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Institute event summary report

Exploring research priorities for the IPCC Seventh Assessment Report

May 2025

Contents

Following the IPCC approval of the outlines for its three Working Group contributions to the Seventh Assessment cycle, the Grantham Institute hosted a day-long event bringing together experts from across the UK climate research community to discuss the WG outlines and explore research priorities to strengthen and support the IPCC assessment. The event took place on 14 May 2025 and included three panel sessions to explore the WGI-III contributions, which were introduced by a representative from the IPCC bureau from each WG. (See here for further details on the event agenda.)

This document provides a short summary of the presentations of the WG outlines as well as research priorities highlighted during the panel discussions. It also includes some overarching reflections on how new research could effectively input into the IPCC process. Slides of the presentations are included in the Annex.

This document aims to signpost some key areas that would benefit from further research by experts in the UK and beyond, to deliver robust IPCC assessment findings. However, it does not aim to cover the full range of research needs for a strengthened AR7.

The event was held under the Chatham House rule. This document distils key points raised during the panel discussion but does not necessarily represent the views of all individual speakers or the Grantham Institute.

For follow-up enquiries about the event or this summary document, contact: Caterina Brandmayr, Director of Policy and Translation, Grantham Institute at c.brandmayr@imperial.ac.uk.

Overarching reflections

- It is important to deliver research in time. Researchers need to check the dates the IPCC sets for publication acceptance for each report. For the Special Report on Climate Change and Cities, the cut-off date for submission for publication is 1 April 2026 and the cut-off date for acceptance for publication is 15 October 2026; for the AR7 WG contributions, the timeline is still to be agreed but the cut-off date will likely be between mid/late 2027 to early 2028 depending on the report. (*Please note that we have amended this last point, which previously said that the cut off dates for the WG contributions would be "towards the end of 2027, or early 2028"*.)
- Research needs to be done over the next couple of years – given the time constraints, researchers should think about how to focus existing research projects to meet these needs.
- Throughout the day it was repeatedly emphasised that greater collaboration across WGs is required, and that this effort needs to start within the research community itself, with publications developing a much more integrated and multi- and interdisciplinary evidence base. Research communities should explore questions that fall outside their traditional research domains to enable IPCC authors to strengthen understanding of key issues using different lines of evidence.
- Credible and robust knowledge synthesis, as well as developing assessment methodologies, provides a very valuable foundation for IPCC authors, who will have to grapple with an exponential growth of research and knowledge on climate.

- The bullet points in the outlines are indicative. There is scope for IPCC authors to consider topics that are not explicitly mentioned.
- To ensure relevant research (especially new evidence) is considered in the IPCC assessment, researchers can send a short contribution (e.g. a paragraph) to the relevant lead author, so long as the evidence is peer-reviewed. To facilitate the work of IPCC authors, the material should be relevant to a specific location within the report chapter. It is also helpful to find out from the relevant authors what is the optimal timing for submitting relevant contributions.
- Grey literature can also be included in the IPCC assessment, but there are additional hurdles for authors, such as being able to justify why it is relevant and ensure that the material is archived. Researchers should be aware of these requirements, if they are planning to publish their findings in grey literature.

Panel sessions on the three WG outlines and research priorities

Working Group I

The discussion on the WGI outline included a reflection on some of the key drivers behind it. These are: first, the need to better understand and reflect the latest evidence on the climate system, to be able to explain recent events and trends; second, acknowledging that there is the need to update the range of possible futures, also leveraging a new range of tools, given that the AR6 futures were based on scenarios that started in 2015 and there have been significant developments since then; and third, ensuring that the evidence and understanding of the climate and earth system can effectively inform solutions and policies.

After the opening chapter, the agreed outline comprises three main blocks of chapters: current status and trends (Ch. 2-4); futures (Ch. 5-8); and information for responses (Ch. 9-10). For more information, see slides in the Annex.

More detailed comments on the outline chapters included: mention of the desire for the WGI report to capture more granular, regional information; the opportunity in chapter 8 to provide more clarity around the definition, uncertainty, thresholds, as well as time and spatial scales of abrupt changes, including tipping points; and that the outline provides the opportunity to highlight a wide range of new science, including evidence related to recent anomalies (Ch 2), exploring the interface of Earth system components (Ch 4), projections (Ch 5-7), abrupt changes and events (Ch 8), and a range of policy relevant research around issues such as climate services and overshoot (Ch 9-10).

During the panel discussion, the following research priorities were highlighted as important to strengthen the AR7 WGI assessment:

- **On scenarios, greater insights on the carbon cycle and transient climate response to emissions will be important to inform emission driven projections** (as opposed to previously used concertation driven projections). **Research should address the physical**

plausibility of scenarios and how human responses to climate impacts might alter projected pathways.

- **More research is needed to assess the physical feasibility and implications of overshoot scenarios**. This includes understanding the response of systems such as the carbon cycle and cryosphere, as well as the feasibility, risks and unexpected side effects of large-scale deployment of Carbon Dioxide Removal (CDR) and Solar Radiation Modification (SRM), which are currently underexplored in the literature. This will also require strong join up with WGII and WGIII research communities.
- **The research community should explore how best to use a wider range of sources of information for modelling, to strengthen assessments and feed through to other WGs**. These could range from new applications of AI to greater engagement with or inclusion of local and indigenous knowledge, which could be especially relevant at regional level.
- **There need to be integrated research efforts assessing the environmental impacts of anthropogenic activities**, including those resulting from adaptation and mitigation action, bringing together communities that study individual systems (such as water, food) with the aim of understanding how they interact with the climate system and feedback mechanisms.
- **Research efforts should advance our understanding of potential abrupt changes and high impact events**. It will be important to better characterise these events, to better understand thresholds, feedback, irreversibility, and correlated risks, and it will be important to go beyond best estimate outcomes to consider risk and extremes. Crucially, a broader and more diverse evidence base is needed to assess these events, including tipping points, to ensure they are examined through multiple lenses.
- **Modelling of potential abrupt changes needs to be improved and would benefit from better use of paleo evidence**. Paleoclimate data offer essential insights into past abrupt changes and can help improve modelling.
- **Models would benefit from better understanding of aspects such as vegetation-climate interactions and circulation and precipitation changes**. Modelling of vegetation responses to compound stressors like fire, drought, and heatwaves is currently weak and needs improvement, while more research is needed to resolve discrepancies between models and observed circulation (e.g. Eastern Pacific behaviour). Addressing this shortfall in models would also provide an opportunity to engage a wider range of researchers, particularly from developing countries, who have strong expertise on related aspects such as tropical forests.
- **Research on high impact events and abrupt changes should include exploration of events where abrupt outcomes materialise in the impacts rather than the physical climate systems**. This could involve for example crossing dangerous thresholds for human health, biodiversity, ecosystems, etc.
- **Research efforts should focus on providing better estimates of the costs of climate impacts**. There is a strong concern that current costs of inaction have been underestimated. Crucially, even where it is not currently possible to derive a robust estimate, efforts to expand the evidence base, even if only qualitative, can still play an important role.

