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SCOPING OF THE IPCC SEVENTH ASSESSMENT REPORT (AR7)

Background, cross-cutting issues and the AR7 Synthesis Report

(Prepared by the IPCC Chair)

(Submitted by the Secretary of the IPCC)

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1. Background and introduction

The Scoping Meeting for the IPCC Seventh Assessment Report (AR7) was held in Kuala Lumpur, Malaysia, from 9 to 13 December 2024 hosted by the Government of Malaysia, the City of Kuala Lumpur and the Universiti Kebangsaan Malaysia with financial support from the Government of Norway. It followed decisions taken at the Sixtieth and Sixty-first Session of the IPCC, and discussions held at the Sixty-seventh and Sixty-eighth Sessions of the IPCC Bureau.

This document provides: the background to the Scoping Meeting; a summary of the preparations for, and the selection of participants of the Scoping Meeting; an overview of the conduct of the Scoping Meeting and cross-cutting topics addressed; and the approach to the Synthesis Report. Much of the Scoping Meeting was conducted in parallel Working Group streams, which are described in more depth in documents WGI-15/INF. 1, WGII-13/INF. 1 and WGIII-15/INF. 1 (the information documents accompanying the Working Group AR7 outlines).

At its Sixtieth Session (Istanbul, Türkiye, 16–19 January 2024), *Decision IPCC-LX-9* of the Panel contained the following elements.

- *The Panel decided that during the seventh assessment cycle the IPCC will provide a comprehensive Assessment Report consisting of three Working Group contributions in the following sequence unless the Panel decides otherwise:*
 - a. WG I – The Physical Science Basis*
 - b. WG II – Impacts, Adaptation and Vulnerability*

c. WG III – Mitigation of Climate Change

and requested the Bureau to prepare a document outlining the month and year of delivery on the basis of an AR7 strategic plan, taking into account the different views expressed in the IPCC-60 and paragraph 3 of this decision, for the delivery of these reports in a timely and policy relevant manner and present it to the Panel at its next meeting for consideration and decision.

- A distinct product revising and updating the 1994 IPCC Technical Guidelines on impacts and adaptation, including adaptation indicators, metrics and methodologies will be scoped, developed, reviewed and should be considered for approval and acceptance in conjunction with the Working Group II Report and will be published as a separate product.*
- A Synthesis Report for the seventh assessment cycle will be produced by late 2029, after the completion of Working Group reports.*
- The Working Group contributions and the Synthesis Report will be developed in accordance with Procedures for the preparation, review, acceptance, adoption, approval and publication of the IPCC reports and the need to be inclusive in representation and literature assessment as well as ensuring the products of the IPCC remain policy relevant but policy neutral, robust and comprehensive.*
- It requested the IPCC Bureau to consider options for Expert Meetings and Workshops and recognized the importance and value of these.*
- In adopting its programme of work, it emphasized that the IPCC seventh assessment cycle will be robust, comprehensive, accurate, inclusive and use diverse literature and knowledge sources including drawing on Indigenous Peoples' Knowledge and Local Communities' Knowledge.*
- It thanked the IPCC Bureau and Secretariat for providing a synthesis of Member countries views on products for the seventh assessment cycle in document IPCCCLX/INF.6 and noted that topics identified for proposed IPCC Special Reports in document IPCC-LX/INF.6 and IPCC-LX/INF.7 are important and should be where possible addressed in the Seventh Assessment Report suite of products.*

At its Sixty-seventh Session (Geneva, Switzerland, 30–31 May 2024), the Bureau requested the Working Group and TFI¹ Co-Chairs to revise a proposed Strategic Planning Schedule with the view to seek agreement from the Bureau intersessionally, by correspondence, before presenting it to the Panel for its consideration at its Sixty-first Session (BUR-LXVIII/Doc. 6). This process did not result in agreement.

At its Sixty-first Session (Sofia, Bulgaria, 27 July – 2 August 2024), the Panel took the following decision (*Decision IPCC-LXI-9*).

- The Panel noted the document IPCC-LXI/Doc. 10 (Strategic Planning Schedule) submitted by the IPCC Chair and document IPCCCLXI/INF. 15 (Improving inclusivity in AR7) prepared by the Co-Chairs of the Working Groups and TFI.*
- Recalling the Decision IPCC-LX-9 and in accordance with paragraph 4.1 of Appendix A of the Principles governing the work of the IPCC, based on the reports of the scoping meetings of the Working Group and Task Force on National Greenhouse Gas Inventories reports, the Panel will agree at its Sixty-second Session on the scope, outline, and the work plan including schedule and budget.*

¹ TFI: The Task Force on National Greenhouse Gas Inventories.

2. Preparation for the Scoping Meeting

2.1. Planning

The planning for the Scoping Meeting was led by the Working Group Co-chairs with the participation of the Chair. This involved settling the design of the meeting (see Section 3) and the preparation of a “vision document” to orientate participants prepared jointly by the Chair and the Working Groups. The Vision Document, which included the Chair’s vision, cross-cutting topics, the Synthesis Report and perspectives from each of the three Working Groups is included in Annex I.

Preparation for the Scoping Meeting also included a set of “pre-scoping” activities organised by the Working Groups. These varied from one Working Group to another, but each included some combination of: a science survey; a survey of meeting participants; webinars with those who were nominated but not selected to participate in the Scoping Meeting; consultations with AR6² Coordinating Lead Authors; and informal exchanges with organisations whose areas of interest are adjacent to the climate space (e.g. IPBES³, UNCCD⁴). In addition, feedback was sought at side events at COP 29 in Baku, Azerbaijan in November 2024.

There is a more complete description of these activities in documents WGI-15/INF. 1, WGII-13/INF. 1 and WGIII-15/INF. 1.

2.2. Participant selection

A call for nominations of experts to participate in the Scoping Meeting was issued to governments and Observer Organisations on 3 May 2024, with a closing date of 7 June 2024. In all, 2210 nominations were received. There were 240 places available, 120 with potential support from the IPCC Trust Fund for experts from developing countries and economies in transition.

Initially the 240 places were divided equally (60 each) between the three Working Groups and the IPCC Chair for work on the Synthesis Report. Given the lower level of work required on the Synthesis Report, all 34 Bureau places were subtracted from the Chair’s total as well as five further places allocated to Working Group II in recognition of its work on guidelines for assessing impacts and adaptation. This left 21 places in all to the Synthesis Report.

The processes for selecting participants for the three Working Groups are described in documents WGI-15/INF. 1, WGII-13/INF. 1 and WGIII-15/INF. 1. The Chair, in consultation with the Vice-Chairs, selected Synthesis Report participants, taking into consideration demonstrated capacity for systems thinking as well as the balance of gender, region, Working Group background, and those with and without previous experience of Synthesis Reports. As there were only three Synthesis Report sessions during the Scoping Meeting, all participants were able to spend most of their time with their “home” Working Group.

After any overlaps in selection between the Working Groups were reconciled, the final allocation was: Working Group I: 61; Working Group II: 65; Working Group III: 60; Synthesis Report: 21 (see list in Annex II). Final levels of participation diverged slightly from these as result of actual attendance at the meeting.

² AR6: IPCC Sixth Assessment Report.

³ IPBES: the UN Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, www.ipbes.net.

⁴ UNCCD: United Nations Convention to Combat Desertification, www.unccd.int.

3. The Scoping Meeting

3.1. Overall format

The AR7 Scoping Meeting, held in Kuala Lumpur, Malaysia from 9 to 13 December 2024, was attended by 240 experts from over 70 countries, experts whose expertise span the domains of the three Working Groups. Experts included scientists, practitioners, government representatives acting in a personal capacity, and members of the IPCC Bureau.

The full program of the Scoping Meeting is shown in Annex III. The first morning comprised of an opening session with introductory remarks by the IPCC Secretary, the IPCC Chair, the Deputy Secretary of WMO⁵, the UNEP⁶ Director of the UNEP Early Warning and Assessment Division, and the Undersecretary from the Ministry of Natural Resources and Environmental Sustainability, Malaysia.

The meeting then went into a closed session. The first scene-setting session covered the vision for the AR7, cross-cutting themes and introductions by the Co-chairs of each Working Group. In the afternoon, participants went into their Working Groups where they remained for most of the week, either in Working Group plenary or in Breakout Groups (BOGs) as described in documents WGI-15/INF. 1, WGII-13/INF. 1 and WGIII-15/INF. 1.

On days 2 and 3, cross-Working Group BOGs were formed to address cross-cutting themes, as described in more detail below. Full plenary sessions were held on each day of the Scoping Meeting to review progress and share insights from cross-Working Group BOGs.

Three Synthesis Report sessions were held on days 2, 4 and 5 with participants of that workstream. Each of the Synthesis Report sessions was scheduled both to succeed and precede a full plenary session, so that insights and progress could be shared.

3.2. Cross-cutting topics

To facilitate ambitions for cross-Working Group coordination and collaboration, several interdisciplinary cross-cutting topics to be covered in BOGs were identified in advance by the Working Group Bureaux, while space was left to introduce other topics suggested by participants.

The initial topics were identified based on several inputs and sources:

- the survey sent to government focal points before the Sixtieth session of the IPCC with a view to collecting ideas for possible Special Reports;
- discussions with the panel during the Sixtieth and Sixty-first Sessions of the IPCC;
- pre-scoping activities, including surveys, webinars and discussions with scientist organisations, AR6 authors, experts nominated to the scoping meeting, and international organisations;
- internal IPCC Bureau discussions and brainstorming; and
- AR6 knowledge gaps.

They were intentionally kept broad to allow refinements by the scoping meeting experts, who were tasked with discussing and deciding how to treat these topics in the report outlines. It was not

⁵ WMO: World Meteorological Organization, wmo.int.

⁶ UNEP: UN Environment Programme, www.unep.org.

expected that each topic would be treated in the same manner in the AR7, just that each would need some discussion.

Nine initial topics were initially identified, listed below in alphabetical order. They include specific scientific themes, ways of subdividing the world, and specific methodologies:

- equity and justice,
- finance,
- health and well-being,
- (information for) losses and damages,
- overshoot,
- risk assessment approaches and regionalisation,
- scenarios,
- sectors and systems,
- solar radiation modification.

The following three topics were suggested by participants:

- biodiversity,
- societal development, included climate resilience development,
- tipping points / large singular events.

For more information, please see WGI-15/INF. 1, WGII-13/INF. 1 and WGIII-15/INF. 1.

4. The Synthesis Report

4.1. Overview

According to the Principles governing IPCC work, *“the Synthesis Report will synthesise and integrate materials contained within the Assessment Reports and Special Reports and should be written in a non-technical style suitable for policymakers and address a broad range of policy-relevant but policy-neutral questions approved by the Panel”*.⁷

The Principles go on to note that the Synthesis Report is composed of a Longer Report that should be 30 to 50 pages long and of a Summary for Policymakers (SPM) that should be 5 to 10 pages long. An approval and adoption procedure allows Sessions of the Panel to approve the SPM line by line and to ensure that the SPM and the Longer Report are consistent, and that the Synthesis Report is consistent with the underlying Assessment Reports and Special Reports from which the information has been synthesised and integrated.

There have been consistent requests that the Synthesis Report should aspire to a genuine synthesis and should not be simply a “cut and paste” from the underlying Working Group and Special Reports.

IPCC procedures for the preparation, review, acceptance, adoption, approval and publication of

⁷ IPCC, 'Appendix A to the Principles Governing IPCC Work: Procedures for the Preparation, Review, Acceptance, Adoption, Approval and Publication of IPCC Reports', in *Principles Governing IPCC Work*, 2013, 29, <https://www.ipcc.ch/site/assets/uploads/2018/09/ipcc-principles-appendix-a-final.pdf>.

reports specify that the Synthesis Report should be preceded by a Scoping Meeting which is separate from the Scoping Meeting for the three Working Group contributions to the Assessment Report.

The Panel decided that a Synthesis Report for the seventh assessment cycle will be produced by late 2029, after the completion of Working Group reports (*Decision IPCC-LX-9*). The IPCC Chair proposes convening a Scoping Meeting after each Working Group has held its third Lead Author Meeting. By that time, expert reviews of the First-Order Draft will have been completed, and key decisions will have been taken about the preparation of the Second-Order Draft. The first meeting of the Synthesis Report Core Writing Team would not take place until after the fourth Working Group Lead Author Meetings. This will allow emerging findings to feed into the scoping and drafting of the Synthesis Report.

However, prospects for a genuine synthesis will be enhanced if some thought is given at an early stage to possible narratives of, and topics covered by, the Synthesis Report. This will allow the scoping of the Working Group reports to anticipate the pipeline through to the Synthesis Report and ensure that the findings of the Working Group contributions are “synthesisable”.

Ultimately, 23 individuals plus the Chair and Vice-Chairs participated in a set of three sessions focusing on the Synthesis Report (see Annex II for a list). These included 11 females and 12 males. The 23 came from 20 different countries, with 12 coming from developing countries. The overall goals were:

- a) to agree a provisional narrative for the Synthesis Report;
- b) to identify Working Group topics and themes to populate the narrative; and
- c) to identify cross-cutting topics that might be featured in the Synthesis Report because they can be fully addressed only by drawing on insights from more than one Working Group.

These were addressed in three sequential sessions timed around the main AR7 Scoping discussions and chaired in turn by the three IPCC Vice-Chairs. After each session, one of the participants reported back to the following full plenary session.

Note that the outputs of these sessions are provisional in character. The Synthesis Report will be fully and formally scoped later in the cycle, and nothing is locked in. It is inevitable that new findings will emerge as the Working Group contributions are developed and these will need to be built into the formal scoping of the Synthesis Report.

4.2. Session 1: Provisional narrative

This session took place in the afternoon of day 2, following the first Working Group plenaries and first cross-Working Group BOGs, and was Chaired by IPCC Vice-Chair Ladislaus Chang’a.

The session had multiple goals: to develop a provisional narrative, or narratives, for the Synthesis Report, including both the SPM and the Longer Report; to consider the treatment of sustainable development / poverty eradication within the narrative; and to address the use of figures / tables and the length of the SPM and Longer Report.

Synthesis Report narrative

The narratives of SPMs of Working Group, Special and Synthesis Reports have been converging across successive cycles. This is summarised in Part C.3 of the Vision Document attached as Annex I to this Document.

The converging elements correspond roughly to the three elements of the Talanoa Dialogue framework employed during Fiji's COP Presidency (COP 23):

1. where are we now ("stocktake");
2. where do we want to go ("futures"); and
3. how do we get there ("responses").

The participants reached a unanimous view quite quickly on three issues:

- the SPM and the Longer Report should follow the same narrative for clarity and consistency;
- the Talanoa Dialogue framework would provide a robust and transparent narrative for the Synthesis Report, noting that actual language used by the IPCC needed be consistent with the mandate to be "policy relevant but not policy prescriptive";
- the AR6 distinction between long-term and near-term responses in the structure of both the SPM and the Longer Report had proved challenging in terms of defining the boundary between long- and near-term and avoiding overlap. The Talanoa Dialogue framework is subtly different and was strongly preferred.

Although the Talanoa Dialogue framework would be appropriate for the Synthesis Report, it does not rely on the Working Groups adopting the same narrative for their AR7 contributions though it would help support cross-Working Group integration.

Sustainable development and poverty eradication

The group endorsed the idea that considerations of sustainable development should be embedded throughout the Synthesis Report in all elements of the narrative (stocktake, futures, responses) rather than being treated at the end. In other words, sustainable development and poverty eradication should act as an umbrella for the narrative. This would acknowledge the two-way relationship between climate and sustainable development, and in particular the Sustainable Development Goals (SDGs). It would also recognise that the world at the end of the AR7 cycle will be different from the world at the start, with the target date for the SDGs rapidly approaching.

Length and figure considerations

The group spent some time discussing report length and the approach to figures. The latter discussion might have wider implications for Working Group contributions.

On report length, the conclusions were:

- There was continuing support for a short SPM and a Longer Report.
- The current target length for the Longer Report (30–50 pages) is appropriate. The AR6 Longer Report ran to 80 pages, but the tighter target length provides an appropriate signal to and discipline for authors.
- The final length of the AR6 Synthesis Report SPM ran to 31 pages including 8½ pages of figures. This was three times the top end of the target range, with the figures themselves almost exhausting the target. The view was that the SPMs could and should be short, but that a length of 5 to 10 pages was unrealistic.
- In general, there was an aspiration to re-imagine the Synthesis Report SPM to make it more actionable and more attractive for policymakers, but without firm recommendations.

The group also discussed the approach to figures. There was a general dissatisfaction with the past tendency towards figures with multiple panels which had been driven by the desire to reduce the overall number of figures and reduce the report length. However, at least one participant did like the approach to figures in AR6. The group converged on the following points:

- figures should be simple and convey the desired message;
- a single figure should convey a single message;
- there was dissatisfaction with complex figures that took a long time to explain and interpret, for example mapping responses against 17 SDGs;
- the current multi-panel approach makes it challenging to adapt figures for subsequent PowerPoint presentation.

A wide-ranging discussion also covered the use of infographics and animated figures.

4.3. Session 2: Broad elements underpinning the narrative

Session 2 took place on the morning of day 4 after Working Groups had identified an initial chapter structure and the cross-Working Group BOGs had completed their work. It was chaired by IPCC Vice-Chair Diana Ürge-Vorsatz.

The goal of the session was to identify topics and themes that could be elevated from the Working Groups to populate the narrative to the Synthesis Report.

The session took as its starting point the provisional narrative identified in Session 1. A comprehensive set of specific topics for each part of the narrative was identified through extensive detailed discussions.

It was subsequently seen as desirable for each part to have a similar internal structure as shown in Table 1. The essential elements are: *Context*; *Warming*; *Impacts, adaptation and vulnerability*; and *Means of implementation*. In addition, it was proposed that Part B, Futures, have an *Integrated Framing* section. Note that the label “warming” attached to some sections does not fully capture the content associated with specific topics, many of which refer to mitigation responses.

Table 1: Possible content of the Synthesis Report.

A. Stocktake	B. Futures	C. Responses
a. Context	a. Context	a. Context
b. Warming	b. Integrated framing	b. Warming
c. Impacts, adaptation and vulnerability	c. Warming	c. Impacts, adaptation and vulnerability
d. Means of implementation	d. Impacts, adaptation and vulnerability	d. Means of implementation
	e. Means of implementation	

4.4. Session 3: Possible topics meriting synthetic treatment

Session 3 took place on the morning of day 5 when Working Groups had almost completed their indicative bullets and before the final full plenary. It was chaired by IPCC Vice-Chair Ramón Pichs-Madruga.

The goal was to identify cross-cutting topics that might not be covered comprehensively in any one of the underlying Working Group contributions and might therefore merit requiring synthetic treatment in the Synthesis Report.

The session started with an interactive voting process intended to provoke subsequent discussion. 13 potential cross-cutting topics were identified deriving from government proposals for possible Special Reports submitted to the Sixtieth Session of the IPCC (IPCC-LX/INF. 6, Rev.1 and IPCC-LX/INF. 7, Rev.1). Participants then “voted” on the topics by each exercising up to nine positive votes and five negative votes which could be distributed freely among the 13 topics. The results are shown in Figure 1.

The three top topics were *scenarios*, *equity and justice*, and *nexus* issues (climate change, food, water) each gaining more than 20 votes. It is worthwhile noting also the two topics that garnered multiple negative votes, in both case negative votes exceeding positive votes. *Solar radiation modification* stands out, but *climate resilient development* also falls into this category.

The subsequent discussions revealed a polarisation of views on *Solar radiation modification* (which implies it may not be excluded as a potential topic) and a lack of socialisation of the wide-ranging conception of *climate resilient development* embodied in Chapter 18 of the WGII contribution to AR6.

An additional two cross-cutting topics were identified in discussions. **Synergies and trade-offs** and **the costs of climate inaction versus the costs (and benefits) of mitigation** had been addressed only at the Working Group level and not in cross-cutting BOGs. An increasing volume of literature is addressing the latter topic which cuts across WGII and WGIII. A start was made on this topic with cross-Working Group Boxes in the AR6.

It is clear that the Synthesis Report can only include topics to the extent to which they are assessed in the Working Group reports. Attention needs to be given to how to handle cross-cutting topics effectively and efficiently as the Working Group reports progress.

