch. 5)
- Large-scale changes in shoreline (Ch. 5)
- Mangrove forest distribution (Ch. 24, 27)

Assessment based on remote sensing in the WGII AR5

Food production systems

- Temporal and spatial changes in agricultural land use (Ch. 7)
- Changes in sowing dates, phenology, crop types (Ch. 7)
- Negative impacts on yield from increasing concentrations of surface ozone (Ch. 7, 18)

Assessment based on remote sensing in the WGII AR5

Adaptation to climate change and human dimensions

- Co-production of knowledge: oral histories & remote sensing (Ch. 2)
- Data for index-based weather insurance (Ch. 10)
- Decision support systems (Ch. 15)
 - Mapping local vulnerability factors to inform planning (Ch. 11)
 - e.g., for heat waves
- Understanding climate change and conflict (Ch. 12)

**Author perspectives
on satellite data & climate change impacts, adaptation, & vulnerability**

Author perspectives on satellite data & climate change impacts, adaptation, & vulnerability

Great strengths:

- Completeness of coverage
- Big data: fine detail over several decades
- Readily accessible free data

Author perspectives on satellite data & climate change impacts, adaptation, & vulnerability

Some important areas of research:

- Glaciers and sea ice
- Soil moisture
- Disturbance: wildfire, diebacks
- Indicators of vegetation “health”
- Potential regime shifts

Author perspectives on satellite data & climate change impacts, adaptation, & vulnerability

Core needs:

- Credible long-term record
 - fusion of data from diverse sources, instruments
 - baseline for detecting change
 - followed by investigation of changes detected
- Continued use of multiple lines of evidence
- Tightened error bands in remote-sensing products
- Better incorporation of remote-sensing inputs in Earth system models
- Place-based information on variables of concern to stakeholders
 - for example, vegetation health for forest managers
 - more proactive use as satellite imagery in disaster response
 - improved measures of vegetation and land-use types, biodiversity

Author perspectives on satellite data & climate change impacts, adaptation, & vulnerability

New generation of work with satellite data?

- “Re-analysis” of the Earth system
 - focused on CO₂, hydrology, water stress, changes in land-use, disturbance, etc.
 - interpretation and re-interpretation of existing data
 - how well can we understand changes and mechanisms?
- Satellites providing wider range of constraints on prognostic models
- Deeper exploration of the role of humans on the future of Earth's vegetation

Take-home message

WGII AR5 Expert and Government Review

Through **May 24, 2013**

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