- **Research can provide insights on what climate services have achieved and how they have shaped policy and politics**. Such assessment of their effectiveness can help inform future efforts.
- **Research should assess the risks and challenges associated with solar radiation modification**. This will require assessment from a broad range of disciplines and the combination of different lines of evidence to be able to effectively outline the risks and implications of these applications, even if only qualitatively.

Working Group II

This panel discussion focused on the WGII outline as well as the Technical Guidelines on Impacts and Adaptation. With regards to the WGII outline, it can be considered as being formed of three broad blocks of chapters: global chapters (Ch. 1-6), regional chapters (Ch. 7-13), and thematic chapters (Ch. 14-20). Based on this structure, the AR7 outline can be seen as a mix between the AR5 outline (which was extensive and included specific thematic chapters) and the AR6 outline (much shorter, mainly focused on regions and sectors).

Comments on specific chapters included: for the first time there is a chapter (Ch.5) on losses and damages, which is focused on responses to losses and damages, rather than assessment (which is instead addressed under Ch. 2); a new chapter on finance (Ch. 6), given that finance is recognised as a key enabler and potential barrier to adaptation and responding to losses and damages. Regional and thematic chapters are intended to be both backward- and forward-looking. These chapters feed into the Atlas, which will provide the mapping of hazards, vulnerability, exposure, impacts, risks, adaptation and, for the first time, responses to losses and damages.

The Technical Guidelines will provide an update to the 1994 Impacts and Adaptation Guidelines. They will be split into four sections and there will be a strong emphasis on ensuring they are usable for practitioners.

For more information on the outline and Technical Guidelines, see slides in the Annex.

During the panel discussion, the following research priorities were highlighted as important to strengthen the AR7 WGII assessment:

- **Research efforts should aim to support vulnerability-led framing of risk**. With growing uncertainty around climate impacts and their interaction with other drivers, it is becoming harder to be predictive and exposure-led with regards to risk. Therefore, alongside exposure-led approaches, it would be beneficial to develop a climate hazard-agnostic, vulnerability-led approach. This would require comparative empirical work on vulnerability; research addressing challenges around proximate over root causes, direct vs indirect losses, extreme vs protracted risk; as well as a more systematic and quantitative approach to social vulnerability.
- **Understanding social tipping points**. Non-linear social changes could affect vulnerability and resilience. Improving knowledge of where social thresholds and tipping points might lie could help to inform understanding of how impacts might play out.

- **With climate change seen as part of a polycrisis, further evidence is needed to support decision makers in understanding and addressing multiple hazards, potentially simultaneously**. Relevant research would include assessment of how key infrastructure systems (especially energy, communications, transport) mediate risk, enable resilience and shape vulnerability. Another area concerns a shift from an asset-based approach to risk and loss assessment towards an access-based approach (for example, from understanding which hospitals are physically vulnerable towards an approach that considers who is able to access functioning hospitals, which might incorporate an assessment of transport infrastructure and so on).
- **Better understanding of climate resilient development requires a more structured and systematic approach. Comparative analysis across physical, social and nature-based interventions would benefit from agreed logics for the aggregation of individual adaptation options into classes for assessment and the disaggregation of the components of climate resilient development through which assessments can be undertaken**. It was also pointed out that there is limited literature that approaches the consequences of adaptation for climate resilient development as a primary goal, while there were also a range of types of assessments depending on the intervention, all of which made it challenging for IPCC authors to review and assess the literature.
- **More evidence is needed around the economics of adaptation**. Crucially, common approaches based on cost-benefit analysis (CBA) are overly simplistic and poorly suited to systemic risks, fat tails, and deep uncertainty. This calls for alternative economic frameworks to address these aspects. More robust assessment of the cost of inaction is also an area of significant interest.
- **There is the need to better capitalise on evidence from a wide range of activities beyond academic research**, such as evidence generated by practitioners and indigenous knowledge. Efforts should focus on gathering and synthesising these materials. Consideration should also be given to including rather than integrating different sources of knowledge, to avoid losing important context, while being careful not to devalue the science.
- **There is an important role for WGII research to provide context to other working groups on overshoot**, for example, on thresholds for severe impacts for people and ecosystems. While overshoot may not be explicitly mentioned in the outlines, it remains relevant and needs to be addressed in close coordination with other WGs.
- **Clear guidelines are needed on approaches and processes to understand context and information needs that enable effective adaptation measures across scales (spatial and temporal)**. Such efforts could make an important contribution to the updated Technical Guidelines.
- **Efforts to assess conditions under which adaptation strategies cease to be effective will be important in assessing adaptation options and pathways**. There is the desire for more quantification of adaptation limits, while the concept of limits can also provide a useful avenue to help define the continuum between adaptation and loss and damage. There is also the need to clarify and communicate soft vs. hard limits in ways that are understandable and useful to decision makers. The cost of inaction is also an area of significant interest.