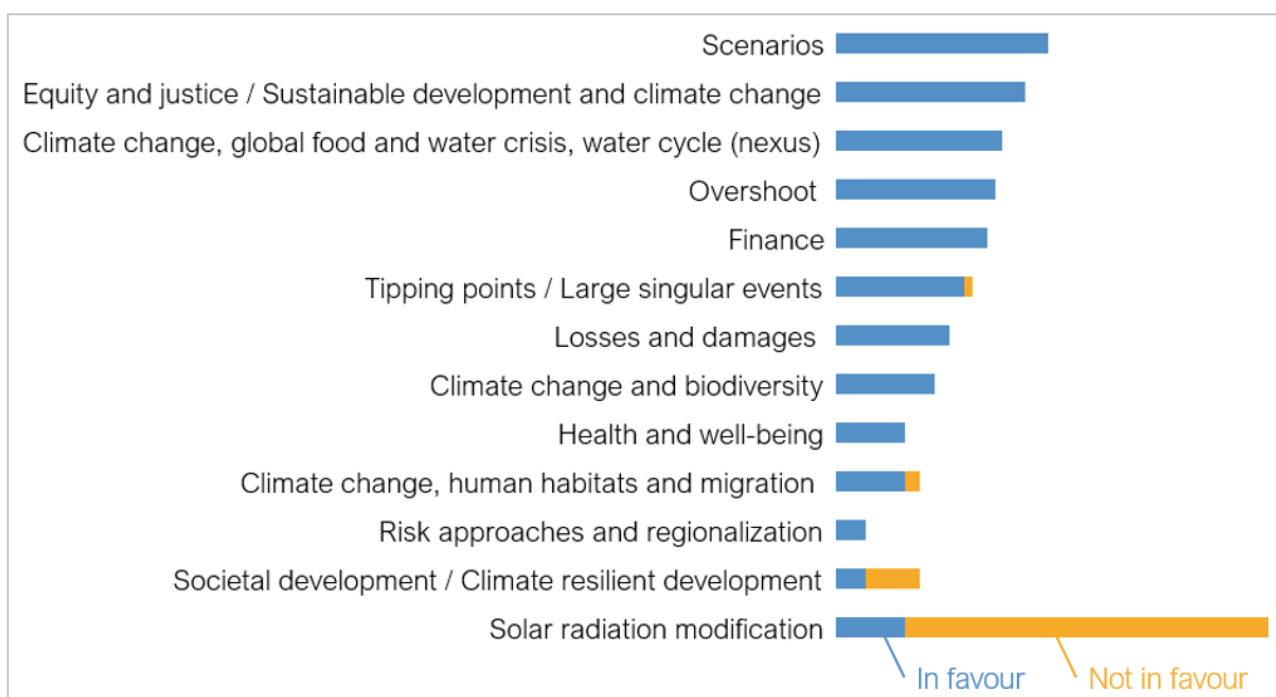


Figure 1. Voting exercise results.

4.5. Next steps

The Synthesis Report discussions have already helped to inform the scoping of the Working Group reports. The conclusions of the Synthesis Report sessions held in Kuala Lumpur will continue to be fed into Lead Author Meetings for the three Working Groups, and will form a starting point for the formal Scoping Meeting for the Synthesis Report to be held later in the cycle.

ANNEX I — Vision Document for the Scoping Meeting

Prepared by the Chair of IPCC and the Co-Chairs of the Working Groups I, II and III. AR7 Scoping Meeting document AR7-SCOP/Doc. 2.

Table of content of the Vision Document:

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INTRODUCTION

The purpose of this document is to inform discussions at the Intergovernmental Panel on Climate Change (IPCC) Scoping Meeting to be held 9-13 December 2024 in Kuala Lumpur Malaysia. The output of the Scoping Meeting will consist of proposed outlines, with explanatory notes, for each of the three Working Group contributions to the IPCC Seventh Assessment Report (AR7). The outlines need to be agreed by the Panel at its 62nd meeting (P-62) in February 2025.

The document is intended as a starting point for the Scoping Meeting and should not be regarded as constraining discussions.

The document has six parts. **Part A** covers the IPCC Chair's perspective on ambitions and challenges for IPCC during the Seventh Cycle. **Part B**, based on Working Group Bureau discussions, covers cross-cutting topics that may require cross-Working Group treatment in AR7. **Part C** offers the Chair's perspective on the AR7 Synthesis Report which the Panel has agreed will be completed by late 2029. **Parts D-F** cover the perspectives of the three IPCC Working Groups: I on the physical basis of climate change; II on impacts, adaptation and vulnerability; and III on mitigation.

The proposed Working Group outlines will form the basis for Decision documents to be considered, for agreement, by the Panel at P-62. The proposed outline for the Synthesis Report will be the subject of a separate Scoping Meeting at a later date. The Synthesis Report is being considered in order to anticipate possible narrative structures, identify topics requiring a synthetic approach, and to identify possible "landing zones" for Working Group findings. The outcomes of the Kuala Lumpur discussions on the Synthesis Report will be presented to the Panel for information only.

PART A: CHAIR'S VISION

A.1 Background

The IPCC's Sixth Assessment Cycle (AR6) made significant advances in terms of policy and societal impact, as well as unprecedented levels of collaboration across Working Groups. The Seventh Assessment Cycle (AR7) starts with similar ambitions, but these ambitions need to be set in the context of a number of challenges including the evolving scientific landscape, IPCC's relevance, and its own processes and procedures.

The **scientific landscape** is evolving in terms of both the volume of published literature, and rapidly progressing research areas, such as climate extremes, tipping points, more granular climate projections for impact analysis, temperature overshoot, transformative adaptation, and carbon dioxide removal. Approaches to dealing with the volume of literature are discussed in Section A.5 below. Specific scientific topics are covered in Sections D-F which cover the Working Group contributions to AR7.

In terms of **relevance**, IPCC's impact throughout its 35-year history has been considerable. The First Assessment Report (FAR) preceded the establishment of the UN Framework Convention on Climate Change (UNFCCC), the Fifth Assessment Report (AR5) influenced the Paris Agreement, and the outputs of the Sixth Cycle (AR6) have influenced the adoption of net zero emission targets covering the majority of global emissions, the Glasgow Pact, and the UAE Consensus.

As attention turns to climate action, the challenge for IPCC is to inform not only the setting of ambitions, but to provide robust scientific assessments to support their achievement. The focus on climate action means greater efforts are required to maintain the delicate balance between policy relevance and policy prescription. Impact and policy relevance must be sought while respecting the IPCC's distinct mandate and remaining true to its own scientific values and principles.

The perceived scientific rigour and success of IPCC assessments mean that its **principles and procedures** have been adapted by other scientific assessment processes, including the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and potentially the proposed new Panel on Chemicals, Waste and Pollution Prevention. The IPCC has decided that it should review its own processes during each assessment cycle, but there was no review during the Sixth Assessment Cycle. A government-led *Ad-Hoc Group on Lessons Learned from the Sixth Assessment Cycle*¹ which operated at the start of AR7 identified many topics for consideration, although no agreement was reached on specific actions. Some of these topics were managerial in nature, but those of possible scientific consequence included: support to author teams; improved integration and collaboration; ethics and scientific integrity; better balanced and more inclusive representation of different knowledge types; guidance on expert/co-sponsored meetings; Government and author engagement; and content considerations.

My focus as Chair of the IPCC is on three main themes: **policy relevance; inclusivity; and interdisciplinarity**. The remainder of this section focuses on these three main themes (A.2-A.4) as well as emerging challenges for the IPCC (A.5) and the approach to the Synthesis Report (Part C) for which the Chair is responsible.

A.2 Policy relevance

The IPCC's primary audiences are governments and policy-makers at all levels (including the UNFCCC). IPCC reports are used by a wide range of audiences and the IPCC Communications Strategy aims to ensure that information is available and accessible for broader audiences, such as the UN, IPCC observer organizations, the scientific community, the education sector, non-

¹ <https://apps.ipcc.ch/eventmanager/documents/87/140720240740-Doc.%209%20-%20AGLL%20Report.pdf>

governmental organizations (NGOs), the business sector and the wider public.²

Approved IPCC reports and other products form the basis for subsequent communication materials. Summaries for Policymakers, as well as underlying reports, that have clear structures and include clear, comprehensible texts and graphics support effective communication to all audiences. It is important that they are conceived as such right from the start. The scoping process underpins this objective.

A.2.1 UNFCCC and other international processes

The UNFCCC is explicitly mentioned as a primary audience in the Principles underlying IPCC's work. An IPCC-SBSTA³ Joint Working Group meets twice a year to share progress and identify points of intersection. The IPCC engages regularly at Conferences of the Parties (COPs) and intersessional activities, presenting findings at official events and through the work of the Research and Systematic Observation (RSO) workstream, notably its Research Dialogue.⁴

During the AR7 cycle, the main policy milestones where IPCC assessments could be relevant are:

- The submission of revised National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) under the Paris Agreement in 2025. There will be no new IPCC products by that time.
- The Second Global Stocktake (GST) under the Paris Agreement which will start at COP 31 in 2026 and conclude at COP 33 in 2028. The aim of the GST is to assess collective progress towards achieving the purpose of the Paris Agreement and its long-term goals. There is no agreement yet on how the second GST will be conducted. UNFCCC has invited the IPCC to consider how best to align its work with the second and subsequent global stocktakes and to consider how to provide relevant and timely information for the second global stocktake. As the Panel has yet to agree a Strategic Planning Schedule, the degree of alignment is not yet clear. However, it is important to consider the GSTs as one of key landing zones for the findings of IPCC assessments.
- The UNFCCC agreed an overarching framework for the Global Goal on Adaptation (GGA) at COP 28 in December 2023. The aim is to build on the GGA framework and develop targets and approaches that can guide global adaptation efforts and enhance support for adaptation in developing nations by COP 30 in 2025. The IPCC was invited to consider updating its 1994 technical guidelines for assessing climate change impacts and adaptation during AR7.⁵ The IPCC agreed to this and will revise and update the IPCC Technical Guidelines on Impacts and Adaptation including adaptation indicators, metrics and methodologies.⁶ This may be relevant for the GGA but cannot be completed by COP 30.

In addition, the horizon for the current UN Sustainable Development Goals (SDGs) is 2030, by which time the AR7 should be complete. Goal 13, *Climate Action*, is clearly relevant but IPCC reports have shown how climate action can contribute to the achievement of other SDGs. In scoping the AR7 assessment, attention to sustainable development and efforts to eradicate poverty would enhance policy relevance.

² IPCC 35th Session, Decisions Taken with respect to the Review of IPCC Processes and Procedures: Communications Strategy, https://www.ipcc.ch/site/assets/uploads/2018/05/IAC_CommunicationStrategy.pdf

³ SBSTA. Subsidiary Body for Scientific and Technological Advice, a permanent subsidiary body to the UNFCCC.

⁴ <https://unfccc.int/topics/science/workstreams/RSO>

⁵ Decision 3/CMA.4, paragraph 21. https://unfccc.int/sites/default/files/resource/cma2022_10_a01E.pdf?download

⁶ Decision IPCC-LX-9, paragraph 11. https://www.ipcc.ch/site/assets/uploads/2024/02/IPCC-60_decisions_adopted_by_the_Panel.pdf

A.2.2 National and sub-national policymaking

As increasing emphasis is placed on climate action, IPCC findings that are relevant for both national policymakers and for policymakers and practitioners at the sub-national levels, including cities, will become increasingly important. Following the framework used in the Working Group III report in AR6, these findings could cover sectoral policies, cross-cutting policies and institutional structures, and policies in other domains that have consequences in terms of climate mitigation and adaptation. For urban settlements and land use, many specific actions may have consequences in terms of both adaptation and mitigation, as well as for broader sustainable development.

National focal points have increasingly called for policy-relevant findings to be made more regionally and nationally specific, for mitigation as well as adaptation. These concerns should be borne in mind during the Scoping Meeting.

A.2.3 Non-governmental stakeholders

Climate action also relies on the active participation of business, the finance sector, civil society actors, political actors, businesses, education, youth, labour, media, Indigenous Peoples and local communities. While these are not the IPCC's primary audience, findings that are relevant for these groups, and the way they are presented in the reports (narrative, summaries, FAQs) are an important consideration.

While the IPCC itself does not produce derivative products aimed at specific audiences, it may engage with organizations that take elements of IPCC assessments and communicate them in more audience-specific formats. For example, the Summary for Urban Policymakers⁷ reports produced by third parties at the end of the AR6 cycle communicated IPCC findings to city policymakers and practitioners. Engagement of non-governmental stakeholders in supporting the report quality and useability is key, and ways of improving such engagement is also to be explored during the reports production and their review cycles.

A.3 Inclusivity

The IPCC's inclusivity challenges relate to gender, the balance of developed and developing country participants, regional representation and representation of different types of knowledge holder.

In terms of **gender**, while men greatly outnumbered women in IPCC's early days, progress has been made. The Bureau reached roughly its current size in the Third Cycle (TAR), at which point it was 100% male. Roughly one in six members were female in the Fourth and Fifth Cycles (AR4 and AR5), while the ratio reached one in four in the AR6 and 40% in AR7, although genders are not equally balanced across roles. Another indicator is the balance of authors in the writing team of the Synthesis Report. Only 10% of Synthesis Report authors were women in the TAR, but this rose to ~20% in AR4 and AR5 and 40% in AR6. IPCC has established a Gender Policy which aims to enhance gender equality in IPCC processes, promote a gender-inclusive environment, and raise awareness of gender-related issues through training and guidance. A Gender Action team has also been established to oversee and monitor the implementation of the actions outlined in the Gender Implementation Plan.

Representatives from **developing countries** make up 60-65% of the IPCC Bureau by virtue of the regional quotas in elections. However, in terms of authorship, the IPCC has historically been dominated by scientists from developed countries. Developing countries accounted for only 30% of authors in the TAR but the ratio had risen to 45% by AR6. The AR6 Special Report on Climate Change and Land had slightly more authors from developing countries, a first for IPCC. The recent

⁷ <https://supforclimate.com/>

scoping meeting for the Special Report on Climate Change and Cities also had a slight majority of developing country participants.

In AR6, some specific provisions were made to recruit chapter scientists⁸ from developing countries. This has proved to have been successful in engaging younger scientists from developing countries in the IPCC process, enhance career development, and support capacity building in developing countries. Resources are currently being sought to recruit chapter scientists from developing countries across the range of Working Group products in AR7.

Similar progress has been made in terms of representation across the IPCC's six world **regions**.⁹ There are still many more nominations than there are authorship positions, and this is especially true for Asia and Europe. Balanced representation from Africa has presented the largest challenge. The issue of ***intra-regional balance*** has been receiving more attention. For example, there has been an imbalance between different parts of Europe. In other regions there has been a tendency for authorship to be concentrated in a small number of countries with relatively strong scientific capacity. This is now receiving specific attention.

Finally, the incorporation of **wider knowledge systems** in IPCC assessments, including Indigenous Peoples' knowledge, local knowledge and practitioner knowledge, has been proposed. This would entail consideration of both process (e.g. participation in scoping meetings and author teams), and assessment methods. This is covered further in Section A.4.

A.4 Interdisciplinarity

“Interdisciplinarity” is used here as an umbrella term to cover communication and collaboration internally between different scientific disciplines and scientific communities. For an assessment body like the IPCC, there are both *internal* interdisciplinarity dimensions (collaboration within and between Working Groups and the Task Force on Inventories) and *external* dimensions (for example interactions with UN Environment Programme (UNEP) assessment bodies such as IPBES).

A.4.1 Internal interactions

AR6 saw an unprecedented degree of collaboration between the IPCC's three Working Groups. This was a necessity because of the production of three cross-cutting Special Reports on: Global Warming of 1.5°C; Climate Change and Land; and Oceans and Cryosphere in a Changing Climate. However, it was also a mission adopted enthusiastically and energetically by the Working Group Co-Chairs, their Bureaux and their Technical Support Units (TSUs). The habit of collaboration continued with the production of the Working Groups contributions to the AR6, including a common glossary, the production of cross-Working Group Boxes on topics of overlapping concern, and an enhanced use of contributing authors from other Working Groups.

It is satisfying to see the same pattern of collaboration developing in AR7, partly driven by the needs of the Special Report on Climate Change and Cities, but also, once again, through the commitment and enthusiasm of Bureau members. It is essential that this momentum is maintained throughout the cycle.

The interaction between the Task Force on National Greenhouse Gas Emission Inventories (TFI) and the Working Groups needs further development. In past cycles the TFI has operated quite independently given its specific remit to develop methodologies for emission inventories. However, the methods and conventions proposed by the TFI can have consequences when estimating the impact of mitigation actions. The start of AR7 has already highlighted strong linkages with Working

⁸ Chapter scientists provide support to author teams.

⁹ These follow the World Meteorological Organisation (WMO) regions: I Africa; II Asia; III South America; IV North America, Central America and the Caribbean; V South-West Pacific; VI Europe

Groups I and III (Methodology Report on Short-lived Climate Forcers) and Working Group III (Methodology Report on CO₂ Removal Technologies and Carbon Capture, Utilisation and Storage). The IPCC Expert Meeting on Reconciling Land Use Emissions successfully brought together experts from TFI, WGI, WGII and WGIII communities. It would be helpful if the Scoping Meeting could take account of possible TFI-WG links during and beyond AR7, for example coherence between assessment at the sectoral level and inventory categories, the above-mentioned issue of accounting for land use emissions, and any implications arising from the two TFI Methodology Reports on Short-lived climate forcers and CO₂ removal technologies and carbon capture, utilisation and storage.

A.4.2 External links

UNEP, one of IPCC's parent organisations, has several environmental assessments under its umbrella including IPBES¹⁰ and the GEO¹¹ (Global Environmental Outlook) assessments. In addition, a new Panel on Chemicals, Waste and Pollution Prevention, is under development¹². The various assessments are loosely coordinated through an Ad-Hoc Global Assessment Dialogue (AGAD).¹³ AGAD discussions have covered practical topics such as glossaries and scenarios.

IPCC-IPBES linkages have received the greatest attention. An IPCC/IPBES *Co-sponsored workshop on biodiversity and climate change* has been held.¹⁴ IPBES has welcomed its secretariat's engagement with the IPCC, has noted suggestions for thematic or methodological issues related to biodiversity and climate change that would benefit from collaboration with IPCC, and has invited IPBES national focal points to engage with their IPCC counterparts to jointly consider potential means of increasing scientific cooperation and information sharing and improving understanding of relevant processes, procedures and workplans.¹⁵ IPCC's response has been more muted, but there is now a standing reporting on IPBES activities at IPCC plenary meetings. Some IPCC national focal points have advocated stronger links with IPBES, but this has been tempered by other voices which have recalled the distinct mandates of the two assessment Panels. For example, capacity building is within IPBES's remit, but not within that of IPCC.

It would be helpful if, during the AR7 Scoping Meeting, possible links and overlaps with IPBES activities are taken into account. The most relevant activity is IPBES's Nexus assessment: *A thematic assessment of the interlinkages among biodiversity, water, food and health in the context of climate change*.¹⁶ The Summary for Policymakers of the Nexus Assessment is currently undergoing a second review and is due to be approved at the 11th IPBES plenary in December 2024.¹⁷

Since the beginning of AR7, links have been further strengthened with the World Climate Research Programme (WCRP), which coordinates and facilitates international climate research to develop, share, and apply climate knowledge that contributes to societal well-being. WCRP is in particular coordinating the climate projections that are extensively used in IPCC reports, through the Climate Model Intercomparison Project (CMIP). With increasing literature, WCRP is also supporting the production of review and concept papers which will simplify the work of the authors during AR7 and

¹⁰ <https://www.ipbes.net/>

¹¹ <https://www.unep.org/geo/global-environment-outlook-7>

¹² <https://wedocs.unep.org/bitstream/handle/20.500.11822/39944/SCIENCE-POLICY%20PANEL%20TO%20CONTRIBUTE%20FURTHER%20TO%20THE%20SOUND%20MANAGEMENT%20OF%20CHEMICALS%20AND%20WASTE%20AND%20TO%20PREVENT%20POLLUTION.%20English.pdf?sequence=1&isAllowed=y>

¹³ <https://www.unep.org/geo/who-we-work/adhoc-global-assessments-dialogue-agad>

¹⁴ https://www.ipcc.ch/site/assets/uploads/2021/07/IPBES_IPCC_WR_12_2020.pdf

¹⁵ [IPBES-9/1. https://www.ipbes.net/resource-file/104074](https://www.ipbes.net/resource-file/104074)

¹⁶ <https://www.ipbes.net/nexus>

¹⁷ <https://www.ipbes.net/resource-file/105299>

beyond.

The IPCC Working Group III has also formed strong links with the Integrated Assessment Modelling Consortium (IAMC), notably in respect of the Special Report on Global Warming of 1.5°C and AR6 scenario databases hosted by the International Institute for Applied Systems Analysis (IIASA). The future of these links partly depends on the outcome of the scoping process.

A.5 Emerging challenges

This section addresses challenges that cut across IPCC assessment activities. Scientific challenges specific to each Working Group are addressed in Parts D-F.

A.5.1 Literature volume and knowledge sources

Figure A.1 (left) shows how the scientific literature referring to climate change has grown since IPCC's inception. The rate of publication reached 135 new papers per day in 2022, with a growth rate of roughly 10% per year. Over a seven-year cycle, the rate of publication doubles and as much new literature is published during a cycle as had been published prior to the cycle's start. This poses unprecedented challenges for IPCC assessments. Various approaches have been proposed for facilitating the assessment including systematic review techniques pioneered in medical research and the use of machine learning tools.¹⁸ While machine learning could provide an opportunity, there is also the risk for IPCC that authors' contributions to the assessment could be based on undeclared generative artificial intelligence tools. Systematic reviews attempt to identify, appraise and synthesize evidence to answer a specific research question using explicit, systematic methods aimed at minimizing bias.¹⁹ However, it has been argued that systematic review techniques risk bias due to a reliance on subjective decisions about question setting, searching, study selection, analysis and interpretation of findings.²⁰ They also make it harder to account for literature in languages other than English, and for publications not captured in established scientific databases such as Scopus or Web of Science.

At the same time, the aspiration to capture wider sources of knowledge further extends the field of assessment, bringing into scope non-codified knowledge that may not be captured by systematic review or machine learning approaches. IPBES has pioneered approaches to the assessment of Indigenous Peoples' Knowledge in its assessments²¹ and IPCC stands to benefit from this experience.

For these reasons, the Chair will propose an IPCC Workshop, tentatively entitled *New and Extended Methods of Assessment*, at P-62 of the IPCC in 2025. The purpose of the meeting would be: (a) to identify means to assess the increasing body of climate change literature, including the potential and limitations of using, for example, artificial intelligence and machine learning techniques to identify, select and analyse documents for the assessment; (b) to identify means of drawing on wider forms of knowledge; and (c) to identify potential trade-offs between approaches and ambitions. This Workshop activity should ideally conclude before the first Lead Author Meeting for the Working Group Reports.

¹⁸ Lea Berrang-Ford, Anne J Sietsma, Max Callaghan, Jan C Minx, Pauline F D Scheelbeek, Neal R Haddaway, Andy Haines, Alan D Dangour, Systematic mapping of global research on climate and health: a machine learning review, *The Lancet Planetary Health*, Volume 5, Issue 8, 2021, [https://doi.org/10.1016/S2542-5196\(21\)00179-0](https://doi.org/10.1016/S2542-5196(21)00179-0).

¹⁹ Cochrane Library, <https://www.cochranelibrary.com/cdsr/about-cdsr>

²⁰ Lesley Uttley, Daniel S. Quintana, Paul Montgomery, Christopher Carroll, Matthew J. Page, Louise Falzon, Anthea Sutton, David Moher, The problems with systematic reviews: a living systematic review, *Journal of Clinical Epidemiology*, Volume 156, 2023, Pages 30-41, <https://doi.org/10.1016/j.jclinepi.2023.01.011>.

²¹ <https://www.ipbes.net/indigenous-local-knowledge>

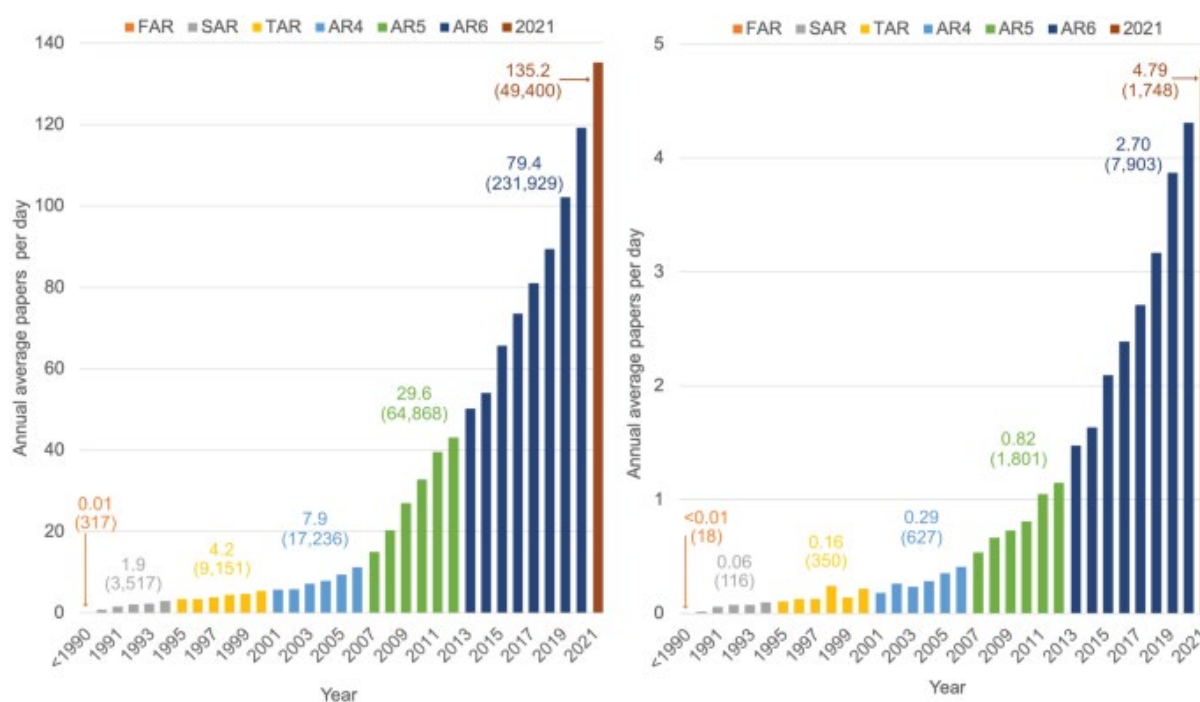


Figure A.1 — Growing volume of publications relevant to climate change. Left: publications mentioning “climate change” or “global warming”; right: publications mentioning also “extreme rainfall” or “heavy precipitation”. Numbers above the bars show daily average (cumulative) papers published for each IPCC Assessment cycle. (Source: De-Gol et al., 2023)²²

A.5.2 Regional presentation

The topic of regional aggregation is highly relevant. The AR7 ambitions for further integration between the three Working Groups would welcome alignment of the Working Group-specific treatment of regionalization of the assessment. This is not only of interest for the potential extension of the AR6 Interactive Atlas to the domains of both WGI and WGII, but also for the assessment of integrated adaptation and mitigation policies requiring strong collaboration between WGII and WGIII. Regionalization can be implemented in multiple ways, varying from region-specific chapters (such as carried out in AR6 WGII) or subsections (AR6 WGI) to explicit acknowledgement of regional diversity in a topical chapter structure (such as in the outline of the Special Report on Climate Change and Cities).

A.5.3 Representation of sectoral or system transitions

Another open question is the treatment of sectoral or systems transitions. The enhanced integration between WGs potentially allows for a common approach for the assessment of adaptation and mitigation. In AR6 WG III, coherence was sought between sectors and systems, and the source categories used by the Task Force on Inventories. For adaptation, the Global Goal on Adaptation (GGA) is preparing for an assessment of metrics and indicators intended for monitoring adaptation progress, under seven themes (water, food, health, ecosystems, infrastructure, poverty, and culture). Alignment of these themes across adaptation, mitigation and development policy assessments is directly relevant for policies arising from the Paris Agreement.

²² De-Gol, A.J., Le Quéré, C., Smith, A.J.P. et al. Broadening scientific engagement and inclusivity in IPCC reports through collaborative technology platforms. *npj Clim. Action* 2, 49 (2023). <https://doi.org/10.1038/s44168-023-00072-3>

PART B: CROSS-CUTTING TOPICS

B.1 Introduction

This section aims at identifying several topics that may require a cross-Working Group (xWG) treatment in AR7. These topics were identified by the WG Bureaux, based on several inputs and sources, and need to be discussed, confirmed and completed by experts at the AR7 Scoping Meeting. They are intentionally kept broad to allow refinements by the scoping meeting experts. It will be ultimately up to the experts to discuss and decide how these topics are treated in the report outlines.

The inputs considered are:

- The survey sent to government focal points before P-60 in view of collecting ideas for Special Report topics;
- Discussions with the panel during P-60 and P-61 (including submitted proposals for special reports);
- Pre-scoping activities, including surveys, webinars and discussions with scientist organizations, AR6 authors, experts nominated to the scoping meeting, and international organizations;
- Internal IPCC Bureau discussions and brainstorming; and
- AR6 knowledge gaps.

This section includes topics that are interdisciplinary, where cross-WG collaboration could be considered for the AR7 WG Report outlines. Section B2 provides the potential formats that could be used to address these topics, focusing on formats that need to be decided at the scoping meeting. Section B3 lists the topics themselves.

B.2 Potential formats for xWG material

Many important xWG issues will be present in AR7, and many of them can be addressed by the authors during the writing process, without a need to be discussed during the Scoping Meeting. However, some topics may need to be discussed at the Scoping Meeting, if they need to be reflected in the outlines in a coordinated way.

Table 1 lists the **types of formats** for xWG topics that need discussion at scoping.

Format	Description	AR6 Example(s)	Comments
xWG Chapter	Single chapter in one WG report with content from more than one WG and assessed by a xWG team.	No full xWG chapter, but there were chapters that included 1-2 bullets with xWG topics in their scoped outline (e.g., WGII Chapter 17 has a bullet that mentions “mitigation”; WGIII Chapters 6-11 mention “links to adaptation”).	This would respond to complex interdisciplinary questions whose assessment could not be split by WG. This requires a multidisciplinary team of authors, as for Special Reports.
Common narrative	Similar narrative and chapter organization of reports to reflect this	None.	An example using the SYR narrative identified in Part C would mean each WG

Format	Description	AR6 Example(s)	Comments
for report	narrative. This could translate, e.g. into mirroring report sections (e.g. Groups of chapters).		would have a chapter or set of chapters focused on "stocktake", a chapter or set of chapters focused on "futures", and a chapter or set of chapters focused on "responses". This is only an example to illustrate the concept; other narratives are possible.
xWG aligned chapters	Alignment of chapters for 2 or more WGs may facilitate later integration. That could for instance be parallel chapters in each WG that address one specific topic from different assessment perspectives (e.g. from the physical standpoint for WGI, the impacts/adaptation standpoint for WGII and mitigation standpoint for WGIII)	In AR6, both WGII and WGIII had chapters on sectors/systems, though used different sectors/systems. WGI CH12 used Sections aligned with WGII Regional split and Cross Chapter Papers.	Considering the mapping/alignment during scoping would facilitate later synthesis.
xWG coordinated content across reports	For a topic that spans 2 or more WGs, different elements of the topic could be covered in different WGs in a coordinated manner. That is, we could determine what aspects of the topic to cover and then divide amongst WGs (instead of working independently) and reflect in the outline bullet points.	This is effectively how the use and assessment of scenarios worked between WGI and WGIII in AR6. WGI covered the climate aspects of scenarios; WGIII covered the socio-economic and emissions aspects.	It is possible that this could be determined during the writing process.
Joint Glossary	Common glossary across WGs to ensure consistent use of terminology.	In AR6, some terms were jointly defined by 2 or more WGs and appeared in those WGs glossaries, while other terms were specific to a single WG	While the glossary is not needed at scoping, it would be good to ensure terms were used consistently across scoped outlines.
Joint Atlas	Potential common WGI-II Interactive Atlas	WGI Interactive Atlas, which could be extended to WGII	The status of an Interactive Atlas needs to be clearly defined. Whether one

Format	Description	AR6 Example(s)	Comments
			continues with Chapter Atlas or Annexes going with the outlines need to be discussed and coordinated
Joint Annex	Potential common Annex across 2 or more WGs	None (other than the Glossary). WGs had additional annexes (e.g., WGIII had one on scenarios and models), but they were specific to a single WG.	

B.3 An initial selection of cross-cutting topics

In this section, nine cross-WG topics are identified. These topics were viewed by the AR7 bureau as needing a xWG discussion early in the scoping meeting to determine the best way of addressing the topic in AR7. It is not expected that each topic will be treated in the same manner in AR7, just that each will need a discussion. The topics include specific scientific themes, ways of subdividing the world, and specific methodologies; topics are listed in alphabetical order. This set of topics is not intended to be an exhaustive list of cross-cutting topics and more may emerge during the scoping meeting.

B.3.1 Equity and justice

“Prioritising equity, climate justice, social justice, inclusion and just transition processes can enable adaptation and ambitious mitigation actions and climate resilient development” (SYR SPM C.5). Both WGII and WGIII mention equity and justice as entry points to their SPM, with WGII noting that “equity and justice” is one of several “alternative, overlapping, complementary, and widely used entry points to the literature assessed in this WGII report” and WGIII noting that “ethics and equity” is one of “multiple analytic frameworks to assess the drivers of, barriers to and options for, mitigation action.” However, in the AR6 agreed outlines, the word “equity” only appears in two WGII chapters (Chapter 6 on “Cities, settlements, and key infrastructure” and Chapter 8 on “Poverty, livelihoods and sustainable development”) and not at all in the WGIII agreed outline. And, in some parts of the assessment, discussions of equity and the implications of equity/inequity on outcomes are missing. Previous IPCC reports have taken other approaches to addressing equity, including a chapter in AR5 WGIII devoted to a discussion of “Sustainable development and equity”. At the scoping meeting, a discussion on the best way to treat equity and justice dimensions in AR7 is needed to ensure these topics are appropriately reflected in the outlines.

B.3.2 Finance

Finance is a critical enabler for accelerated climate action, and lack of finance is often a barrier to action. AR6 approached finance differently in each WG, with WGII examining finance in the context of risk management in adaptation options (Chapter 17), and WGIII having a dedicated chapter (Chapter 15) assessing all investment and financing towards climate objectives. Climate finance plays a dominant role in the design and implementation of national adaptation and mitigation policies, as well as in bilateral and multi-lateral agreements. A discussion on how to address climate finance in AR7 coherently can facilitate later integration in the SYR.

B.3.3 Health and well-being

Climate change is impacting human health and well-being in many ways (e.g., via heat, extreme events, infectious diseases, air quality, allergies, service disruptions, ...) (AR6 WGII), requiring significant adaptation measures. Changes in climatic impact-drivers (AR6 WGI), combined with vulnerability and exposure, can lead to increasing health-related risks of climate change. At the same time, drivers of warming (in particular, greenhouse gas emissions) are often inversely linked with drivers of health and well-being. Greenhouse gas emissions often originate from the same sources as air pollutants affecting health, and air pollutants are themselves short-lived climate forcers. Many mitigation options would have benefits for health through lower air pollution, active mobility (e.g., walking, cycling) and shifts to sustainable, healthy diets. Health, well-being and climate change is therefore a theme where a xWG assessment might be needed. In AR6, information on health is scattered across WG Reports. Early coordination on this theme in AR7 could ensure a robust, comprehensive assessment in AR7.

B.3.4 (Information for) losses and damages

IPCC AR6 WGII states that “Human-induced climate change, including more frequent and intense extreme events, has caused widespread adverse impacts and related losses and damages to nature and people, beyond natural climate variability”. Determination, attribution, projection and response to regional losses and damages due to climate change is spanning the domain of multiple WGs. Areas that need assessment in AR7 include the attribution of losses and damages to climate change, quantification of both economic and non-economic losses and damages, ways to minimize, avert and address losses and damages, and how these interact with adaptation responses and limits to adaptation, policy options to respond to losses and damages, and the financial costs of losses and damages that can inform climate finance needs. Literature is growing in this area of research, including advances and limitations of “event attribution” and “attributable risk” approaches. There have also been advances in assessing non-economic losses and damages, such as negative impacts on human health and wellbeing, biodiversity and ecosystem services. As those fields are progressing rapidly, AR7 could provide a significant policy-relevant advance assessment of the available information for losses and damages, requiring strong coordination between WGI and WGII.

B.3.5 Overshoot

To what extent are pathways that exceed and return to a warming level physically, technologically, economically and institutionally feasible, and what are the reversible and irreversible consequences of a temporary overshoot, and what implications apply to principles of equity and justice? In AR6, only a small number of the most ambitious global modelled pathways were able to limit global warming to 1.5°C by 2100 without exceeding the level temporarily (reaching 1.5°C usually in the first half of the 2030). These pathways assume drastic emission reductions in the first half of the 2020s that have not materialised. Achieving a long-term warming level below 1.5°C will likely involve temporary exceedance of this level and gradual reversal enabled through achieving/sustaining net negative CO₂ emissions, accompanied by substantial reductions of short-lived climate forcers like methane. The AR6 SYR stated that “overshoot entails adverse impacts, some irreversible, and additional risks for human and natural systems, all growing with the magnitude and duration of overshoot”. Overshoot is inherently a xWG theme and all three WGs addressed overshoot in AR6; however, constrained by what was available in the literature, each took a different approach, including differences in the level and duration of overshoot. Additionally, more literature has emerged since AR6. Given the highly interdisciplinary nature of this topic, xWG coordination is needed.

B.3.6 Risk assessment approaches and regionalisation

AR6 Reports from both WGI and WGII achieved considerable progress in the granularity of regional and/or sectoral information for risk assessment, with the identification of a knowledge chain, from global climate change to regional information distributed in different land regions and ocean regions, climatic impact-drivers and risks. Via some alignment between WGI and WGII the chain extended into the assessment of regionally varying risk characteristics and ways to address risks, but the different WG workflows and approaches limited the level of integration between the different WG domains. Multiple risk assessment methodologies were used and forms of presentation varied from Reasons for Concern to Representative Key Risks to the use of burning embers. For the first time, the Special Reports and WGII reports explored the impact of adaptation or development trajectories on risk. Regional and sectoral embers and risks from response actions, such as use of BECCS, were also highlighted.

There is large potential for further coordination across WG domains, especially at the interface between climatic impact-drivers (CIDs) and impacts/risks. In many cases, the driver induces a physical risk (e.g., heavy precipitation driving a flood, or heat and drought combined induce a fire risk). Water and renewable energy resources are often affected by climatic impact-drivers. Hence coordination at scoping meeting between WGs is essential to clearly define where the assessment of changes in those elements is carried out, minimize duplication, and avoid inconsistencies. Models simulating changes in climatic impact-drivers, impacts and socio-economic conditions are increasingly integrated, and can be used to revise indices and metrics (for instance considering compound or cascading drivers or abrupt changes), or explore feedbacks between drivers and impacts. Cross-WG integration is also needed to better account for the regional variability of risk drivers, attribution and response options. Presentation of risk information in a common structure across WGs, or in an Atlas (e.g. with additional WGII layers on risk drivers) is another topic that can be included in the assessment.

B.3.7 Scenarios

Scenarios are used to explore future emissions, climate change, related impacts and risks, and possible mitigation and adaptation strategies. In AR6, all three working groups assessed scenario-based information, though in different ways. WGI assessed the climate response to five illustrative scenarios. WGII assessed regional climate impacts and risks at different global warming levels. WGIII assessed 1202 global modelled pathways. Since the publication of AR6, many challenges and opportunities have been identified with respect to the IPCC assessment of scenarios (representation of principles of equity, feasibility of very high and very low scenarios, the consistency between global, national, and sectoral scenarios...), including thorough discussions at an IPCC workshop held in April 2023. Recommendations from the workshop to the IPCC²³ included starting planning early for coordination across working groups and embedding coordination in each step of the process, including scoping. A discussion on the approach to scenarios in AR7, including how to ensure consistency and coherence, would be very useful.

B.3.8 Sectors and systems

Different sectors and systems (e.g., energy, industry, AFOLU, etc.) are influenced by different climate impact drivers and have different adaptation and mitigation options. Sectors and systems have been used as an organizing principle in many IPCC reports, including WGII, WGIII, and TFI reports. In AR6, a systems transition structure was used within the SR1.5, WGII had chapters on specific human-natural systems (Chapters 2-8 in AR6), WGIII had chapters on sectors, and the SYR used systems to integrate the content from all AR6 products (though those systems differed

²³ <https://www.ipcc.ch/event/ipcc-workshop-on-the-use-of-scenarios-in-the-sixth-assessment-report-and-subsequent-assessments/>

from those in SR1.5 and WGII). For adaptation, the Global Goal on Adaptation is preparing for an assessment of metrics and indicators intended for monitoring adaptation progress, under seven themes (see section A.5.3). Early coordination across WGs on sectors and systems could facilitate later integration in the SYR, regardless of whether sectors and systems are used as chapter organizing principles.

B.3.9 Solar Radiation Modification

What would be the overall, global and regional, consequences of a large-scale solar radiation modification (SRM) deployment, considering biophysical, economic, political, institutional, ethical and equity dimensions? In AR6, large knowledge gaps were identified in many areas, such as the response of ecosystems and the carbon cycle to SRM approaches like stratospheric aerosol injection or marine cloud brightening. A number of ethical and governance issues were assessed, such as the large imbalance across regions in participation to research on SRM or the risk of creating a long-term lock-in dependence obstructing mitigation efforts. Also, the assessment of risks and benefits linked to SRM do not fit readily into the IPCC Working Group structure. Specifically, SRM approaches do not constitute “mitigation” of or “adaptation” to climate change. Furthermore, assessment is challenging because it mainly relies on modelling results that are difficult to validate due to lack of observations and requires anticipating future actors’ behaviour in response to potential deployment of yet untested technologies. As literature and investments grow, SRM requires increased attention as a cross-WG topic and AR7 has the potential to bring new timely advances. This topic therefore needs to be discussed in a xWG manner.