- **Evidence is needed on responses to losses and damages**. The dedicated chapter on loss and damage will consider responses, and would benefit from evidence around what is working, including at different spatial scales. What could work in future? What principles should be used? This new evidence can also support the new Loss and Damage Fund instituted under the UNFCCC.
- **Significantly more evidence is needed on finance, both for adaptation and loss and damage**. This includes assessment of actual financial flows going to developing countries, and the role of blended finance.
- **There was also emphasis on the benefit of research that effectively speaks to the international policy landscape** – for example, considering evidence relevant to the Global Goal on Adaptation, Nationally Determined Contributions, Adaptation Gap Report, etc. – and of research that also directly contributes to delivery of adaptation action across all spatial scales from local to international.

Working Group III

Following an introductory and framing chapter, the agreed WGIII outline comprises four main blocks of chapters. These cover past and current trends and futures; sustainable development and mitigation (Ch 2-4); factors that enable or constrain mitigation (Ch 5-7); sectors, systems and their integration (Ch 8-14); and a final chapter on carbon dioxide removal (CDR), which is a new feature, compared to AR6. (For more information, see slides in the Annex.)

In this assessment cycle, it was noted, the WGIII report has been asked to ensure a stronger degree of integration compared to AR6, considering diverse perspectives, and with greater consideration given to sustainable development, equity and justice, as well as better join-up with adaptation research. Comments on individual chapters included: the opportunity and need for chapters to highlight key policy-relevant issues and to provide links to the other WGs; the need to ensure links and coordination between Ch.2 and Ch.6 on policy instruments; and the decision that sustainable development will feature early in the report (Ch.3-4), given its perceived importance as a framing concept, with Ch.3 covering and integrating a broad set of dimensions, while Ch.4 will go deeper into sustainability.

During the panel discussion, the following research priorities were highlighted as important to strengthen the AR7 WGIII assessment:

- **Research how mitigation policies influence and are influenced by political and social conditions**. Policies that are intended to reduce emissions can reshape political landscapes and social conditions, and understanding this feedback loop is crucial for effective and just policy implementation.
- **Study the interrelationship between climate policies and other political goals (e.g. growth, health, energy security)**. Research should assess how climate goals interact with and influence other national policy priorities, where any perceived and actual trade-offs or synergies lie, and how those can be effectively managed.

- **Examine real-world outcomes of existing mitigation policies, assessing different policy combinations and design options and their sequencing**. As the evidence base grows, it's critical to analyse what has worked in practice, including with regards to the design, combination and timing of policy interventions (carbon pricing tends to come later in the policy cycle, for example). Assessment should also consider factors such as socioeconomic conditions that may impact policy effectiveness and outcomes, as well as the impact of policy on driving innovation and cost reductions. This can provide greater insight into what works, the nature of transitions, and policy options for future decision-making.
- **Analyse the impact of current international political shifts on mitigation coordination**. Research is needed to consider how increasing trade conflicts and regionalisation may affect progress and cooperation on climate action.
- **Strengthen the risk/opportunity evidence base and framing for climate action**. Building on assessments of real-world outcomes and implementation so far, more robust research is needed to communicate the full economic and social benefits of mitigation, including the resulting economic opportunities and co-benefits versus cost of inaction, and the potential for policy driven cost reductions.
- **Investigate how anti-mitigation narratives become influential, especially using narratives of unfairness and economic costs, and how to effectively counter them with evidence on the costs of inaction and co-benefits**. Opponents often portray climate action as economically damaging or socially unjust; research should unpack how these narratives are constructed, and what factors enable them to gain traction in specific communities.
- **Scenario research should look at integrated questions, considering, for example, the impacts of climate change on the effectiveness and design of mitigation strategies**. This is vital to inform robust, reliable and resilient strategies that can be effective in a changing climate. It will involve a shift away from prioritising cost effectiveness to instead focus on resilient solutions and will require deeper integration of climate risk information in mitigation assessment, joining up with WGI and WGII communities on global warming and impact projections.
- **The scenarios and wider research community should also explore how to more effectively integrate equity and justice considerations**. This could involve the scenario community looking at how emissions can be reduced in a world that focuses on advancing justice, therefore integrating these considerations ex ante, or how to develop a robust assessment of justice implications of mitigation strategy ex post. There is significant desire and scope in the outline to strengthen this dimension in AR7, but it is up to the research community to provide the evidence to support this.
- **The research community should consider whether scenario sampling needs to be expanded and improved, to ensure a wider range of plausible pathways is being explored**. Questions for the research community to consider include: Are we sure we are sampling all the possible ways of achieving policy-relevant temperatures within the scenarios? Are we sure we have incorporated all the different drivers of emissions? Are we sure we are sampling and looking at regional land use and non-CO2 emissions? How can scenarios be developed in a more interdisciplinary way?