PART C: THE SYNTHESIS REPORT

C.1 The role of the synthesis report

According to the Principles governing IPCC work, “the Synthesis Report (SYR) will synthesise and integrate materials contained within the Assessment Reports and Special Reports and should be written in a non-technical style suitable for policymakers and address a broad range of policy-relevant but policy-neutral questions approved by the Panel.” The Principles go on to note that the Longer Report should be 30-50 pages and the Summary for Policymakers 5-10 pages. There have been consistent requests that the SYR should aspire to a genuine synthesis and should not be simply a “cut and paste” from the underlying Working Group and Special Reports.

This section covers:

- The process for developing the Synthesis Report;
- The narrative of the Synthesis Report;
- Possible topics covered by the Synthesis Report; and
- The length and format of the Synthesis Report.

C.2 Synthesis Report process

IPCC procedures for the preparation, review, acceptance, adoption, approval and publication of reports specify that the Synthesis Report should be preceded by a Scoping Meeting which is separate from the Scoping Meeting for the three Working Group contributions to the Assessment Report.²⁴

The IPCC Chair proposes convening a Scoping Meeting after each Working Group has held its third Lead Author Meeting. By that time, expert reviews of the First Order Draft will have been completed, and key decisions will have been taken about the preparation of the Second Order Draft. The first meeting of the Synthesis Report Core Writing Team would not take place until after the Fourth Working Group Lead Author Meetings. This will allow emerging findings to feed into the scoping and drafting of the Synthesis Report.

However, prospects for a genuine synthesis will be enhanced if some thought is given at an early stage to possible narratives of, and topics covered by, the Synthesis Report. This will allow the scoping of the Working Group Reports to anticipate the pipeline through to the Synthesis Report and ensure that the findings of the Working Group contributions are “synthesisable”.

The Working Group scoping meeting will therefore include a stream where a number of pre-selected participants will address and propose: a) possible narratives for the Synthesis Report; and b) topics that might be featured in the Synthesis Report because they can be fully addressed only by drawing on insights from more than one Working Group. There will be three sessions during the course of the Working Group Scoping Meeting, starting after the Working Groups have started to make progress, and some cross-Working Group sessions have taken place. Outcomes of the Synthesis Report meetings will be reported back to plenary sessions to allow feedback to Working Group discussions.

C.3 Narratives of Summaries for Policymakers: past practice

The narratives of Summaries for Policymakers (SPMs) of Working Group, Special and Synthesis Reports have been converging across successive cycles (Annex A). There have been three

²⁴ Appendix A to the Principles Governing IPCC Work: Procedures for the Preparation, Review, Acceptance, Adoption, Approval and Publication of IPCC Reports, Section 4.1. <https://www.ipcc.ch/site/assets/uploads/2018/09/ipcc-principles-appendix-a-final.pdf>

consistent elements, which correspond roughly to the three elements of the Talanoa Dialogue framework employed during Fiji's COP Presidency (COP 23): where are we now ("stocktake"); where do we want to go ("futures"); and how do we get there ("responses"). The "responses" element was not part of the AR4 and AR5 Working Group I reports, but has been used in every other report, including that of Working Group I in AR6.

The AR6 Synthesis Report deviated slightly from this pattern. Responses from a longer-term perspective formed part of the "futures" section and there was a separate section on near-term responses. Distinguishing between near-term and longer-term responses proved difficult, not least because different Working Groups had different definitions of near-, medium-, and long-term.

Several SPMs have included a "framing" section up front to establish key concepts and describe the approach to the assessment. The framing element formed a substantial part of the SPM of the Working Group III contribution in AR5, but has otherwise been quite short.

The attention given to sustainable development has increased over time and was particularly prominent in AR6. However, the treatment has varied. The Working Group III SPM in AR4 ended with a section on mitigation and sustainable development. In AR6, Working Group II concluded with a section on "climate resilient development" which was seen as a higher-level approach linking climate action and development. In AR6, Working Group III placed the sustainable development section prior to the "responses" section. The responses section could then assess actions in terms of their contribution to mitigation, adaptation *and* the sustainable development goals. The explicit treatment of sustainable development is now a settled practice, but there has not been convergence on the means for doing so.

C.4 Proposed narrative

Considerations of options for the Synthesis Report narrative will be a priority for the Synthesis Report workstream at the Scoping Meeting.

The Synthesis Report comprises an SPM (5-10 pages in principle) and a Longer Report (30-50 pages). The Chair is firmly of the view that the SPM and the Longer Report should follow the same narrative. This makes the relationship between the SPM and the Longer Report clear and should facilitate approval.

Following converging practice, the lead option would be for the narrative to follow the "Talanoa" approach observed over recent cycles, though other approaches could be considered. The three elements would be:

"Stocktake" to cover quantitative indicators addressing the state of the climate and emission trends, but also available indicators on impacts, and on adaptation and finance, as well as qualitative information on topics such as policy development.

"Futures" to take a forward-looking perspective framed round two questions: what future climate-related risks do we face? And what is the scope for risk reduction through adaptation and mitigation. This is the section in which scenarios could play a critical role by demonstrating the range of possible futures and the degree to which risks can be reduced through human agency. This section would *not* be cast as solely a long-term perspective but would cover all timescales.

"Responses" would address how the risk reduction potential identified in the previous section can be achieved, focusing on robust climate information, tangible measures and means of implementation. Splitting this into two sections, one on tangible responses, the other on means of implementation, is also an option.

The open question is how the wider consideration of sustainable development can be embedded in the report. There are multiple options:

- a) Positioning a specific section on sustainable development between the "futures" and

“responses” sections to contextualise the responses.

- b) Making a specific section on sustainable development the final section to evaluate the consequences of response options.
- c) Embedding sustainable development throughout the report, including the “stocktake” (how much progress has been made); “futures” (the scope for risk reduction); and “responses” (the development consequences of specific actions).

C.5 Topics meriting synthesis

The Synthesis Report workstream will also identify any topics that merit a cross-cutting approach that could be specifically addressed in the Synthesis Report. The following list is a starting point for the Scoping Meeting and has been derived largely from national focal point proposals for possible Special Reports during AR7.²⁵ (See also Part B: Cross-cutting topics).

- Tipping points
- Temperature overshoot and its implications
- Solar radiation modification
- Loss and damage/limits to adaptation
- Climate finance
- Climate change and health
- Climate change and biodiversity
- Climate change, human habitats and migration
- Climate change and global food and water crisis, water cycle
- Sustainable development and climate change, SDGs solutions, equity, fairness

C.6 Length and format

Governments have often called for the length of the Synthesis Report, and in particular the SPM, to be limited. But other national focal points have cautioned against limiting the length lest important nuances are lost. The target length has been consistently and substantially exceeded in past reports, and criticisms of the technical nature of the text persist. In spite of strenuous efforts by the former Chair, the Longer Report for AR6 ran to 80 pages excluding annexes, and the SPM to 31 pages including 8½ pages of figures that by themselves almost exhausted the budgeted length.²⁶

One challenge is that the amount of content on a page can vary widely. The laid-out print version has around 900 words per page whereas drafts can have as few as 400-500. During the AR6 Synthesis Report preparation, it was conventionally assumed that a figure would displace 450 words (½ page), whereas some multi-panel figures with footnotes ran to 1½ pages (1350 words). It might be more realistic to focus on word count, perhaps without footnotes, and numbers of figures in assigning target lengths.

It would be preferable to take a realistic view of the length and format of the Synthesis Report and attempt to adhere to these. The Chair proposes to bring forward to a future IPCC Plenary Session a specific proposal for an Expert Meeting on the *Science of Communicating Science*. This has been in IPCC budget lines since 2016 (44th Session) but has never been convened. This would focus on communication with policymakers with one of the sub-topics being the most effective

²⁵ IPCC-LX/INF. 6, Rev. 1. <https://apps.ipcc.ch/eventmanager/documents/83/120120241019-INF.%206,%20Rev.1%20-%20Synthesis%20of%20Member%20countries%20Views.pdf>

²⁶ <https://www.ipcc.ch/report/sixth-assessment-report-cycle/>

length and format of Summaries for Policymakers and Synthesis Reports. Preliminary views could be canvassed during the Scoping Meeting, but any final decisions would be reserved for the Synthesis Report Scoping Meeting and final agreement by the Panel.

PART D: PERSPECTIVE FROM WORKING GROUP I

D.1 Introduction and context

The 6th Assessment Report Synthesis Report (AR6 SYR) stated that “human influence, principally through emissions of greenhouse gases have unequivocally caused global warming”, as one of its key findings from the Working Group I (WGI) Report. AR6 WGI has also delivered an extremely comprehensive assessment of the state of climate in 2021, the physical consequence of potential future scenarios, rooting the explanations of observed and predicted evolutions on a solid understanding of the basic processes, responses and feedbacks operating in the Earth system. After such a comprehensive assessment, one might wonder what additional key messages the 7th Assessment Report (AR7) WGI could provide, and even why a WGI report remains relevant for policy, beyond simply updating the numbers of previous assessment results. The general narrative of the SYR adopting the “Talanoa dialogue” framework (“**stocktake**”, “**futures**” and “**responses**”, see Section C.4) provides a clear framework for answering these latter questions, and for demonstrating the relevance of the AR7 WGI findings at the time of adoption, near the end of the decade.

Stocktake: Since AR6 WGI approval in 2021, important evolutions could be observed in the climate system. Recent observations include notable trends, impactful climate anomalies and unprecedented extremes. Knowledge about both paleoclimates and these recent historical evolutions has advanced significantly. An AR7 climate assessment is needed to (i) explain these new observations in the light of scientific advances, (ii) understand what they mean in terms of human influence on the climate system, (iii) assess whether climate models are able to simulate these evolutions, and (iv) provide inputs to present-day emergency management approaches.

Futures: With a global warming increase at a pace of about 0.2°C per decade, and without major reductions in greenhouse gas emissions, global warming is likely to exceed 1.5°C shortly after the release of the report. Pledged mitigation targets and implemented climate policies have also progressed since 2015, the starting year for the AR6 scenarios. Both warming to date and the policy developments narrow the spectrum of plausible climate futures relative to those assessed in AR6. The AR7 WGI assessment will be key to describe this new spectrum, the warming levels reached in different emission scenarios, the potential of tipping points being reached, and to assess uncertainties due to physical limitations (e.g. potential declines of carbon sinks, effect of extremes on stability of economies), in collaboration with Working Group II (WGII) and Working Group III (WGIII). AR7 WGI can also describe the regional consequences of plausible futures, based on recent progress in model resolution and process representation, to provide key information for the assessment of risks, losses and damages.

Responses: AR6 SYR stated that “the choices and actions implemented in this decade will have impacts now and for thousands of years”. While WGI is generally not focusing on responses, it can provide a wealth of *information for responses*, a particularly important contribution given the urgency, for instance related to climate extreme events and climate tipping points. This has been recognized in AR6, e.g., with several specific chapter sections on “Climate Services”. AR7 WGI could broaden its contribution by an in-depth assessment of near-term information needed for urgent adaptation and mitigation, including for early warning systems and information for other specific topics, drawing on diverse knowledge systems (including Indigenous Knowledges) and requiring enhanced cross-WG collaboration (e.g., global health and well-being, renewable resources, or early warning systems). The assessment of “information for responses” bears a high potential for new key messages and useful outcomes.

How these considerations, together with science advances, will be reflected in the report structure and outline is what the Scoping Meeting will determine. Other important considerations also come into play:

Policy relevance and audience reach: A key consideration is the report storyline and the attractiveness of chapters for an audience broader than the scientific community. The reach of the report and its ability to deliver new key messages could benefit from a *question-driven approach*: chapters devoted to addressing major questions and developing the scientific elements that underpin answers. This approach can also be developed within chapters: clear questions of broad relevance, summaries for various audiences and Frequently Asked Questions (FAQs).

Interdisciplinarity: Many of the society-relevant questions are interdisciplinary and require strong coordination with other Working Groups (WGs). Some would also benefit from drawing on diverse knowledge systems (including Indigenous Knowledges). This will be enabled by the joint Scoping Meeting with the other WGs, a list of possible formats for cross-WG material, and potential cross-WG themes proposed by the Bureau.

Report size and workload: The report size and workload for the authors, the reviewers, Technical Support Units (TSUs) and government delegations should be considered. Lessons learned have shown that workload was extreme in AR6. There are several ways to mitigate both aspects, which will need to be considered both during the Scoping Meeting and during the report writing: conciseness in the writing style, avoidance of overlaps by a clear chapter structure, and a reduced number of chapters.

AR7 and AR6: AR6 WGI included a wealth of assessments of detailed physical processes that are likely to still be up to date at approval time of AR7 WGI. AR6 WGI used a process-based approach. AR7 WGI could adopt a complimentary question-driven approach in its narrative. The outline will have to reflect where mature topics in AR6 only need short updates and where expansion is needed due to urgent or emerging questions. The coordination with other reports such as AR7 Special Report on Climate Change and Cities, will also need to be considered, as well as how to rely on review or assessment papers produced by other organizations, such as the World Climate Research Program (WCRP).

In a nutshell, our recommendations to participants are to develop an outline and chapter structure that would:

- Allow major (and urgent) society- and policy-relevant questions to be addressed, considering a question-driven approach
- Favor interdisciplinary interactions with other WGs, through alignments of chapters, strongly coordinated content, or other report structure innovations
- Reduce workload, the size of reports, and the number of overlaps, while keeping comprehensiveness
- Rely significantly on results from AR6 WGI and other reports for mature topics
- Highlight new areas of research and allow new key messages to emerge
- Feed the general narrative of the SYR (stocktake-futures-responses)
- Allow a reach to a wider audience, with a clear report structure where information is easy to locate and accessible

D.2 Key uncertainties and gaps identified in AR6 WGI and SYR

The chapters of the AR6 WGI report were divided into 3 sections. The first section was devoted to large-scale climate change (Chapters 2-4). The second section described the components and processes of the climate system that play a key role in global and regional climate (Chapters 5-9). The third section (Chapters 10-12 and the Atlas) was devoted to the assessment and distillation of regional climate information from multiple lines of evidence at sub-continental to local scales. Here we review and highlight some of the important areas of uncertainty that were identified in AR6.

D.2.1 Large scale climate change

Several processes, such as near-surface fluxes, clouds, the carbon cycle under rising temperatures, and methane emissions, remain uncertain and are crucial for determining climate sensitivity and projections. High-resolution proxy paleoclimate reconstructions, which extend only to the Common Era on a global scale, restrict comparisons with earlier periods and hinder the quantification of the current climate's uniqueness and rate of change over millennia. Emerging data and research methods are sought to fill this gap.

One dominant uncertainty in future projections remains the response of large-scale atmospheric circulation and precipitation, especially in the North Atlantic/European sector and in understanding Arctic-midlatitude interactions. Climate models also continue to show limited agreement on regional precipitation trends.

Many AR6 scenarios involve temporarily exceeding global temperature targets (overshoot), followed by carbon removal at scale to lower temperatures. However, there are significant uncertainties tied to the feasibility, costs, and effectiveness of a large-scale deployment of Carbon Dioxide Removal (CDR) and its irreversible impacts on the Earth system, as well as to the potential consequences and additional risks of such overshoot trajectories, compared to stabilizing below a temperature threshold. How the climate system responds to decreasing CO₂-concentrations, including hysteresis effects, reversibility, and the closely related question of the zero-emissions-climate change commitment, needs further research.

D.2.2 System components and processes

Substantial uncertainties in basic climate physical processes, feedback mechanisms and model resolutions limit accurate projections. Key uncertainties identified in Chapters 5-9 include future natural greenhouse gas emissions, such as oceanic N₂O and methane, and potential abrupt changes and tipping points in regional systems (e.g., forest dieback). The transient climate response to cumulative CO₂ (TCRE) as a warming predictor in very low or net-negative emissions scenarios is uncertain due to potential Earth system feedback. Estimating remaining carbon budgets is complicated by uncertainties around historical warming, feedbacks, and non-CO₂ gases.

Cloud feedback, aerosol and short-lived climate forcers (SLCFs) also contribute to uncertainties in climate sensitivity indices like Equilibrium Climate Sensitivity (ECS) and transient climate response (TCR). Additionally, gaps in the representation of ocean heat absorption, transport mechanisms, and atmosphere interactions further limit the accuracy of long-term projections. In the water cycle, the restricted accuracy in projected precipitation led to considerable uncertainty in runoff change projection, especially in South Asia. Despite consistent regional projections of significant changes in soil moisture and evapotranspiration, these remain uncertain due to plant responses to elevated CO₂ and other biological processes. The representation of land-atmosphere interactions in climate models also affects projections, as monsoon system responses vary significantly across Coupled Model Intercomparison Project Phase 6 (CMIP6) models under the same emissions scenario.

The likelihood, timing, and magnitude of abrupt and irreversible changes in the cryosphere, e.g., ice sheets and permafrost, remain uncertain. Permafrost thawing and associated carbon release are difficult to predict due to inadequate models and limited data. Although Atlantic Meridional Overturning Circulation (AMOC) is expected to weaken, its collapse remains uncertain (crossing of a tipping point, timing of collapse).

D.2.3 Regional climate information

Accurate regional climate projections are hampered by several factors, including limited regional climate monitoring, which results in a lack of critical variables needed to understand regional processes, develop models, and validate simulations. There is also a shortage of process-based

model evaluations at the regional scale, and global models struggle to simulate large-scale processes relevant for downscaling. Internal variability, particularly for extreme events, and its validation in models remains incomplete. Methodologies to propagate uncertainties from global to local scales are still underdeveloped. This includes the lack of consistent models that incorporate human-controlled surface processes, such as urban effects. The uneven distribution of global climate research leaves some regions under-represented in climate literature, and there is a shortage of regional climate studies incorporating multiple lines of evidence (observations, projections and process understanding).

Predicting compounding and cascading events, as well as interactions between extremes and non-linear effects, is challenging. The influence of regional factors and internal climate variability on local extremes and their interaction with long-term trends is not fully understood. Models have difficulty with spatial patterns and feedback mechanisms for specific extremes like heavy precipitation, tropical cyclones, and droughts, especially in the tropics and high latitudes. There is significant uncertainty about how regional tipping points, abrupt changes, and high-impact global events will affect extreme weather. These events could drastically intensify extreme weather conditions. We also lack understanding of the link between marine heatwaves and atmospheric conditions, their future trends, and how changes in major ocean currents will impact extreme weather.

D.3 Emerging and rapidly progressing areas

Examples of research areas that have been rapidly progressing or emerging since AR6 are summarized below, based on IPCC surveys and recent publications. They are also highlighted in the following section D.4 that introduces a (non-exhaustive) set of society-relevant questions where research is expected to advance significantly.

Systems and processes: In general, significant progress has been made in understanding climate change systems, natural variability, and interactions. Some of the most dynamic research areas are carbon sinks/sources, the water-carbon nexus, and the impacts of SLCFs like methane, aerosols, and other forcers. Extensive research efforts on ocean and cryosphere responses led to new observations and results on ice/ocean dynamics, key for understanding changes in sea level and sea ice.

Improved observation and model technologies: Advances in observational and modelling technologies have improved our understanding of various systems and processes. New generations of satellites with wider coverage and higher resolution sensors provide unprecedented insights into atmospheric, oceanic and terrestrial variables. Artificial intelligence (AI), especially machine learning and deep learning, has had a significant impact on climate research, helping to analyse data, emulate physical processes and develop climate emulators. The development of regional convection-permitting models to simulate extreme events is also an emerging research area.

Projection strategies and experiment designs: Observational constraints are now more integrated in weighted projection ensembles, thanks to new statistical techniques, a step change contrasting with the previous “model democracy” approach. The Coupled Model Intercomparison Project Phase 7 (CMIP7) design will allow new Earth System Model (ESM) runs based on emissions from Shared Socio-economic Pathways (SSP) scenarios, moving beyond purely concentration-driven ESMs as in CMIP6. High-resolution simulations are increasingly available to address topics such as global/regional climate change.

Regional climate and climate services: With the advent of higher resolution regional climate projections, increasingly coordinated efforts in Coordinated Regional Climate Downscaling Experiment (CORDEX), and improved observational coverage (in particular due to remote sensing based products), scientific communities will better understand climate change implications for risk in data scarce regions. This will support the development of adaptation and mitigation services,

including early warning.

Extreme events and attribution: Since AR6, literature on extreme event attribution has expanded significantly, improving coverage in previously under-represented regions, and extending beyond the more classical event types (heat waves, heavy precipitation, droughts, storms) to other types of events (e.g., fire weather, humid heat, ...) that are often more directly linked to impacts. The field has benefited from new framing approaches (e.g., storylines), advanced statistical methods, and higher-resolution models, including regional convection-permitting climate models. There have also been significant developments in understanding compound and record-shattering events.

Tipping points and High-impact events: Tipping points and high-impact events have received significant attention due to the potential for triggering nonlinear, abrupt and irreversible changes. Recent observations (e.g., ocean, cryosphere dynamics, carbon-climate and land-atmosphere feedbacks) and new ensembles of climate simulations will provide key new insights, including into the risk related to overshoot-pathways.

Scenarios: A new generation of emission scenarios (CMIP7/ScenarioMIP and other scenarios), starting in 2025 instead of 2015 and incorporating updated plausibility constraints, are being designed to address considerations like regional effects of emissions, overshoot trajectories, or equity, among others, and will provide more up-to-date and differentiated projections of future climate change. These new global emission scenarios that account for the current trends in emissions of major carbon-emitting regions (e.g., peaking and moving towards carbon neutrality), will refine our understanding of warming levels and the range of plausible climate futures, and provide new insights into achieving the Paris Agreement goals.

D.4 Society-relevant questions where AR7 WGI could bring advances

This section describes some potential society-relevant questions to which AR7 WGI may be able to provide new answers thanks to scientific advances.

D.4.1 How to explain and interpret recent climate trends and extremes?

Since the release of the AR6 WGI report, many outstanding or even record-shattering climate extreme events occurred, highlighting the need for a fast update of available IPCC assessments. One can cite as examples the 2021 flooding in Central Europe (which led to more than 250 deaths and 54 billions in property damages), the 2022 flooding in Pakistan (associated with more than 1,700 deaths and \$30 billion in damages and economic losses), the 2023 wildfires in Canada (which led to CO₂ emissions equivalent to three times the annual emissions of the country), the 2023 flooding associated to the Medicane Daniel (which led to over 11,000 deaths in Libya), and the recent 2024 flooding associated with heavy precipitation in Spain. Event attribution studies have been performed for several of these events. However, their scale and intensity triggered a range of new questions and studies.

In addition to recent extreme events, the year 2023 was associated with an extreme anomaly of the global mean temperature, which almost reached 1.5°C for the first time for a single year. This was followed by further outstanding global mean temperature anomalies for much of 2024. While first studies suggest that these large anomalies, which were also induced in part by an El Niño event, were in the high range of expected possible conditions based on available climate model simulations, some climate experts suggested that the anomalies may point to an accelerated global warming beyond the level expected from past studies. With greenhouse gas emissions continuing to rise, a careful assessment of the evolution of global and regional climate change, and whether they might exceed expectations from climate models is necessary as a key delivery of the AR7 WGI.

D.4.2 Are models able to simulate both recent evolutions and past climate?

AR5 WGI devoted an entire chapter to "Assessment of climate models", covering a range of aspects from mean values to variability and extremes across different systems and processes, spatial and temporal scales, feedbacks and climate sensitivity. AR6 WGI also devoted considerable space to model assessment, but this content was spread across chapters. The continued development of global and regional climate models, now reaching the kilometric scale, and the development of emulators and data-driven models have provided a wide range of options for analysing future climate change scenarios. The capabilities and key uncertainties of each type of model have yet to be assessed by the IPCC. Model evaluation also continued after the publication of AR6, and a number of process evaluations took place, which are expected to provide a fresh understanding of model capabilities. Since AR6, not only has the development of models continued, but more years of observations have been added, in a rapidly changing climate with pronounced trends and extremes, potentially helping to better understand uncertainties in the model response to human activities. Progress in understanding past climate also places new constraints on climate models and their sensitivity to drivers of climate change. Also, questions were raised whether the current climate trends were predicted in previous assessments. Therefore, in general, there is a large scope for AR7 to better assess model capabilities.

D.4.3 How do new observations and scientific progress narrow the space of potential futures?

The assessment of climate projections in WGI has always been enabled by the WCRP's CMIP. The latest ScenarioMIP exercise (CMIP6) that largely underpinned the AR6 assessment was started 10 years ago. Given current policy developments, emission levels and warming trends, both the very high warming scenario (Representative Concentration Pathway 8.5 (RCP8.5)/SSP5-8.5) and the very low stabilization scenario (SSP1-1.9) assessed in AR6 have since been criticized as being "unrealistic". Mitigation ambition and policies in major emitting countries and regions, as well as the expected climate change impacts on economy and society, render a very high emission scenario based on unfettered growth and fossil fuels use implausible. On the other hand, due to the high and still rising level of Greenhouse Gas (GHG)-emissions and the failure to peak in the early 2020s as needed in most scenarios achieving the Paris Agreement temperature goal, the lowest stabilization scenario would now require reducing emissions at rates and deploying carbon dioxide removal at scales that are considered less and less feasible.

The potential futures assessed by AR7 will reflect those developments. For CMIP7, the plausible scenario space will be increasingly constrained by stated and implemented policies, by technology developments in particular in the energy sector, as well as by the dynamics of other important factors linked to emissions, such as population, land use, or economic development. Advances in modeling, such as high-resolution projections and regional emulators, enable WGI to better address specific challenges on scales relevant to decision-makers, such as frequency and extent of regional extreme events under different emissions scenarios, and to assess the regional consequences of a wider range of global scenarios. CMIP7 will mostly be run in emissions-driven mode, which will enable a consistent representation of Earth-System feedbacks, such as the weakening land carbon sink due to increasing drought or wildfires.

To provide the most useful input for risk assessment and a basis for planning, AR7 will strive to assess projections that anticipate the most plausible future developments in the underlying socio-economic scenarios, including the consideration of increasing climate change impacts and adaptation efforts for those trajectories, in close cooperation with WGII and WGIII. At the same time, in-depth evaluation of unprecedented and low-likelihood events, Earth system feedbacks, and threshold behavior is needed to support decision-making under high uncertainty (see D.4.5).

D.4.4 How would the climate system respond to an overshoot in global temperatures?

An important new area of research in climate science is devoted to assessing changes in the climate

system in the event of an overshoot pathway. Central questions are manifold:

- To what extent may the assumptions of the emission scenarios underlying the overshoot pathways be unrealistic in the light of projected changes in the physical climate system, e.g. the impact of increased fire weather, droughts and heatwaves on forested areas (a question that could be assessed jointly by WGI, WGII and WGIII)?
- How do changes in extreme climate and weather events and other drivers of climate change evolve in overshoot pathways, and how do these changes in climate hazards contribute to the risks of overshoot pathways?
- What is the extent of irreversible changes in the climate system that could be induced in an overshoot pathway? In particular, what are the uncertain risks associated with overshoot pathways, e.g. associated with the triggering of global and regional tipping points?
- What are the changes in the climate system that show hysteresis with decreasing emissions?

D.4.5 How close are we to potential abrupt changes, tipping points or high-impact events?

The AR6 Glossary defines a tipping point as "a critical threshold beyond which a system reorganises, often abruptly and/or irreversibly". Tipping points assessed by the WGI typically arise from the non-linear nature of the climate system. Examples of potential tipping points include the potential collapse of the AMOC and its possible consequences, abrupt changes in monsoons, weather patterns and the hydrological cycle, as well as greatly increased melting of the Antarctic ice sheet due to instabilities in ice/ocean dynamics, or forest dieback (Amazon, Boreal). There is a growing literature of new observations, early warning indices and models that indicate an increased risk of tipping points of regional and global significance being crossed at global warming close to current levels, with potentially severe consequences. Beyond tipping points, the potential for complex events or unprecedented high impact extreme events was also assessed in AR6 WGI. For example, large and sudden high impacts may result from the co-occurrence of large-scale severe extreme events, such as drought exacerbated by heat. Simultaneous extremes in different locations could also lead to non-linear increases in impacts, for example if all the world's breadbasket regions were to experience climate extremes at the same time, potentially affecting global food security (Special Report on Climate Change and Land (SRCCL); WGI AR6 Chapter 11). However, the analysis of complex events was still in its infancy at the time of AR6, and the literature on this highly policy-relevant topic has grown considerably.

D.4.6 What will be the main changes in my region and the main drivers of future impacts, losses and damages?

Nearly one third of the AR6 WGI chapters were dedicated to regional climate information assessment. The performance of regional models and other tools and methods were assessed as well as observed changes including in extreme weather and climate events. Observed and future changes in climatic impact-drivers (CIDs), defined as physical climate system conditions (e.g., means, events, extremes) that affect an element of society or ecosystems, were assessed at regional basis for sectoral impacts and risk assessment using a common risk framework across AR6. Regional differences in historical data coverage or data access, model availability and peer-reviewed literature make it impossible to assess changes in CID and their attribution to climate change to the same extent in every single region.

Since AR6, there is a continuous increase in the literature on the complexity of interactions among multiple drivers of risks associated to climate change including of cascading and compounding risks. The assessment of futures impacts, risks and losses and damages is at the interface between WGI and WG2 II, and even WG III, if responses to climate change are systematically integrated into the risk framework. Advances in regional climate change projections, in the

attribution of extreme events, including progress in studies of previously understudied regions, will be key to provide more useful and more even inputs for the assessment of risks and losses and damages across the world in AR7.

D.4.7 What are expected climatic consequences of solar radiation modification at global and regional scales?

Solar radiation modification (SRM) is increasingly studied as a potential strategy to supplement ongoing greenhouse gas emission reduction, carbon dioxide removal, and adaptation. Proposed SRM methods involve using aerosols or other materials to increase the reflectivity of the atmosphere, clouds, or Earth's surface. SRM options include stratospheric aerosol interventions (SAI), marine cloud brightening, ground-based albedo modifications, ocean albedo change, and cirrus cloud thinning. Since AR6, a growing body of new literature investigates the effects of SRM on global and regional climates. Modeling studies have shown that SRM in the form of SAI could potentially offset some climate change risks, including global warming and the increase in frequency and intensity of temperature and precipitation extremes. However, it could also introduce new risks related to the modification of global and regional precipitation patterns and the spatio-temporal behavior of large-scale climate teleconnection patterns represented by the North Atlantic Oscillation, Pacific Decadal Oscillation, El Niño–Southern Oscillation (ENSO) and Atlantic Multidecadal Oscillation. SRM in the form of SAI may also offer co-benefits, such as reduced tropospheric ozone and enhanced diffused sunlight. However, several studies have identified possible risks of SAI as acid deposition, and stratospheric ozone and water vapor changes if sulfate were used as aerosols. Regional studies associated with a specific SRM strategy provide information on potential impacts on, for example, extratropical cyclones, storm tracks, and sea level rise. Southern Hemisphere extratropical cyclones are expected to become increasingly intense under global warming while SAI could lessen their intensity, resulting in a similar intensity to the current period. In addition, SAI can partially offset the poleward shift of the storm tracks in the Middle East and North Africa, thus potentially soothing the environmental and water stresses of the region. Global mean thermocline sea level could be reduced under a SAI scenario on some densely populated coasts but do not perfectly restore regional sea level rise patterns. While literature is growing, the assessment of SRM remains challenging because it mainly relies on modeling results that are difficult to validate due to lack of observations. While the above-mentioned research developments need consideration by WGI, concerns outside the WGI domain (e.g., governance, monitoring and equity issues) would warrant a cross-WG approach (see section B).

D.4.8 How can climate science progresses support near-term adaptation and mitigation options?

Findings in AR6 underscore a critical window of opportunity to secure a sustainable future, suggesting that immediate, integrated climate action—encompassing both adaptation and mitigation—is necessary to address escalating climate risks effectively and equitably. AR6 established the importance of reducing GHG emissions to mitigate long-term warming, recognized the importance of adaptation, described region-specific impacts, risks, and adaptation needs especially concerning vulnerable communities, and explored how exposure to near-term climate extreme events varies across regions.

Recent advancements in climate science provide important new insights that are essential for enhancing near-term adaptation and mitigation efforts. For example, improved methods for attributing climate extremes to human influence allow for better assessment of current/near-term region-specific impacts, though gaps remain in understanding compound events and projecting future high-impact events. Integrating extreme event findings into adaptation strategies helps meet vulnerable populations' needs, offering policymakers more targeted risk reduction through adopting near-term adaptation strategies.

Ensemble seasonal to decadal forecasts, and refined regional climate projections, combined with monitoring also support near-term adaptation by informing early warning systems, enabling timely responses to extreme events and enhancing resilience in high-risk areas. Localized climate data now guides urban planning, agricultural policy, and water management, supporting communities to protect essential resources amid changing conditions.

New scientific insights also strengthen mitigation by suggesting evidence-based pathways equipped with near-term measures for emissions reductions. For example, recent methane research supports targeted short-term actions to reduce warming, while advances in high-resolution projections of regional-to-local climate can support planning for practical solutions such as renewable energy (see also D.4.10). By advancing coordinated actions across energy, transport, health, and food systems, current climate science not only supports near-term responses but also fosters long-term resilience and prosperity.

D.4.9 How can new climate information support improvement in health and well-being?

The human health dimensions of climate change have been identified by pre-scoping meeting participants and governments as an important cross-cutting topic for AR7. The topic of health has always been assessed by IPCC, including the first stand-alone health chapter in WGII in the 3rd Assessment Report (TAR). Human health impacts, vulnerability, and adaptation has been covered in the past by WGII and health co-benefits of climate change mitigation have been covered by WGIII. AR7 WGI could enhance these contributions by assessing the physical basis information needed for health-related adaptation and mitigation. For example, WGI plays an important role in assessing air pollution and atmospheric chemistry, but could also support the coordination of this assessed physical information across WGs. Taken together, there is an opportunity to strengthen the health narrative across WGs in AR7. For example, the assessment of air quality and health spans all WGs: past and future projections of human-health relevant air quality (e.g., black carbon, methane, ozone) using thresholds and metrics that are relevant to health outcomes (WGI); the impacts of air quality on health, including cardiovascular and respiratory morbidity and mortality (WGII); and the short- and long-term health co-benefits of improved air quality achieved via climate change mitigation (WGIII).

D.4.10 How can new climate information support the assessment of renewable resources?

Renewable resources such as biomass, water, wind or solar energy depend on favorable climatic conditions. They are increasingly impacted by changes in regional climate variables, including cloud cover, wind speeds and direction, heat or cold waves, extreme precipitation, drought or storms. Anticipating impacts on existing resources and infrastructure and planning for future uses will hence benefit greatly from high resolution regional climate change predictions and advances in modeling enabled by artificial intelligence.

With the right framing, the data, literature, tools, and insights provided by the WGI report and interactive Atlas can serve as valuable inputs for the energy transition and to maintaining and enhancing the resilience of existing and planned basic infrastructure. Examples would include higher-resolution regional climate change projections and decadal predictions that allow improved siting of wind power and solar farms, consideration of changes in wave and wind patterns that may affect offshore infrastructure and locally specific sea-level rise and storm surges relevant for coastal installations. Water availability is a key challenge for the energy sector, since conventional power generation as well as hydropower are extremely vulnerable to drought conditions.

Addressing regional developments of climate-impact drivers under different emission scenarios through the specific lens of renewable resource use for basic human needs would provide timely and policy-relevant information at the interface between WGI and II, and WGI and III respectively. It could also support better communication of WGI findings and further strengthen the impact and visibility of the WGI report.

D.5 Summary of WGI pre-scoping consultations and surveys

To support the Co-Chairs and Bureau in preparing the scoping meeting, WGI TSU collected input on expectations, priorities, concerns and structural questions concerning the WGI AR7 from a range of audiences, using different formats and sources. This Annex provides an overview about those activities and the key findings. More detailed analyses are available for most of the consultations summarized below. These have informed the Bureau and can be shared by TSU upon request.

D.5.1 Pre-scoping science survey

The WGI TSU solicited input from the global WGI scientific community on key issues and priorities for AR7, and on report structure and organization of work. The questions were developed based on initial discussions within the WGI Bureau in preparation for the AR7 scoping meeting, and responses collected via an online survey between late September and early October. The form was distributed to AR6 WGI authors, and scientific organisations and networks with international reach, as well as the AR6 Synthesis Report Core Writing Team to include cross-WG perspectives. While some personal information was collected to get an overview of the respondents' background, the survey results themselves were not linked to individuals or analysed differentiated by specific characteristics.

The survey was sent to ~ 420 individuals experts, ~ 370 were AR6 WGI authors, (Review Editors) REs and SYR Core Writing Team (CWT) and ~ 115 representatives of WCRP leadership, CMIP and Future Earth (with some overlap between the groups), and to ~ 45 additional international science organisations. The survey had a ~40% response rate, with 186 individual and one institutional response received over the course of 3 weeks. 70% of respondents were AR6 authors, and almost 70% identified as male. 110 were from Global North countries, and 66 from the Global South, with EU countries, UK and US dominating, but a diverse Global South representation.

Many substantive inputs and helpful suggestions were received, reflecting the high level of commitment and engagement of the WGI scientific community in the IPCC process.

On overall narrative and focus, the question how WGI can “communicate urgency and make people act” was prominent in many responses. In line with this, many participants advocated for a focus on information relevant for policy issues, mitigation, adaptation, losses and damages, and the interfaces with WGII and III respectively. The need for greater emphasis on regional aspects of climate change, to enhance impact and accessibility, and link to WGII / Atlas is highlighted.

There was also support for a stricter focus on physical science, and concerns whether science is mature enough for some of the questions we proposed, with calls to resist the urge to respond to all kinds of requests and take both the relevance of the question and the readiness of science to take them into account.

Many highlighted the robust assessment of uncertainties and the evaluation of performance/quality of different data, tools, and methods as a valuable WGI service to policy makers/users. Another key priority that emerged from the answers was to systematically evaluate “how right we have been”, e.g., concerning past projections, and assess whether we understand what is happening now in the climate system (e.g., high Ocean temperatures, unprecedented extremes...).

Most prominent content areas

- *Extreme events, compound and cascading risk and „tipping points“*
- *The water cycle and its interlinkages with other human interventions, water requirements for human needs/the transition, and Earth System Feedbacks*
- *Systematically assess the role of the Ocean: “Oceans’ perspective” of the climate system*

- *Land-atmosphere feedbacks and the role of sinks/biomass-based mitigation/Nature-Based Solution (NbS)*
- *SLCF, and their link to mitigation, health, and relevant Earth System Feedbacks*

Key results on structure and process

- *Emphasis on shorter, more focused report, no encyclopedia /more of the same*
- *Integration with WGII/III has high priority, esp. Informing risk and regional climate information/Atlas*
- *Calls not to change everything and keep much of AR6 structure, but updating rather than rewriting: all structures have pro's and con's*
- *Plan ahead and devote resources to coordination, solicit input from community (e.g., synthesis papers, special issues) to help with literature, provide tools to support authors*

D.5.2 Prescoping Webinars with non-attending nominees

IPCC focal points and experts who were nominated for, but will not participate in, the December scoping meeting were invited to attend one of three pre-scoping webinars that the IPCC Bureau hosted on October 30th, 2024. A total of ~600 participants attended the webinars, including ~70 participants affiliated to WGI. Each webinar lasted 1.5 hours with general introductions followed by WG specific Breakout Groups, a report back and an invitation to an online survey on inclusivity.

The three WGI-Breakout Groups (BOGs) had lower attendance (23-27 external experts per session) than the other WGs, allowing slightly more time for interaction. The composition of the groups was broadly representative of the international WGI community, with a majority of male experts from Europe, North America, Australia, China and India. There was a total of 10 participants from South- and Central America, but only two African experts joined the WGI. Approximately two thirds of participants self-identified as senior scientists.

Questions asked during the WGI BOGs

- *What level of temperature rise would you still consider to be safe?*
- *To what extent has WGI been able to deliver policy-relevant information for decision-makers?*
- *Which scientific topic has been emerging and/or progressing most quickly since the publication of the last IPCC reports?*
- *In one sentence/three key words, what would be the main new message that could be delivered by WGI at the end of this cycle?*

In response to the “Icebreaker” questions “What level of temperature rise would you still consider to be safe?”, a large **majority gave figures between 0 and 1.5C**, with some pointing out that current levels of warming were already unsafe, or that “safe” levels depend on location. There were also ~10% of responses that considered up to 2C to be safe, and two votes each for 2.5 and 3 degrees.

Over 70% supported a shorter WGI contribution to AR7, while keeping it comprehensive, policy relevant and policy neutral. The group rated the WGI’s past provision of policy-relevant information to decision-makers as generally positive, with less than 10% of votes below medium level.

The **most dynamic research areas since AR6** identified by the group fell mainly into the following categories: **Tipping Points**, especially AMOC; **extreme and compound events and their attribution**; **improved climate models**, including high-resolution (km scale), convection-permitting and AI-enabled modelling; and **advances supported by AI and machine learning** more generally, especially for regional climate information. Polar, cryosphere and marine research were

also highlighted, as well as CDR and Solar Radiation Modification. Both the categories and the individual topics highlighted correspond well with responses from other surveys.