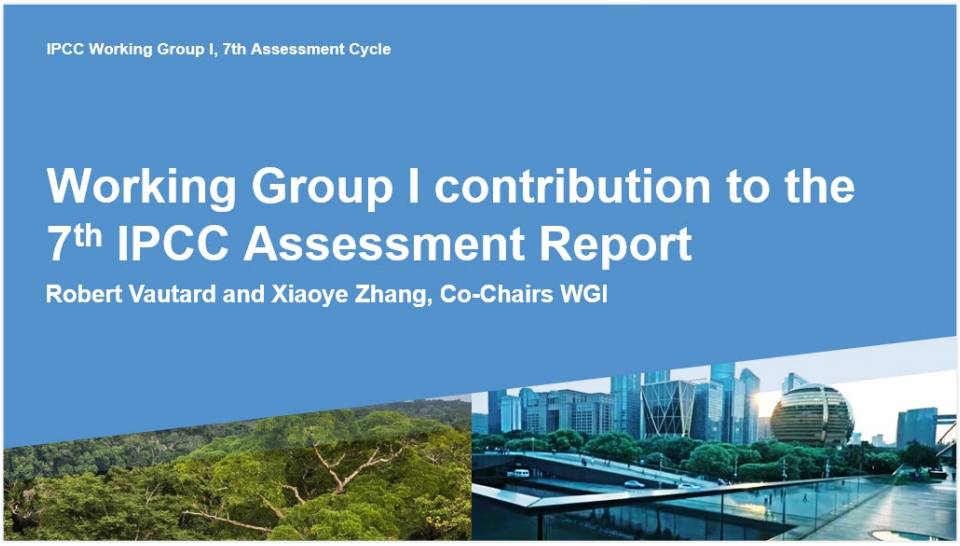
- **Efforts to develop and mainstream minimum quality standards for scenario data and a transparent process for vetting scenarios would help ensure a diversity of scenarios is available to the assessment**. Basic scenario quality standards regarding data availability and accuracy are essential. A clearly communicated vetting process can help ensure a wide diversity of scenarios are made available and considered in the AR7 assessment.
- **Further comments on scenarios** focused on: the need to ensure effective join-up across the WGI, WGII and WGIII research communities (strengthening coordination, especially with WGII) as well as to aim for consistency across scales (from global to national to sectoral); the opportunity for AR7 to be clearer on the purpose of scenarios; the scope for scenarios to provide greater insights at national level, to inform domestic policymaking, rather than focusing mainly at global or sectoral level; and on the opportunity to go beyond just quantitative scenarios.
- **There is a need to increase the diversity and transparency of integrated assessment models**. While there have been efforts to address these points, more is needed to improve robustness and ensure they effectively address the range of integrated questions they are called upon to tackle.
- **Efforts should focus on developing assessment approaches that can deal with the variety of (integrated) questions that are being asked of WGIII**, with the peer-reviewed literature acting as a sandbox for assessment methods. This includes, for example, ways to better deal with collections of scenarios and scenario data, including methods and approaches that allow us to probe feasibility and integrate uncertainty in our assessment of scenarios and how to use them; tools for interdisciplinary integration of working groups, especially information from WGII to assess implications for mitigation pathways; as well as approaches to bring together multiple lines of mitigation evidence for decision support over different timescales from today, in a few years, or 5-10 years into the future.
- **Research the impact of AI and other emerging technologies on behaviour and mitigation pathways, and what this means for realistic scenario development**. The role of AI in shaping consumption, production, and social behaviour needs to be better understood and integrated into scenario modelling.
- **Research should assess sequencing, timing, and risks around the deployment of carbon dioxide removal (CDR)**. Research should clarify when and how to use CDR responsibly, avoiding moral hazard and ensuring these tools do not replace rapid emissions cuts.

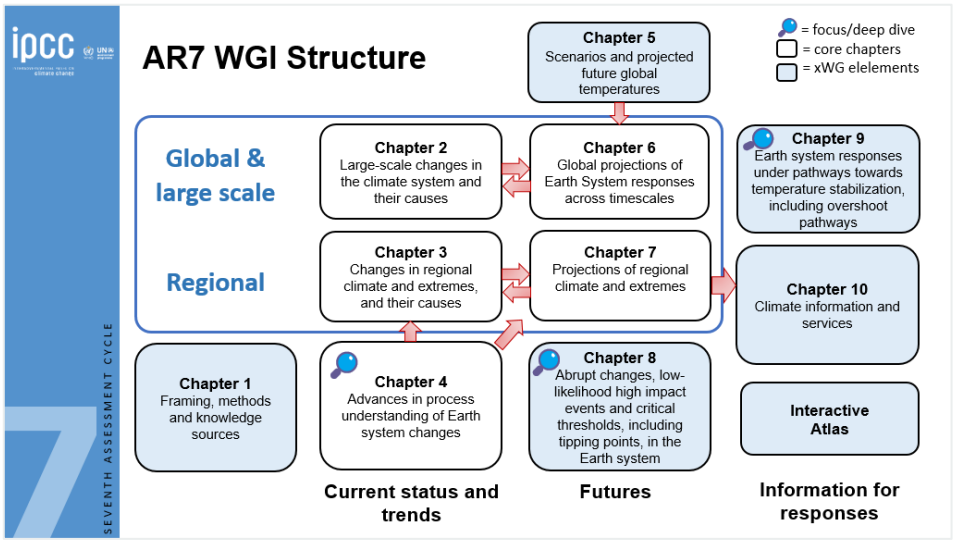
Further resources

- Agreed outlines for the IPCC WGI, WGII and WGIII reports
- Background document prepared ahead of the IPCC AR7 Scoping Meeting

Annex

WGI outline presentation





SEVENTH ASSESSMENT CYCLE

ipcc INTERGOVERNMENTAL PANEL ON climate change

UN environment programme

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WGII outline presentation

IPCC Working Group II, 7th Assessment Cycle

AR7 Working Group II Outline

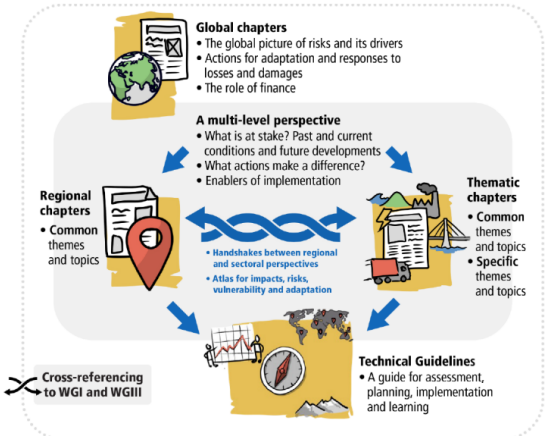
Dr. Adelle Thomas
Working Group II Vice Chair, IPCC AR7