Key messages that might be delivered by WGI covered the broad categories of **urgency of action**, given the unfolding effects of climate change and a rapidly closing window of opportunity; **communicating reduced uncertainty**, including better constrained future scenarios and the ability to detect impacts of emissions reductions in the near term; **a focus on regional changes and risk**, and specific impacts, e.g., the water cycle or extreme events **rather than global mean temperature changes**; the urgency to understand and respond to **increasing extreme events and potential climate tipping points**, including the roles of overshoot, early warning signals and complex feedbacks; and providing **robust information for decision making**, especially for mitigation and adaptation strategies, and elaborate on their consequences.

D.5.3 Prescoping survey with scoping meeting participants

WGI TSU sent a survey to all confirmed scoping meeting participants with a WGI affiliation, a total of 68, not counting WGI Bureau members, to prepare the discussion on a few key topics. Five questions were developed based on the feedback received hitherto and discussions within the Bureau. The objective was to get a first impression of experts' thinking on emerging vs. mature research areas, potential key messages, regional information, report length, usability and workload, and on overall report structure and organization in the light of delivering a policy-relevant report. A total of 62 responses were received, with many valuable insights and helpful suggestions. Below is a short summary of the input received. Results have further served to inform the WGI Bureau and will also be presented as inputs to the meeting in Kuala Lumpur.

On emerging and highly dynamic research areas that would warrant a more in-depth assessment in AR7, a wide range of suggestions was received. The most prominent issue areas in terms of number of experts highlighting them were methodological advances in modeling and observations, including the role of AI/Machine Learning (ML) as enabling tools, regional information and relevant processes, tipping points, compound and unprecedented extreme events, overshoot scenarios, and Earth System and carbon cycle feedbacks.

On areas of research considered to be more mature, with a comprehensive assessment in the AR6 report, where new findings are likely to be more incremental in nature, responses were less clear and sometimes contradictory, indicating that the question may not have been as clear as intended. Several respondents noted that many of the previous key messages were supported by very mature research and pointed towards the concept of providing focused updates rather than broad re-assessments of the full body of literature. It was also noted that it would be helpful to have a mechanism to formally link areas where there are now standardized annual assessments, such as the global carbon budget, or global indicators of climate change, to the IPCC assessment. Some of the areas that featured most prominently in the list of mature topics were global mean indicators, including climate sensitivity, TCRE, the Earth energy and the global carbon budget, large scale (past) changes in the climate systems, records and projections of global climate change and most GHG concentrations on century time-scales, and human influence on the climate.

On options to address regional information, integrating regional information with global information within all chapters received the strongest support and almost no objections. One additional suggestion was to systematically follow the same format for regional information, e.g., summary tables, that could be developed and included for each major topic addressed or use visuals to outline regional consequences (as done in the Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC)). Participants also supported having specific chapters / sections on regional information, while the option of organization by typological region or a focus on data-scarce regions lacking prior in-depth assessment was broadly supported yet also had a larger group being unsure.

On an overall organization of the report that would enable a shorter, policy-relevant AR7, two-thirds of the group strongly supported the approach to “ensure that the outline provides for a short and focused assessment giving most space to areas that are emerging or rapidly progressing”, and 90% saw at least some benefit. Using a very concise writing style, e.g., with headline statements followed by a summary of key developments and references also received broad support, with ~51% stating full support and a total of 81% seeing at least some benefit. The group was more divided on approaches based on number of chapters.

Several proposals outlined how to build on AR6, providing updates where needed and reserving more space for topics that had not been assessed or where science is moving fast. Some respondent cautioned against too much focus on new and emerging issues, highlighting the need for AR7 to be a comprehensive, standalone report and re-stating the key basic findings. Limiting the time and energy to ensure consistency and address overlaps emerged as a common concern.

On the report structure in terms of chapter organization and narrative, experts provided a wide range of views and many helpful and constructive (yet often mutually exclusive) suggestions. There was some convergence on

- *the general importance of providing enough space for regional information, yet emphasizing the challenge to avoid redundancy with global/process information*
- *a stronger focus on changes in modes of variability and circulation which are important for regional projections and local manifestation of climate change*
- *giving more space to (directly) policy-relevant and highly dynamic research areas, building on some sort of “updating AR6” approach summarizing most relevant new findings for more mature and basic research areas, including global indicators, processes and projections*
- *preserving at least some of the AR6 structure to enable continuity and an “update” approach, guide the reader and benefit from coordination and delineation work done in AR6*
- *support for the AR6 SYR structure “Current Status and Trends, Long-Term Climate and Development Futures, Near-Term Responses in a Changing Climate” as an organizing principle, with some form of special focus on regional information*

D.5.4 Conversations with external groups and networks

In addition to ongoing engagement with the wider climate science community, WGI TSU organized exchanges with international organisations outside the core climate space, including United Nations Convention to Combat Desertification (UNCCD), Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), United Nations (UN) Water and the International Energy Agency (IEA), as well as with representatives from international associations engaged on Insurance, Health, Environmental Issues, Food, Mountain regions and Oceans. In addition, two virtual roundtables were held with reporters from international media outlets that cover IPCC and climate science, and a dedicated survey for Youth was undertaken. Conscious that reaching out to all interested audiences is not feasible, the TSU intentionally targeted international organization to ensure a global perspective.

Consultations with international organisations, networks and civil society

Questions posed during consultations varied according to audience, but generally covered the following three issue areas:

- *What are your expectations, questions and key concerns that should be addressed by the WGI AR7?*
- *Do you find the WGI interactive Atlas useful, and do you have suggestions for improvement?*
- *Do you have any recommendations for publications and/or further partners and networks*

WGI should take into account?

Not everyone was familiar with the WGI “domain” or IPCC’s work mode and governance structure. International organisations would generally welcome IPCC engagement on their respective issues (e.g., water, desertification, biodiversity) and some expressed interest towards joint products.

Many highlighted the important role of physical climate science basis to better understand what is going on and forthcoming, especially with a view to unprecedented extreme events or crossing tipping points, to evaluate responses (e.g., in terms of renewable energy capacity, water / resource needs, resilience), and to inform risk analysis with robust future projections.

WGI-specific issues and priorities emerging from many conversations included

The request for regionally specific, “realistic” future projections with high level of granularity

Improving the WGI region definition and coarse model resolution that currently limit usability

Concerns that prominent treatment of Solar Radiation Modification in the IPCC report would establish SRM as a viable solution, despite high uncertainty and potential risks

More focus on the near-term, both in terms of projections and evaluating recent past and current developments, to support decision-making, communication, and planning

How climate change impacts will limit the potential of natural sinks to take up carbon, and feedbacks from such impacts (e.g., increased wildfires) on the carbon cycle and feasibility of future pathways, notably high “negative emissions” (nature-based CDR)

Again, responses, and highlight topics were found consistent with science surveys and webinars.

Summary of conversations with climate journalists

The conversation with global media representatives that cover climate science, IPCC and the science-policy interface proved to be very insightful and valuable. The rich input provided has been documented in a separate summary and can help to guide future communication and design questions beyond scoping.

Key messages that emerged from the roundtables most relevant for scoping included the following:

- *Basic climate science is still very much needed. Do not underestimate the anchor IPCC provides, and how critical it is to have an authoritative body. Repetition of previous assessments’ key messages is still useful. Don’t step away just because the message has not changed for a few decades*
- *Focus on the near term, both the recent past and the coming decade! What do we know, what is coming? What can we attribute, what exactly is “human induced”, how will regional differences play out?*
- *Evaluate and show where IPCC has been right. Highlight the advances of science over 30 years, re-confirm or refute the idea that everything is “faster than we thought, worse than we feared”.*
- *Emphasize the authoritative voice of IPCC as institution, including on tipping points – what’s coming? what do we know? And if tipping points happen, what will be the impacts?*

Youth survey

Via an online survey, the WGI TSU asked gathered input from young people all over the world about their knowledge and feelings about climate change, as well as their familiarity with the IPCC. The results portray youth as interested in climate issues but also as anxious about the way things

might go down. Indeed, if 80% of the participants knew that the IPCC was the United Nations body for collecting and evaluating the science related to climate change, 79% of them would agree with the statement “*Thinking about climate change impacts me emotional/ makes me anxious*”. They request dialogue, answers and tools to light this obscure and uncertain future to come. Details are provided in this [report](#),²⁷ showing results of the survey as well as some recommendations for AR7, with a view to reaching out to youth, such as more intuitive and audio-visual media, teaching materials and social media engagement. Translation was also highlighted as a key factor enabling engagement.

²⁷ <https://zenodo.org/records/13789039>

PART E: PERSPECTIVE FROM WORKING GROUP II

E.1 Introduction

The Sixth Assessment Report showed the stark reality that climate change and its impacts are more pronounced and evident than previously assessed. Some of these impacts are likely to be unmanageable and irreversible. Since the publication of AR6, we are continuing to witness continued ecosystem loss and increased risk of extreme climate-related events. Slow-onset events such as water scarcity, degradation of natural resources, reduced agricultural productivity and rising food and water insecurity, are deepening in scope. Continued and comprehensive adaptation planning and implementation of climate action is needed to address these impacts in all sectors and regions. Although there is evidence of progress on adaptation, it is not keeping up with the challenges of complex and cascading impacts, and adaptation solutions must grapple with both hard and soft adaptation limits. Soft limits to adaptation are driven by governance and financial barriers, available technology, development stage and socio-cultural contexts. There is growing evidence of losses and damages occurring before expected adaptation limits have been reached. The effectiveness of adaptation will decrease with every increment of warming, with losses and damages also expected to grow.

While adaptation at all levels of governance (local, national and global) has seen a steady growth in importance, new developments, forms of progress and new issues have arisen since AR6. The Global Goal on Adaptation (GGA), established in Article 7 of the Paris Agreement, has adopted a framework (the UAE Framework for Global Climate Resilience) in 2023 and a work programme to develop global adaptation indicators to measure progress towards sectoral and dimensional targets. Developing countries have made significant progress in developing National Adaptation Plans with nearly 30 new NAPs submitted since 2022, with ten of these submitted in 2024 alone. In the AR7 work program, WGII will revise the 1994 Technical Guidelines for Assessing Climate Change Impacts and Adaptation (TGIA), planned to be released as a Volume of the WG2 contribution to AR7. This is a unique opportunity to provide a critical resource to support the GGA and the implementation of adaptation actions of national and subnational institutions.

The provision of policy-relevant assessments for understanding climate impacts, adaptation, and vulnerability requires listening to different stakeholders. At the IPCC 60th Plenary, the Panel underscored the need to explore mechanisms for informal engagements in the preparation of IPCC reports. To achieve this ambition, we organized pre-scoping activities²⁸ reaching a wide range of experts and stakeholders. These engagements generated many suggestions and requests for updated WGII-related information. They also underscored cross-Working Group information that is relevant for enhancing the implementation of multi-faceted climate-related policies.

This section first reflects on WGII AR6 focusing on major advances, post-AR6 updates and knowledge gaps (Section **E.2**). The AR7 ambitions written in the first chapters of this Vision Document are addressed from a WG2 perspective in Section **E.3**. Section **E.4** lists several opportunities for AR7 to ensure an adequate and timely policy relevant assessment. Section **E.5** elaborates on the TGIA update, Section **E.6** discusses pre-scoping activities and their outcomes, and Section **E.7** concludes with considerations for the structure of the WG2 contribution to AR7.

E.2 Point of departure from AR6

This section is not intended to summarize all relevant information from AR6, but to provide several key messages for the scoping of WG2 AR7 products.

²⁸ Including a WG2 survey returned by 721 respondents, Break Out Groups at the pre-scoping webinars, and consultation with former WG2 CLAs

E.2.1 AR6 advances and gaps on climate impacts, risk and vulnerability

AR6 advanced conceptual frameworks on risk, making references to preparedness, response actions, risk ownership, and relationships with resilience and vulnerability. It also identified significant gaps in observational data on impacts and risks, and the challenges in representing complex and cascading impact chains across regions and sectors. Progress was made in mapping climate vulnerability hotspots. However, many countries found the aggregation of information to national levels problematic as it was not able to accommodate specific characteristics of their country's vulnerability patterns.²⁹ Emerging risks from, for instance, Solar Radiation Management and carbon dioxide removal approaches and the potential impacts of tipping points in the biophysical system (e.g., the collapse of AMOC or Amazon transition to savannah) received increasing attention in AR6 and thereafter.

E.2.2 AR6 advances and gaps on climate adaptation

Although AR6 did not have a focused chapter on adaptation, there was significant advancement in its assessments within regional and sectoral chapters, including systematic approaches advanced through the Global Adaptation Mapping Initiative. AR6 assessed that observed adaptation actions were mostly incremental, rather than transformational in scope and outcome. Challenges remain on assessing the feasibility and effectiveness of adaptation measures, monitoring and evaluation, and links to disaster risk management. The assessment of best practices, long-term synergies and trade-offs between different societal goals, and maladaptive practices varies widely due to strong dependence on local context and inhomogeneous data.

E.2.3 AR6 advances and gaps on climate resilient development:

AR6 elaborated on the framework of climate resilient development (CRD) to align adaptation measures with broader sustainable development goals, including assessing resilience and transition to a low emissions economy (e.g., in Chapter 18 of WGII). Gaps and challenges persist in the literature on enabling conditions for climate resilient pathways, the equity and justice dimensions, and the determination of limits to effective and adequate adaptation across levels of global warming. Opportunities for actions with adaptation-mitigation synergies, and with that of sustainable development goals that emerged from AR6 should be further assessed. Also alignment between WGII and WGIII treatment of CRD and Shifting Development Pathways could be envisaged.

E.3 The AR7 ambitions from a WGII perspective

Ambitions articulated in this Vision Document on “policy relevance” (Part A, chapter 2), “inclusivity” (Part A, chapter 3), “interdisciplinarity” (Part A, chapter 4) and principles of “equity and justice” (Part B3) need to be translated into choices of topics covered, assessment methodologies, report structure and style of presentation. For Working Group II, several high-level ambitions are identified:

- Impact and risk assessments reflecting the diversity of vulnerability profiles of human and natural systems, response capacity, limits, and availability (and various sources) of information that document these characteristics. This calls for methodologies, framings and presentations that are sensitive to principles of equity and inclusivity and prioritize the most vulnerable and/or underrepresented within a comprehensive approach;
- An action-oriented report that emphasizes the assessment of climate change (adaptation) measures, its linkage to near-term actions and disaster risk management, the incorporation of monitoring, evaluation and learning via relevant indices and targets, their (time-varying)

²⁹ https://enb.iisd.org/sites/default/files/2022-03/enb12794e_0.pdf

effectiveness under varying local and global conditions, their links to sustainable development goals, and a “reality check” on enablers and barriers that determine when and where solutions can be expected to work or not, including costs and the attendant risks;

- A comprehensive and integrative coverage and assessment of key topics embracing multi-disciplinarity (particularly including humanities and social sciences), trans-disciplinarity (including experiences from local and indigenous knowledge-keepers) and the integration of global, (sub)national and sectoral perspectives on these topics;
- The assessed information is structured by regional, physical, natural and socio-economic characteristics, in a way that facilitates easy navigation by potential users operating at scales from regional to national and local.

E.4 Specific WGII and xWG opportunities for AR7

The AR7 report has various opportunities to make a significant contribution to the implementation of national and subnational climate change priorities. Policy-relevant information for these agendas can include the assessment of the current state and challenges, evaluation of potential strategies, mapping enabling conditions and barriers, and monitoring progress. Building on the point of departure from AR6 (see section E.2) and new literature, several thematic areas can be identified to provide this policy relevant information. Below, a small and non-exhaustive subset of topics for consideration in the scoping discussions is given (in no particular order):

- *Updated impact and risk assessments*: following the AR6 point of departure, AR7 should aim to update past impact and risk assessment by considering increasingly pressing or emerging impacts and impact drivers (such as wildfires, heat, drought, floods), the inclusion of indirect impacts, compound and cascading impact chains, risks from response options and role of adaptation or development in reducing risks, and impact attribution to climate change and other drivers;
- *Economic analysis of climate action vs. inaction scenarios, including an expanded discussion on losses and damages*: AR7 should consider assessment of the overall macro-economics of multi-level climate action that builds on initial work done in AR6 to identify lowest overall cost pathways to inform policy settings. This could include a comprehensive assessment of the costs/benefits of impacts and of adaptation, as well as on the costs/benefits of mitigation as a potential cross-WG assessment. There should also be a full assessment of literature related to minimizing, averting, addressing and financing losses and damages;
- *Updated adaptation assessment*: a comprehensive and contemporary assessment of adaptation theory has the potential to connect the wide range of adaptation practices (including solution space, soft and hard limits to adaptation, residual risks vis-à-vis loss and damage, monitoring and evaluation, adaptation effectiveness versus adequacy in both the short and long-term, enablers and barriers, co-benefits of different actions), each of these deserving an updated assessment of the state-of-the-art;
- *Systems transitions*: discrete sectoral approaches as adopted in AR6 WGII limited the assessment of cross-cutting solutions and enabling conditions that apply across sectors and regions, such as the water-energy-food nexus, or transregional supply-chains. In AR7, a systems transition approach (building on the SR1.5 and WGII chapter 18) could be considered in addition to sector-level assessment aligned with GGA themes. A systems approach could enable stronger integration with transitions assessed in WGIII;
- *Climate Resilient Pathways*: Both near-term and long-term efforts are important and should be pursued in parallel, and represented in the cross-working group scenario frameworks. Consideration should be given to how some short-term trade-offs may need to be accepted to achieve long-term gains in adaptation or emission-reduction. These long-term gains are

expected to be synergistic with sustainable development goals and long-term resilience (co-benefits of reduction of GHG emissions and enhancing societal resilience), but need to reconcile near-term development agendas. Evidence on critical characteristics of Climate Resilient Pathways could be assessed from case studies and practice-oriented literature;

- *Refinement and standardization of adaptation frameworks, metrics and indicators:* AR7 has the chance to contribute to enhanced monitoring, evaluation and learning to boost adaptation effectiveness, adaptation programming, avoid maladaptation, avert avoidable losses and damages, and enhance implementation of national and local adaptation plans. A strong call for further standardization of adaptation approaches and metrics is emerging from the pre-scoping activities, and can be considered in the scoping of the TGIA update;
- *Climate Finance:* AR7 presents the opportunity to go beyond quantifying the finance gap, to where public, private and blended finance can service adaptation needs at different levels, both for adaptation and for responding to losses and damages. Information on what is and what isn't effective can supplement the quantification of the amount of existing and needed funding;
- *Multi-level governance:* AR6 findings and recommendations include the consideration of climate change planning and decision-making at multiple time scales, levels and actors (including both state and non-state actors, practitioners, the private sector, civil society organisations), inclusive of policies targeted at the most vulnerable. A comprehensive and “whole-systems” approach calls for a strong engagement of all actors contributing to enhanced climate resilience and low-carbon economies;
- *Special Report on Cities:* The AR7 is preparing a Special Report on Cities, slated for release in 2027. While it aims to provide comprehensive, evidence-based guidance for policymakers, urban planners, and businesses on how cities can mitigate and adapt to climate impacts, the report will also provide crucial information and actionable strategies to enable sustainable urban development.

E.5 The GGA and the TGIA update

There have been sweeping changes in the adaptation landscape since 1994, ranging from the Paris Agreement to the launch of aligned frameworks such as the Sendai Framework on Disaster Risk Reduction, the Kunming-Montreal Biodiversity Framework, and Agenda 2030 on SDGs as well as increased responses to accelerating climate change impacts. These have produced new demands and conditions for designing, assessing, implementing and monitoring adaptation progress at all levels: within sectors and locations, in climate finance, and at the level of global action. At the UNFCCC COP27 in 2022, in the adoption of the Glasgow–Sharm el-Sheikh work programme on the global goal on adaptation, Parties invited the IPCC to consider updating the TGIA as part of AR7.³⁰ Subsequently, the IPCC 60th Plenary sought the views of the Panel and agreed on a distinct product revising and updating the Technical Guidelines, “including adaptation indicators, metrics and methodologies” to be scoped and developed in conjunction with the AR7 WGII report.

In the AR7 work program, WGII will update or revise the 1994 Technical Guidelines for Assessing Climate Change Impacts and Adaptation (TGIA). The 1994 Technical Guidelines provided a step-wise method for assessing impacts and adaptation progress, with a range of methods in each step. The scoping process will determine to what extent the Guidelines will support the assessment of climate change impacts and adaptation progress at the global, national and local scales, and/or the development of adaptation policies, prioritisation and implementation of adaptation options, and monitoring of adaptation planning/action and development of climate change finance investment

³⁰ <https://unfccc.int/documents/624436>

plans.³¹ The Global Goal on Adaptation has seen a particular acceleration of policy activity since AR6. The current GGA work programme is developing global adaptation indicators to measure progress towards sectoral and policy targets.

AR6 highlighted the need for global inventories for tracking and learning from global progress in adaptation, which is being partially taken up by the GGA work programme on indicators. It also points towards the need to inform criteria for assessing effectiveness and appropriateness, and to inform iterative risk management and ongoing adaptation that is more inclusive, including to avoid maladaptive practices. The scoping meeting provides a unique opportunity to prepare a product that will be a critical resource for the GGA and support the ongoing adaptation action of (sub)national institutions.

WGII is preparing a proposal for an Expert Meeting on Methodologies, Metrics and Indicators for Impact and Adaptation Assessment to stimulate discussions and provide relevant evidence on different approaches and methodologies to define and collect metrics and indicators assessing climate change impacts and tracking adaptation progress relevant to the TGIA. The Expert Meeting is also expected to review existing guidelines and best practices. The meeting is planned to be held in the first quarter of 2026.

E.6 Pre-scoping activities and their outcomes

Working Group II (WGII) conducted a series of activities as part of the AR7 pre-scoping phase to gather input and insights to engage with and include the input of a wide range of relevant stakeholders unable to participate in the scoping meeting. Key activities included:

1. Pre-Scoping Webinars: Cross-Working Group (WG) sessions also including WGII specific breakout groups (BOGs);
2. Pre-Scoping Survey: specific to WGII's mandate.
3. Consultation Meeting: Feedback from Coordinating Lead Authors (CLAs), Lead Authors (LAs), and Bureau members of AR6.

E.6.1 Pre-scoping webinars

Held on October 30, 2024, in three webinars 670+ participants from 109 countries joined, with around 300 experts joining the WGII BOGs. In WGII BOGs, moderators asked participants two questions about WGII AR7, and two questions about the IPCC Guidelines for Assessing Climate Change Impacts and Adaptations. The answers were synthesized into main points and are presented below:

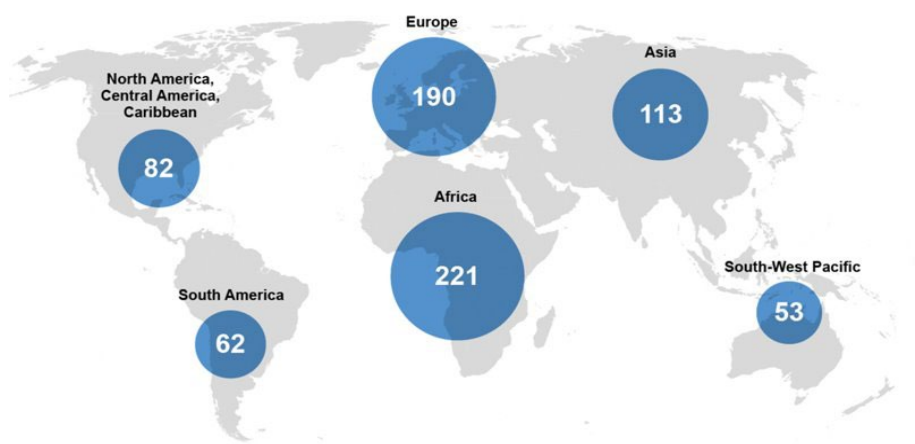
- **Main topics that have seen rapid development since the AR6:**
 - Nature-based solutions (NbS).
 - Maladaptation.
 - Cascading risks and intersectionality.
 - Integration of indigenous and local knowledge
 - Urban resilience and the role of infrastructure
 - Intersectionality (with gender, poverty, and equity, ..)
- **Information needs that are critical to advance action and implementation:**
 - High-quality, accessible localized and regional data.
 - Sustainable finance mechanisms for scaling up adaptation initiatives.
 - Inclusion of marginalized voices such as indigenous and marginalized community perspectives for equitable and inclusive climate actions.
 - Evidence-based inputs such as practical successes, failures, and "no-regret" adaptation.
 - Strengthened governance frameworks at multiple levels.

³¹ <https://unfccc.int/documents/624436>

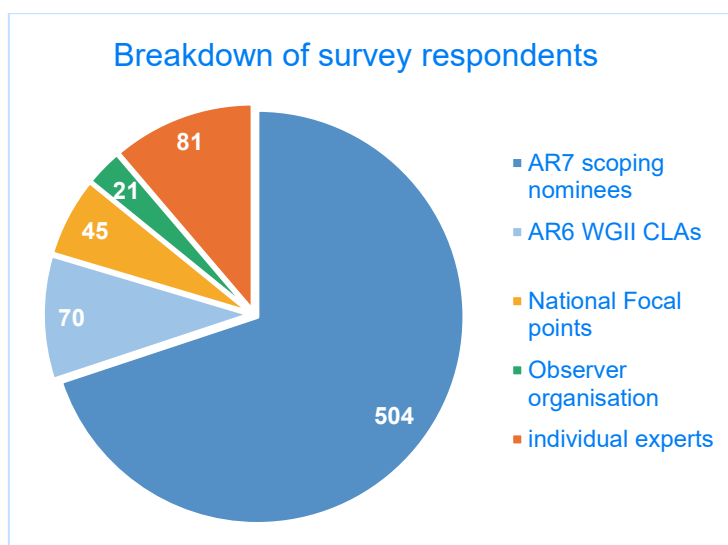
- Cross-sectoral collaboration.
- Transformative approaches such as systemic and cross-disciplinary.
- **Optimal structuring of the update to the IPCC Guidelines for Assessing Climate Change Impacts and Adaptations**
 - Action-oriented to focus on practical solutions and clear metrics.
 - Global and regional case studies with examples with measurable outcomes
 - Simplified communication through accessible language and visual aids.
 - Community-driven by integrating localised focus and grassroots insights.
 - SDG alignment for broader relevance.

E.6.2 WGII Pre-scoping survey

A WGII targeted survey was sent to non-selected nominees, AR6 CLAs, LAs, Bureau members, National Focal Points, Observer organizations, and additional networks. It was sent out in October 2024, kept open for three weeks, allowing respondents to choose and answer questions from one or more themes. It had 721 respondents, with their geographical spread and breakdown shown in the below figures.



Number of respondents by WMO-region



The pre-scoping survey focused on four themes: climate change impacts, risk, vulnerability and exposure, climate change adaptation, and IPCC Guidelines for Assessing Climate Change Impacts and Adaptations.

All respondents answered the common question of what is the biggest challenge or barrier to

climate action. A same set of questions applied to the first three themes which focused on how IPCC reports are used in their professional environments, what emerging topics and priorities, as well as key gaps need to be addressed in AR7 reports.

The IPCC Guidelines for Assessing Climate Change Impacts and Adaptations theme had a tailored set of questions which covered how an update could contribute to climate adaptation, the key topics that should be addressed, and how the guidelines could be applied in assessing climate impacts, prioritizing adaptation strategies and tracking progress. The questions also asked which stakeholders would benefit from the guidelines and how, and whether they should support the Global Goal on Adaptation (GGA) and in what ways.

Survey responses were compiled and synthesized, and in this process some areas may have been emphasized or omitted. Top five themes for each question were identified based on response frequency. Results are displayed below.

Q A: What would you consider the biggest challenge or barrier to climate action?

Responses were dominated by lack of political will as the main challenge, followed by financial gaps, inadequate access and understanding of climate finance and complex funding mechanisms, followed by limited public awareness and education gaps, poverty and global inequality.

Q B: How are IPCC reports used in your professional environment?

Responses highlighted five main ways the IPCC reports are used. Firstly, for **educational and academic use** including their application as teaching material, supporting research dissemination, course development, and informing university policies and campus initiatives. They also act as a **key scientific and technical reference**, most credible for use in official documents, reports and program designs. In **policy development and government planning**, IPCC reports were said to guide national and regional adaptation strategies, regulatory frameworks, and international negotiations, contributing to alignment across policies.

Additionally, responses highlighted their use in **media, advocacy, public awareness, and outreach**; supporting public climate advocacy, community engagement, and promoting adaptation actions. Lastly, IPCC reports were said to drive **research and the development of research agendas**, offering climate data for environmental modeling, risk assessment, project funding, disaster management, and adaptation strategies.

Q C: How can AR7 reports be best structured to enhance its usability and impact?

Responses showed a recurring suggestion to create **concise, accessible executive summaries** that distill key findings and **practical recommendations** for each section of the report, while also **highlighting main research gaps** and providing practical monitoring, evaluation and learning frameworks where possible. Additionally, there is strong support for structuring content by **regional chapters** and sectors to improve navigation and relevance.

Another common and widely repeated suggestion was the call for an **interactive, digital presentation** of the report. Recommendations include adding interactive data visualizations, maps, and scenario exploration tools, which would provide an engaging and user-friendly experience while enabling targeted information access for varied users. **Visual aids** like charts, infographics, and summary boxes should also be included to simplify complex data, making information more digestible for non-specialist audiences.

Another prominent suggestion was **highlighting cross-sectoral integration** to facilitate the understanding of interconnectedness of climate impacts across sectors (like water, energy, and health) and including **cross-cutting issues** such as equity, social justice, indigenous knowledge,

and climate resilience, presented in **explicit cross-chapter and cross working group boxes**. Complementing this structure with **real-world case studies, actionable recommendations** tailored to different groups, implementation toolkits and successful adaptation examples are how some responses see to enhance the practical applicability of AR7 findings.

Furthermore, the report could greatly benefit from **jargon free language** and clearer communication of uncertainties, emphasizing transparent language on confidence levels and risk assessments.

Q D: What emerging topics and priorities/ key gaps that need to be addressed in the AR7 reports?

Theme	Most recurring emerging topics & priorities
<i>Climate Change Impacts</i>	<p>Climate Justice & Equity: Vulnerable Communities & Global Representation</p> <p>Adaptation & resilience: Strategies for resilience, ecosystem-based adaptation, effectiveness of Adaptation Measures, Nature-Based Solutions and Community Adaptation.</p> <p>Loss & damage: Compensation and technical & financial support mechanisms</p> <p>Climate & health nexus: Healthcare systems resilience, mental health dimensions, public health impacts</p> <p>Biodiversity & ecosystem services: Nature-based solutions, climate and biodiversity loss interconnections, effectiveness of ecosystem-based adaptation (EBA) strategies.</p> <p>Regional and Localized Climate Impacts: Localized Climate Models and Impact Assessments, Vulnerabilities of Specific Regions and Populations, regional Focus Areas and strategies.</p>
<i>Risk, vulnerability and exposure</i>	<p>Loss and Damage, vulnerability and adaptive capacity: Compensation, irreversible damages, quantifying L&Ds, finance, compound and cascading risks differentiated vulnerabilities.</p> <p>Climate-induced migration & security risks: Indigenous knowledge and focus on vulnerable communities and regions, migration patterns and implications.</p> <p>Localized climate data: High-resolution, localized and granular impact assessments, and local scales.</p> <p>Climate & health nexus: Healthcare systems resilience, mental health dimensions, public health impacts, direct and indirect climate impacts on health.</p> <p>Emerging technologies: Artificial technology, digitalization risks, data collection and knowledge transfer.</p> <p>Risk quantification & cost analysis: Economic valuation and risk of inaction, quantitative tools for loss and damage, financial mechanisms & funding for adaptation, non-economic losses, cost-benefit of adaptation strategies, long term cost of inaction.</p>

<p><i>Climate change adaptation</i></p>	<p>Adaptation strategies & effectiveness: Standardization Metrics, indicators, adaptation progress, long-term adaptation impacts.</p> <p>Climate Justice & Equity: Vulnerable Communities & Global Representation.</p> <p>Loss and Damage: Compensation, irreversible damages, quantifying L&Ds, finance.</p> <p>Transformative adaptation.</p> <p>Indigenous & local knowledge: Cross-Cultural Adaptation Strategies, socioeconomic impacts of climate change, adaptation for marginalized communities.</p> <p>Climate-induced migration & security risks: Indigenous knowledge and focus on vulnerable communities and regions, migration patterns and implications.</p>
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The IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations responses:

Finally, the last theme of the survey was about the the IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations, which received 88 responses. The respondents stated that the Guidelines are seen to be for policymakers, stakeholders, experts, and researchers involved in climate adaptation planning and monitoring. The respondents see the guidelines should include standardized methods and tools for assessing risks, prioritizing actions, and tracking progress, with metrics aligned to global targets like the Global Goal on Adaptation (GGA). The guidelines should provide structured frameworks, best practices, and strategies that address gaps, support local and national adaptation planning, and ensure scalability. Key areas to be covered by the guidelines include indicators for monitoring and evaluating adaptation actions, methods for assessing effectiveness, and metrics for non-economic losses like cultural impacts. The respondents see that the main goal of the guidelines is to make adaptation efforts effective and measurable across all levels.

E.6.3 Consultation with Former WGII AR6 Coordinating Lead Authors, Lead Authors, & Bureau Members

In addition to collecting their feedback through the survey, and collecting written feedback from four participants who could not join the call, a consultation call was held with around 50 participants to collect responses on the following topics:

<p>Optimal WGII report structure:</p> <ul style="list-style-type: none"> ▪ Retain regional chapters with sub-regional specificity, especially for large regions like Africa. ▪ Introduce solution-oriented chapters on systemic transitions (e.g., food-energy-water nexus and transformative adaptation). ▪ Use a matrix approach combining sectoral chapters with regional subsections to reduce duplication. ▪ Align regional groupings logically, such as consolidating Pacific islands into an "Oceania" chapter. 	<p>Addressing cross-cutting Topics</p> <ul style="list-style-type: none"> ▪ Align cross-cutting topics early in the scoping phase. ▪ Integrate themes like climate justice, biodiversity-health nexus, and systemic adaptation across chapters. ▪ Use Cross-Chapter Boxes (CCBs) or lead chapters for key themes. ▪ Develop digital tools like an interactive WGII Atlas for visualizing regional vulnerabilities. ▪ Create a web-based, searchable assessment report for improved accessibility.
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Coordination and Chapter Count	Lessons from AR6
<ul style="list-style-type: none"> ▪ Ideal number of chapters: 15-20. ▪ Focus on concise, policy-relevant insights linked to the Summary for Policymakers (SPM). ▪ Embed synthesis within sectoral and regional chapters instead of standalone synthesis chapters. 	<ul style="list-style-type: none"> ▪ Retain flexibility to incorporate emerging issues. ▪ Use a modular outline with core sections and adaptable sub-sections. ▪ Adopt a dynamic structure to address evolving policy demands during the assessment cycle. ▪ Standardize chapter structure to cover observed impacts, projected risks, adaptation, and climate-resilient development.

E.7 Considerations for the AR7 WGII report structure

In AR6 and earlier cycles, various narrative structures have been used for the WG2 contribution to the AR. The scoping process for AR7 needs to reconcile the diversity of themes and perspectives while embracing the principles of comprehensiveness, integration, inclusivity and policy relevance. In particular, a report structure that meets stakeholder requests to be concise, easy to navigate by different stakeholder groups, and has a clear and understandable language and visual identity is desired. This requires innovative ways to represent sectors or systems and presenting regional, physical and social-cultural diversity in the available information, such as the use of digital interactive products such as an interactive Atlas or a case study repository. Finally, giving emphasis to integrated and context-specific policy support in AR7 may have implications for the report structure, and this should form part of the considerations at the scoping.

PART F: PERSPECTIVE FROM WORKING GROUP III

F.1 Introduction

This section describes the WGIII Bureau's vision for WGIII's contribution to the 7th Assessment Report. **Section F.2** contains a retrospective of WGIII's contribution to the 6th Assessment Report, including an analysis of the structure, main messages, advances, knowledge gaps, and criticisms. **Section F.3** summarises pre-scoping activities that WGIII hosted and participated in during the leadup to the December scoping meeting. **Section F.4** summarises considerations for the aims and structure of WGIII's contribution to the 7th Assessment Report.

F.2 Reflections on AR6

F.2.1 Structure of AR6

WGIII's AR6 Report contained a Summary for Policymakers (SPM), a Technical Summary, 17 chapters, and six Annexes. The Report's 17 Chapters fall under five parts. Chapter 1 covered the Introduction and Framing. Chapters 2–4 covered Emissions Trends, Drivers, and future Pathways. Chapters 5–12 covered Sectors and Systems. Chapters 13–16 covered Policy, Governance, Finance, and Technological Drivers. Finally, Chapter 17 covered Mitigation in the Context of Sustainable Development.

The SPM discussed mitigation in five parts that overlap with – but are distinct from – the five parts of the Report's 17 Chapters. Section A of the SPM covered Introduction and Framing. Section B covered Recent Developments and Current Trends. Section C covered System Transformations to Limit Global Warming. Section D covered Linkages between Mitigation, Adaptation, and Sustainable Development. Finally, Section E was titled Strengthening the Response.

We link the content of the Report's 17 Chapters and the SPM to analyse the proportion that each dedicated to main themes by total page number (Table F.1). The Chapters and the SPM dedicated approximately equal proportions to introducing and framing climate change mitigation, discussing greenhouse gas emissions trends, discussing sectors and systems, and discussing sustainable development. Discussions of policy response were of proportionally greater length in the Chapters (24% of page length) than in the SPM (11% of page length).

Table F.1: Percentage of Pages Covering Five Mitigation Themes

Chapters	Introduction & Framing	Emissions Trends, Drivers, & Pathways	Sectors & Systems	Policy, Governance, Finance, and Technological Drivers	Accelerating Mitigation Transition in the Context of Sust. Dev.
	Chapter 1	Chapters 2-4	Chapter 5-12	Chapters 13-16	Chapter 17
	4%	11%	57%	24%	4%
SPM	Introduction & Framing	Recent Developments and Current Trends	System Transformations to Limit Global Warming	Strengthening the Response	Linkages between Mitigation, Adaptation, and Sus. Dev.
	Section A	Section B	Section C	Section E	Section D
	4%	24%	51%	11%	9%

Note: values have been rounded and may not sum to 100%.

F.2.2 Main Messages

In the interest of space, we do not attempt to summarize the entire WGIII contribution to the 6th Assessment Report, but rather present some of the main findings from the SPM.

- Global net anthropogenic emissions have continued to rise across all major groups of greenhouse gases.
- Emissions have grown in most regions but are distributed unevenly, both in the present day

- and cumulatively since 1850.
- The unit costs of some forms of renewable energy and of batteries for passenger EVs have fallen, and their use continues to rise.
 - Projected global GHG emissions from National Determined Contributions announced prior to COP26 would make it likely that warming will exceed 1.5°C and also make it harder after 2030 to limit warming to below 2°C.
 - Modelled mitigation pathways that limit warming to 1.5°C, and 2°C, involve deep, rapid and sustained emissions reductions.
 - Demand-side mitigation can be achieved through changes in socio-cultural factors, infrastructure design and use, and end-use technology adoption by 2050.
 - Many options available now in all sectors are estimated to offer substantial potential to reduce net emissions by 2030. Relative potentials and costs will vary across countries and in the longer term compared to 2030.
 - Mitigation options have synergies with many Sustainable Development Goals, but some options can also have trade-offs. The synergies and trade-offs vary, dependent on context and scale.

F.2.3 Advances

The AR6 Working Group III report reflects several advances since AR5.

- *An evolving international landscape.* This includes outcomes of the UN Framework Convention on Climate Change (UNFCCC) process, such as the adoption of the Paris Agreement; the UN 2030 Agenda for Sustainable Development including the Sustainable Development Goals (SDGs); and the evolving roles of international cooperation, finance, and innovation.
- *Increasing diversity of actors and approaches to mitigation.* The report highlighted the growing role of non-state and sub-national actors including cities, businesses, Indigenous Peoples, citizens including local communities and youth, transnational initiatives, and public-private entities in the global effort to address climate change.
- *Close linkages between climate change mitigation, adaptation and development pathways.* The report discussed the relationship between development pathways taken by countries at all stages of economic development, their impact on GHG emissions, and how they shape mitigation and adaptation challenges and opportunities, which vary across countries and regions. The report underscored that climate change mitigation action designed and conducted in the context of sustainable development, equity, and poverty eradication will be more acceptable, durable, and effective.
- *New approaches in the assessment.* The report included for the first time in a for WGIII, dedicated chapters on demand-side mitigation measures, including a consideration of decent living standards and well-being, and innovation, technology development and transfer. Moreover, the assessment of future pathways in the report covered multiple time scales, including near term (to 2030), medium term (up to 2050), and long term (to 2100) time scales.
- *Increasing diversity of analytic frameworks from multiple disciplines including social sciences.* The report identified multiple analytic frameworks to assess the drivers of, barriers to, and options for, mitigation action, such economic efficiency, including the benefits of avoided impacts; ethics and equity; interlinked technological and social transition processes; and socio-political frameworks, including institutions and governance.