SEVENTH ASSESSMENT CYCLE

ipcc INTERGOVERNMENTAL PANEL ON climate change

UN environment programme

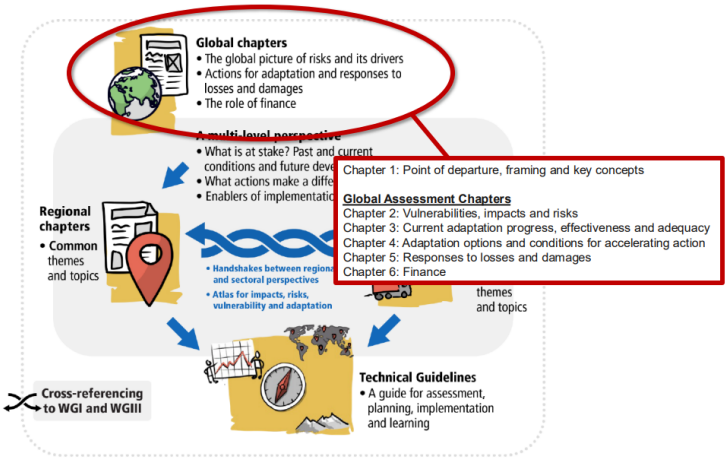
Outline of WG II AR7



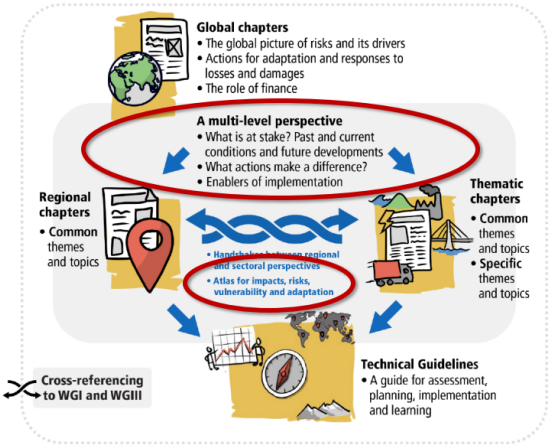
https://www.ipcc.ch/site/assets/uploads/2025/03/Doc_12-WGII_AR7_Chapter_Outline.pdf

IPCC Working Group II

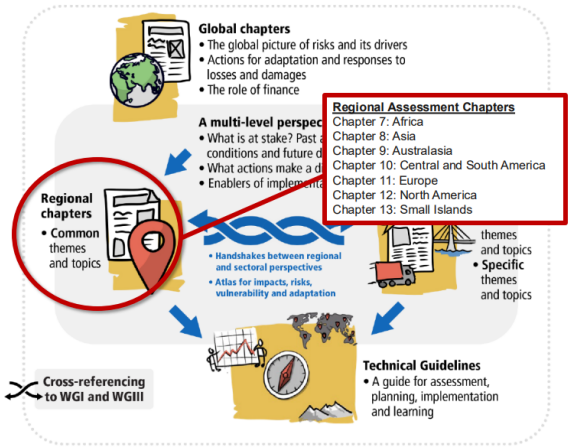
Starting with global chapters



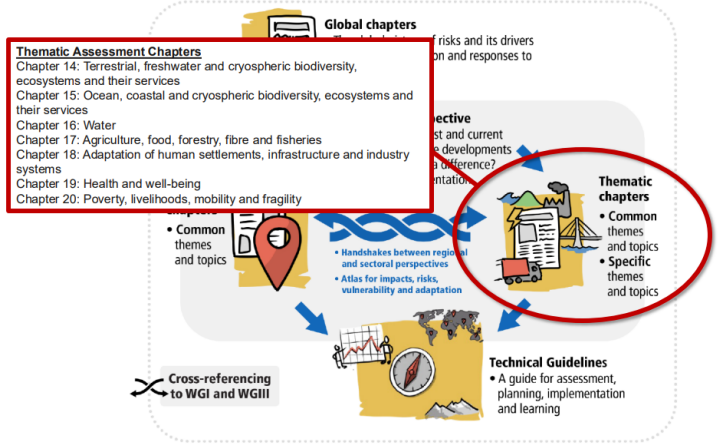
Segments to note



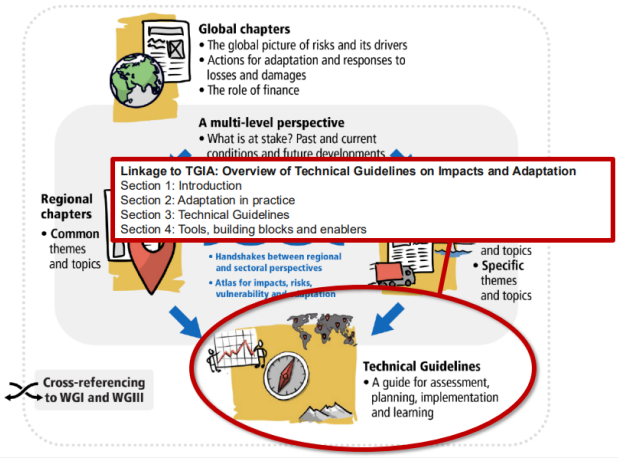
Progressing to regional chapters



Moving to thematic chapters



The updated Technical Guidelines



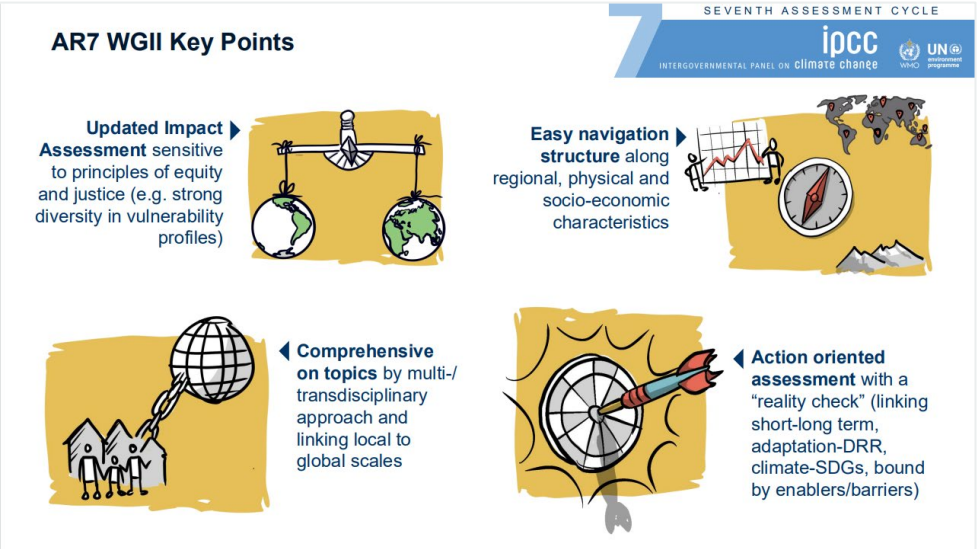
The 1994 Impacts and Adaptation Guidelines

- Define problem
- Select method
- Test method/sensitivity
- Select scenarios
- Access biophysical impacts, assess socio-economic impacts
- Assess autonomous adjustments
- Evaluate adaptation strategies

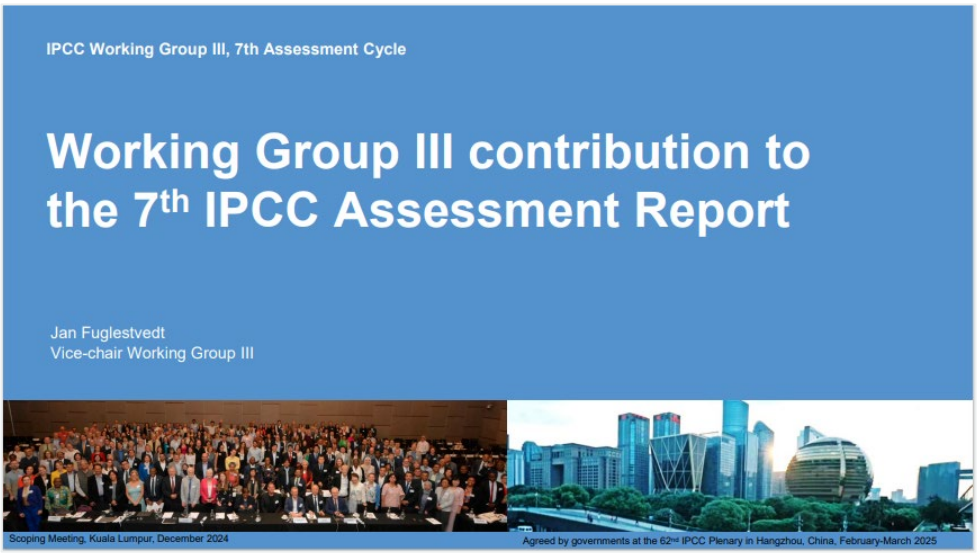
- 1994 guidelines widely applied, revealing new insights and needs.
- Adaptation focus has surged, now central in UNFCCC and climate finance (GGA)
- New guidelines from organisations (eg. World Bank, GCF) highlight need for updated framework

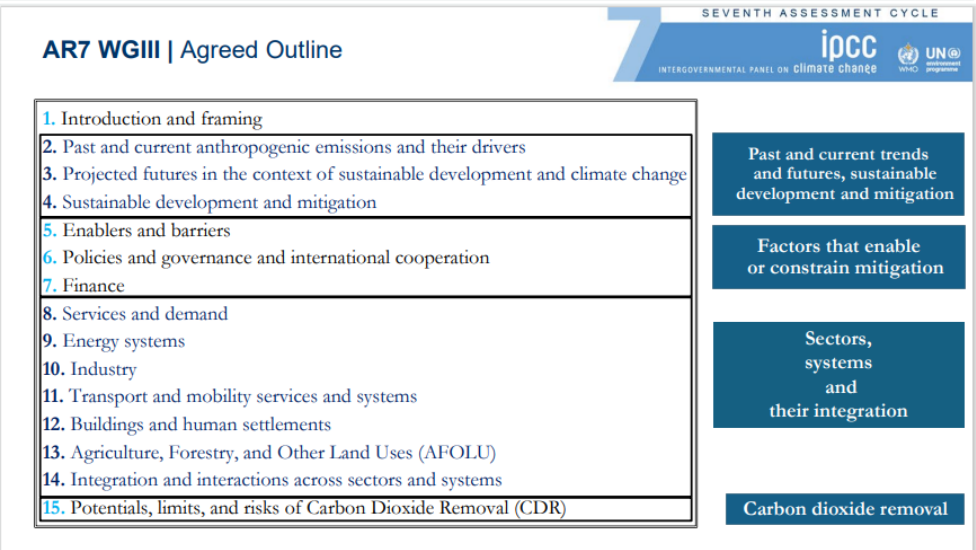
Update in AR7

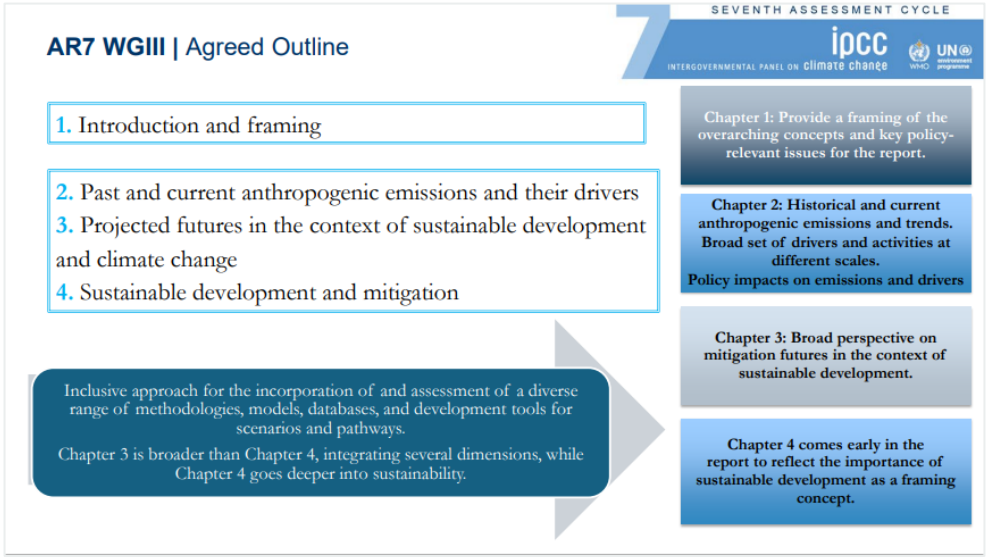
- New climate insights
- New data and scenarios
- New adaptation insights
- Local lived experiences with metrics and frameworks
- Support to global, national and local M&E

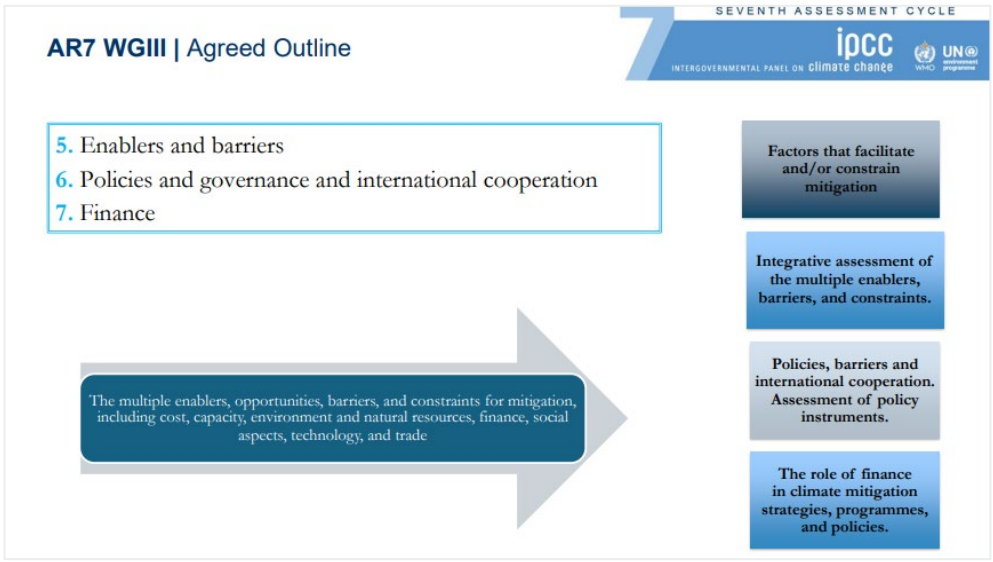


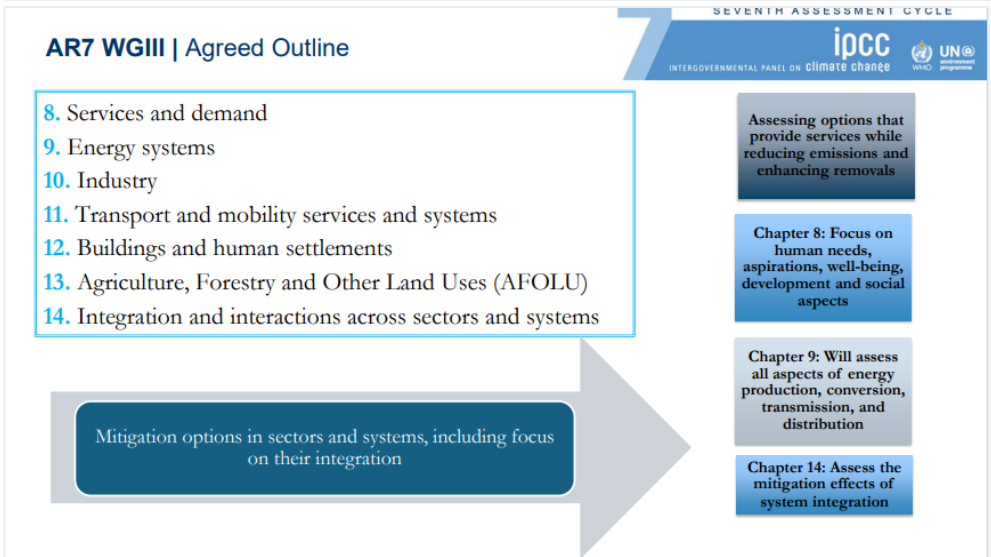
WGIII outline presentation

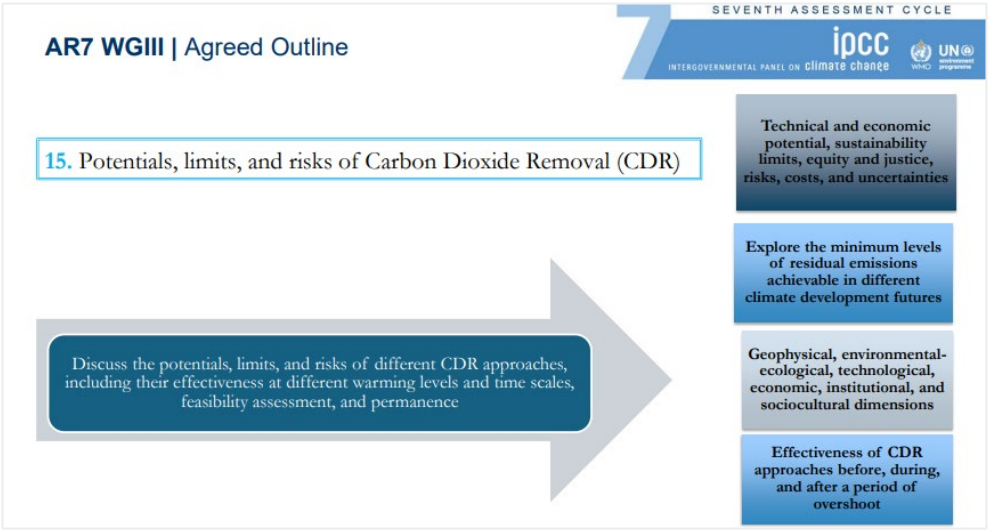


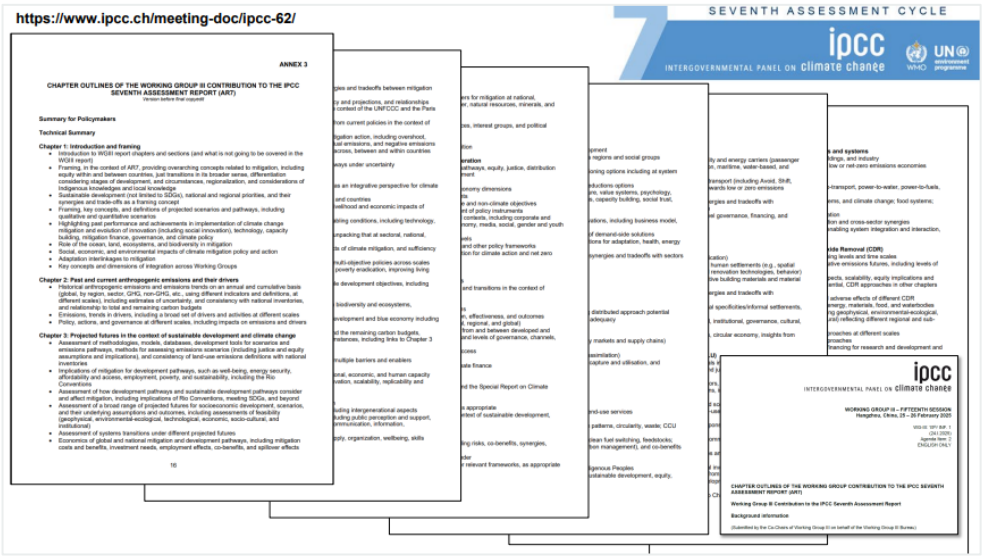


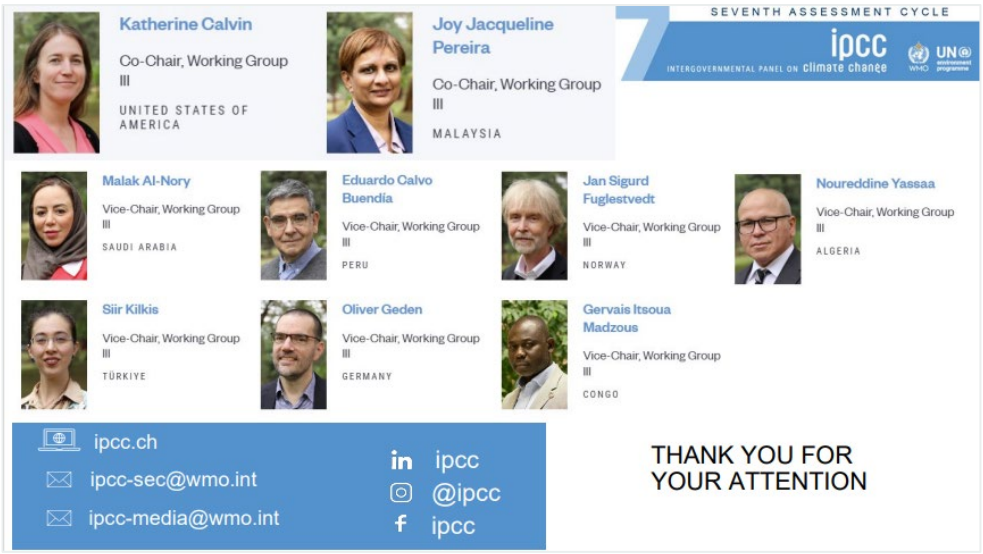

AR7 WGIII | Agreed Outline
SEVENTH ASSESSMENT CYCLE
ipcc
INTERGOVERNMENTAL PANEL ON climate change
1. Introduction and framing
2. Past and current anthropogenic emissions and their drivers
3. Projected futures in the context of sustainable development and climate change
4. Sustainable development and mitigation
Inclusive approach for the incorporation of and assessment of a diverse range of methodologies, models, databases, and development tools for scenarios and pathways.
Chapter 3 is broader than Chapter 4, integrating several dimensions, while Chapter 4 goes deeper into sustainability.
Chapter 1: Provide a framing of the overarching concepts and key policy-relevant issues for the report.
Chapter 2: Historical and current anthropogenic emissions and trends. Broad set of drivers and activities at different scales.
Policy impacts on emissions and drivers
Chapter 3: Broad perspective on mitigation futures in the context of sustainable development.
Chapter 4 comes early in the report to reflect the importance of sustainable development as a framing concept.


AR7 WGIII | Agreed Outline
SEVENTH ASSESSMENT CYCLE
ipcc
INTERGOVERNMENTAL PANEL ON climate change
5. Enablers and barriers
6. Policies and governance and international cooperation
7. Finance
The multiple enablers, opportunities, barriers, and constraints for mitigation, including cost, capacity, environment and natural resources, finance, social aspects, technology, and trade
Factors that facilitate and/or constrain mitigation
Integrative assessment of the multiple enablers, barriers, and constraints.
Policies, barriers and international cooperation. Assessment of policy instruments.
The role of finance in climate mitigation strategies, programmes, and policies.


AR7 WGIII | Agreed Outline
SEVENTH ASSESSMENT CYCLE
ipcc
INTERGOVERNMENTAL PANEL ON climate change
8. Services and demand
9. Energy systems
10. Industry
11. Transport and mobility services and systems
12. Buildings and human settlements
13. Agriculture, Forestry and Other Land Uses (AFOLU)
14. Integration and interactions across sectors and systems
Mitigation options in sectors and systems, including focus on their integration
Assessing options that provide services while reducing emissions and enhancing removals
Chapter 8: Focus on human needs, aspirations, well-being, development and social aspects
Chapter 9: Will assess all aspects of energy production, conversion, transmission, and distribution
Chapter 14: Assess the mitigation effects of system integration


AR7 WGIII | Agreed Outline
SEVENTH ASSESSMENT CYCLE
ipcc
INTERGOVERNMENTAL PANEL ON climate change
15. Potentials, limits, and risks of Carbon Dioxide Removal (CDR)
Technical and economic potential, sustainability limits, equity and justice, risks, costs, and uncertainties
Explore the minimum levels of residual emissions achievable in different climate development futures
Discuss the potentials, limits, and risks of different CDR approaches, including their effectiveness at different warming levels and time scales, feasibility assessment, and permanence
Geophysical, environmental-ecological, technological, economic, institutional, and sociocultural dimensions
Effectiveness of CDR approaches before, during, and after a period of overshoot


https://www.ipcc.ch/meeting-doc/ipcc-62/
SEVENTH ASSESSMENT CYCLE
ipcc
INTERGOVERNMENTAL PANEL ON climate change
ANNEX 3
CHAPTER OUTLINES OF THE WORKING GROUP III CONTRIBUTION TO THE IPCC SEVENTH ASSESSMENT REPORT (AR7)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ipcc
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