F.2.4 Knowledge Gaps

Most of the chapters in the AR6 Working Group III report have dedicated sections on knowledge gaps. Here we highlight some of these considerations, but we do not intend to take a position, nor

prioritize them for AR7.

- *Current GHG Emissions and Trends.* GHG emissions data quality and reporting frequency remain issues, particularly in the Global South. One key gap is an understanding of how socio-economic drivers modulate emission mitigation and to what extent they can be limited by demand management, alternative economic models, and rapid technological change. There is high uncertainty in contemporary sources and sinks within AFOLU. Though there has been a rapid rise in the quantification and analysis of urban emissions, gaps remain in comprehensive global coverage, particularly in the Global South. Future CO₂ emissions from existing and planned infrastructure is not well understood and quantified outside of the power sector.
- *Equity and Well-Being.* Human welfare-focused development (e.g., reducing inequality) has been identified as a research priority. Mitigation measures have often been supply-side oriented and evaluated against GDP, but a better metric is needed to measure actual human well-being and evaluate policies in relation to decent living standards. While the technology aspects of accelerated mitigation pathways at the national level are generally well documented, there is a lack of studies on the economic and social implications of such pathways. The role of social and equity issues in mitigating emissions needs further research.
- *Feasibility.* While the political, economic, social, and technical feasibility of some technologies, such as solar energy, wind energy and electricity storage technologies, have improved dramatically in the last several years, there is uncertainty about the feasibility of other mitigation options across a number of dimensions (geophysical, environmental-ecological, technological, economic, socio-cultural, institutional), such as AFOLU measures and carbon dioxide removal methods. Further research is needed on how to move beyond option-level feasibility assessments, robustly including differentiation across countries, or transition speed and scale.
- *Mitigation Costs and Potentials.* Estimates of long-run mitigation costs in energy systems are highly uncertain and depend on various factors, such as technological development and international cooperation. There are knowledge gaps on the potential scale and costs of mitigation in several sectors and systems, for example, deep decarbonization in industry, options in the buildings sector in the developing world, or the role of nature-based solutions in urban areas, especially for cities that have yet to be built. There have been calls for greater regional specificity on mitigation options and enabling conditions. In AFOLU, there is a need to improve mitigation potential estimates, and incorporate the impacts of future climate change, biodiversity loss, and corresponding feedbacks. The integrated assessment models used to project long-term emissions pathways do not include all mitigation options available in the literature (e.g. demand-side and land-based mitigation options, carbon dioxide removal options), and on the economics side, only a subset of the models provide full economic implications beyond marginal costs (i.e., carbon price).
- *Policy Effectiveness.* More *ex-post* analysis is needed on the effectiveness of climate policies and their outcomes, focusing on national and local contexts, trade-offs, institutional needs, approaches for emissions sources that are unregulated or under-regulated, and the implications of carbon leakage across countries. The empirical evidence of emission impacts from climate policies, including carbon pricing, has not been sufficient for unambiguous attribution assessment. The relative roles of near-term mitigation policies and long-term investments have not been adequately explored. There is still a limited understanding of the effectiveness of international agreements and institutions.
- *Technology and Innovation.* Despite evidence of technological progress across a variety of mitigation areas, knowledge gaps remain on the role of innovation and factors that affect the speed of transitions. There is an under-representation of the Global South in studies on innovation and technology development and transfer.

F.2.5 Published Criticisms of AR6

In this section, we summarise criticisms of AR6, as reported in literature published since the completion of AR6. This section is not intended to be a comprehensive summary of criticisms, nor are we implying any position or priority. These criticisms are included for awareness, and we will continue to track literature of this nature in the future. There have been ongoing criticisms that Working Group III reports, including AR6, have not been successful in being policy-relevant and helping policymakers design climate policy frameworks, due to a narrow focus on certain climate policies (e.g. economic instruments), inadequate models, lack of assessment of a range of policy metrics, inattention to human behaviour, and lack of analysis of past policy successes. Some have pointed out the lack of economic considerations, in part due to limited representation of economists.

Global emissions scenarios have garnered much criticism during the AR6 cycle. These include: reliance on a AR6 WGIII scenarios database where the majority of scenarios were developed by only a few institutions, the treatment of the database ('ensemble of opportunity') as a random statistical sample, domination by one (of five) socio-economic pathways (SSP2) in the scientific literature, limited consideration of equity, and a high burden of land-based mitigation.

Compared with previous IPCC cycles, AR6 included more references related to Indigenous Peoples and their knowledge systems. However, there have been some critiques of the Working Groups, including Working Group III, related to treatment of Indigenous Peoples as a homogenous group, overemphasis given to forest-dwelling Indigenous communities, lack of consistent recognition of Indigenous Peoples' rights (e.g. land tenure), conflation of local knowledge and Indigenous Knowledge, and sidelining of Indigenous knowledge systems, among others.

F.3 Summary of WGIII AR7 Pre-Scoping Activities

F.3.1 Pre-Scoping Webinars

IPCC focal points and experts who were nominated for, but not selected to participate in, the December scoping meeting were instead invited to participate in one of three pre-scoping webinars that the IPCC Bureau hosted on October 30th, 2024. The Secretariat invited the experts when it issued the regrets memo on October 10th and issued a separate invitation to the focal points and alternate focal points on October 15th. Over 670 participants from 109 countries registered to attend the webinars. WGIII BOGs were attended by 70 participants representing 34 countries. The self-reported gender ratio was 41:23 male:female.

Each webinar lasted 1.5 hours with the following format:

Cross-Working Group Introduction

- Welcome
- Overview of IPCC – Recorded Video Remarks by IPCC Chair Jim Skea
- Overview of Scoping Meeting Process – Working Group Co-Chairs
- Slido Poll – “Key Cross-Working Group Themes for AR7”

Working Group-Specific Breakout Groups

- Specialised Slido Polls
- Working Group-Specific Discussion and Q&A Session

Cross-Working Group Conclusion

- Highlights from Breakout Groups
- Opportunities to Continue to Engage with AR7

In working group-specific breakout groups, Co-Chairs presented Slido polls that enabled

participants to respond to questions in real time. Working Group III asked participants in its breakout groups five questions related to demographics, proposed report structure, and proposed report content. Figure F.1 illustrates a Word Cloud of responses to the question: “What are important WGIII themes to be covered in the Seventh Assessment Report?”



Figure F.1 — Word Cloud representing 70 responses to the Slido Poll: “What are important WGIII themes to be covered in the Seventh Assessment Report?”

During additional discussion, some participants mentioned organising the report around sector-specific challenges, including a review of various emerging mitigation technologies, and emphasising equity and justice. These participants believed guiding themes would help make the report content relevant to policymakers.

In a separate Slido poll, the WGIII Co-Chairs asked participants: “How should the AR7 WGIII Assessment Report be structured?” Figure F.2 illustrates the number of responses that suggested a specific structure.

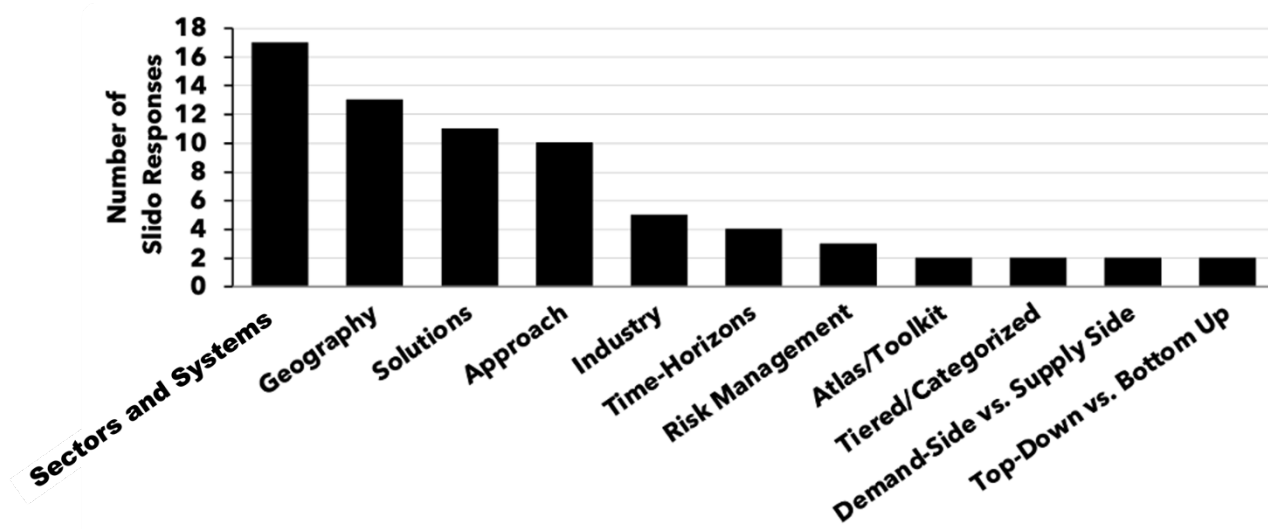


Figure F.2 — 71 responses to the Slido Poll: “How should the AR7 WGIII Assessment Report be structured?” Open-text responses were binned into 11 proposed structures.

The WGIII Co-Chairs and WGIII Vice-Chairs invited BOG participants to discuss the proposed report structures. We summarise their recommendations below:

- **Sectors and Systems:** Emphasise how different sectors and systems link to global solutions and include specific recommendations tailored to various groups based on

geography and development status. Also include content on how sectors influence each other.

- **Geography:** Structure content based on global, regional, national, and local mitigation trends and options.
- **Solutions:** Structure the report around actionable solutions, allowing users to identify problems and corresponding strategies.
- **Approach:** Suggest organising chapters around technology, nature-based solutions, and lifestyle approaches, each focusing on actionable steps.
- **Industry:** Organise the report around different industries.
- **Time-Horizons:** Organise content by time frames (short-term, medium-term, and long-term mitigation options). Participants acknowledged it may be hard to come to consensus on what these time horizons are.
- **Risk Management:** Frame the report around climate change as a risk management issue. The structure could be organised around different risks and options to mitigate or minimise these risks.
- **Atlas/Toolkit:** The atlas framework and toolbox from WGI's contribution to AR6 were effective, and WGIII could consider utilising a similar approach in AR7.
- **Tiered/Categorised:** Structure the report into different tiers/categories: sectors and systems; cross-cutting issues; and major mitigation technologies/options.
- **Demand-Side vs. Supply Side:** Use the report framework to discuss both demand-side and supply-side policy options and highlight the importance of incorporating both perspectives into policy frameworks.
- **Top-Down vs. Bottom Up:** Organise mitigation pathways into two categories: bottom-up vs. top-down. The top-down approach is focused on global distribution of emission cuts and international cost-effectiveness. The bottom-up approach is based on national efforts.

In addition, participants recommended including the following specific chapters in the WGIII AR7 report:

- **Health Focus:** Consider a dedicated chapter on health, linking it to climate pathways due to its growing significance.
- **Integration of Social Action:** Propose a concluding chapter connecting mitigation strategies to social actions and human needs (food, shelter, health) with a focus on governance.
- **Social Capital:** Address the role of social capital in supporting mitigation efforts.
- **Investment and Research Needs:** Identify areas for investment and further research across short, medium, and long-term timelines.
- **Carbon Capture, Utilisation, and Storage:** Discuss carbon capture, utilisation, and storage (CCUS) as well as the implications of public funding in carbon dioxide removal.

F.3.2 AR6 Coordinating Lead Authors Consultations

Working Group III hosted two consultations with 12 coordinating lead authors (CLAs) of WGIII's contribution to the 6th Assessment Report. One additional CLA submitted written feedback to the Co-Chairs.

At these consultations, the WGIII Co-Chairs asked the former CLAs four questions:

1. Based on your experiences within your chapter in AR6, do you have any feedback on the chapter structure and content (e.g., things that helped or hindered the assessment within your chapter)?
2. Do you have any feedback on chapter structure and content as it relates to cross-chapter coordination or cross-working group coordination?
3. If you were at the scoping meeting, do you have any suggestions for what to do at scoping?

(or what not to do)?

4. What were the major guiding questions in your chapter?

On structure and content (Question 1), some AR6 CLAs recommended emphasising using chronological narratives, discussing regional considerations, focusing more on equity and distributional effects, and using case studies to enhance the policy impact of the report content. On cross-chapter and cross-working group coordination (Question 2), some former CLAs emphasised the need for coordination on metrics for wellbeing, better collaboration between modelling scenario chapters and sector chapters, earlier scenario translation across working groups, and more time for integration of cross-chapter content and coordination with other CLAs. In terms of the scoping process (Question 3), many former CLAs recommended striving for flexibility in the proposed outlines, adhering to a “bottom up” process for outline development, including a consideration of what policymakers would need in 2030, and aiming for fewer chapters. The discussion on guiding questions (Question 4) highlighted that not all chapters had an overarching guiding question and that this may be something to consider at the scoping meeting.

F.3.3 COP29 Events

COP29 in Baku included four side events related to WGIII in AR7. The first event, organised by the Chair, focused on regionalization and granularity of information across the three Working Groups. WGIII Co-Chair Kate Calvin presented on WGIII’s approach to regionalization in AR6. During the audience Q&A, participants asked about dynamics of regions (i.e., where regions may change over time) and on combining qualitative and quantitative information.

At the second event, *Plans for the IPCC seventh cycle: a Consultative Workshop*,³² WGIII Co-Chair Kate Calvin presented on WGIII’s contribution to AR6, highlighting relevant messages from the Summary for Policymakers and advances and knowledge gaps in AR6. She also briefly summarised past assessment report structures before describing the aims of WGIII in AR7 (see below). During the audience Q&A session, some participants suggested that in AR7, WGIII could: highlight regional issues, including disparities and similarities between regions; structure the report around a problem-solution-strategy framework; and strive for policy relevance by evaluating past and potential policy interventions.

At the third event, *Plans and prospects for IPCC’s seventh assessment cycle: The science and how we deliver it*,³³ WGIII Co-Chair Kate Calvin presented on knowledge gaps identified in AR6 (see above). During the audience Q&A, questions focused on integrating knowledge sources and communication of results.

The fourth event, *Towards a Robust Economic and Policy Assessment for Working Group III: Ways to Improve in AR7*,³⁴ was moderated by WGIII Co-Chair Kate Calvin and featured a panel discussion with AR6 WGIII authors, Bureau members, and government delegates. The panel explored enhancing policy and economic assessment in AR7, as well as social science engagement in a broader sense. Some panellists mentioned the need for: increasing the use of *ex post* evaluation of policies, tailoring information to what policymakers will need this decade for actionable solutions without being policy prescriptive, broadening economic methodologies (e.g., exploring distributional effects), and making better use of qualitative information. During the audience Q&A, participants inquired about engaging diverse communities of practice, incorporating new data and knowledge in the coming years, integrating a wide variety of knowledge sources (including different methodologies, different disciplines, different schools of thought) into WGIII analyses, and linking the conversations on climate and sustainable development.

³² Available online at: <https://apps.ipcc.ch/outreach/programme.php?q=144&e=10>

³³ Available online at: <https://apps.ipcc.ch/outreach/programme.php?q=146&e=10>

³⁴ Available online at: <https://apps.ipcc.ch/outreach/programme.php?q=154&e=10>

F.4 Elements for the WGIII AR7 report

F.4.1. Aims of the WGIII Contribution

We have identified three high-level aims for the WGIII contribution in AR7:

- Enhanced inclusivity: In the AR7 cycle, the Bureau is committed to increasing inclusivity among authors, experts and literatures, including both ensuring diversity in participation and ensuring the voices of all participants are heard.
- More integration: The AR6 WGIII report has several examples of methodology-specific findings, where the assessment was derived from a single discipline or approach. For AR7, we aim to have more integration of methodologies to provide a comprehensive assessment of each individual topic/question. In particular, this would include greater attention to equity, more integration of social sciences and humanities, and more synthesis of global findings with national, local, sectoral, and systems perspectives.
- Heightened focus on assessment: The IPCC mandate is to assess the scientific and technical literature related to climate change in a policy relevant, but policy neutral manner. While some aspects of a policy-relevant assessment are a function of writing style and not report structure, it is worth considering the implications of structure on the ability to provide a policy-relevant assessment as the outline is being scoped.

F.4.2. Considerations for report structure

For AR7, the report structure will be determined by the scoping meeting participants and there are many possible ways of organising the WGIII content. Previous WGIII reports have varied in their organising principle, the number of chapters, and the order of chapters:

- TAR (10 chapters): Introduction (1 chapter); Emissions pathways (1 chapter); Mitigation options and potential (3 chapters); Institutional drivers (1 chapter); Economics (3 chapters); Decision-making frameworks (1 chapter)
- AR4 (13 chapters): Introduction (2 chapters); Emissions pathways (1 chapter); Sectors (8 chapters); Sustainable development (1 chapter); Institutional drivers (1 chapter)
- AR5 (16 chapters): Introduction (1 chapter); Framing (3 chapters); Emissions trends, drivers and pathways (2 chapters); Sectors (6 chapters); Institutions, policy and cross-cutting (4 chapters)
- AR6 (17 chapters): Introduction (1 chapter); Emissions trends, drivers and pathways (3 chapters); Sectors and Systems (8 chapters); Institutional drivers (2 chapters); Financial and technological drivers (2 chapters); Sustainable Development (1 chapter)

In addition, the WGIII SPMs have at times used a different structure/organisation than the longer reports. For example, the AR6 SPM was organised around: recent developments and trends; systems transitions; linkages between mitigation, adaptation, and sustainable development; and strengthening the response.

The above structures are only provided as examples to help with brainstorming. There are a few considerations when choosing a structure:

- Content that is found in different chapters can still be assessed together through cross-chapter boxes, the Technical Summary, and the SPM. However, the primary integration and assessment occurs within chapters, though cross-cutting topics can be covered within a chapter.
- Organising a chapter around a particular topic makes it more easily findable. A reader focused on a particular topic will have an easier time finding information if it is located in a single place and identified in the title of a chapter than if that topic is spread throughout the report.
- Having a chapter on a particular topic can give that topic emphasis. However, many

readers will only look at the SPM, which can have a different structure than the longer report and that structure will not be determined until much later in the writing process (and not independently from government review of early SPM drafts).

ANNEX II — Synthesis Report stream participants

Last name	First name	Gender	Citizenship	Country	Affiliation	Nominator Employer
ALDUNCE	Paulina	F	Chile	Chile	University of Chile, Centre for Climate and Resilience Research	Ministry of Environment
BOSETTI	Valentina	F	Italy	Italy	Bocconi University and EuroMediterranean Center on Climate Change	CMCC - Centro Euro-Mediterraneo per i Cambiamenti Climatici Istituto Nazionale di Geofisica e Vulcanologia (INGV)
BRACONNOT	Pascale	F	France	France	Laboratoire des sciences du climat et de l'environnement - Institut Pierre Simon Laplace	Ministère de la Transition Énergétique
CANADELL	Josep (Pep)	M	Australia	Australia	Commonwealth Scientific and Industrial Research Organization (CSIRO)	Department of Climate Change, Energy, the Environment and Water
CHANG'A	Ladislaus	M	Tanzania	Tanzania	IPCC Vice-Chair	
COHEN	Brett	M	South Africa	South Africa	University of Cape Town	Senior Policy Adviser International Climate Change Cooperation Department of Environmental Affairs
DIEDHIU	Arona	M	Senegal	Côte d'Ivoire	IRD-University Felix Houphouet Boigny	Agence Nationale de l'Aviation civile et de la Météorologie
FRIEDLINGSTEIN	Pierre	M	UK	UK	University of Exeter, Faculty of Environment, Science and Economy	Department for Energy Security and Net Zero
GARSCHAGEN	Matthias	M	Germany	Germany	LMU Munich	Federal Foreign Office, Division 409
GIDDEN	Matthew	M	United States of America	Austria	International Institute of Applied Systems Analysis	U.S. Department of State
JUPESTA	Joni	M	Indonesia	Indonesia	IPB University	Ministry of Environment and Forestry Indonesia
LEE	June-Yi	F	Republic of Korea	Republic of Korea	Research Center for Climate Sciences, Pusan National University and Institute for Basic Science Center for Climate Physics	World Climate Research Programme (WCRP)
LI	Mojie	M	China	China	Chinese Academy of Fiscal Sciences	China Meteorological Administration
LIWENGA	Emma	F	United Republic of Tanzania	United Republic of Tanzania	Vice President's Office	Tanzania Meteorological Authority (TMA)
LWASA	Shuaib	F	Uganda	Netherlands	International Institute of Social Studies of Erasmus University	Indian Institute for Human Settlements (IIHS)
MÖHNER	Annett	F	Germany	Germany	UNFCCC	
MUKHERJI	Aditi	F	India	Kenya	CGIAR	CGIAR System Organization

Last name	First name	Gender	Citizenship	Country	Affiliation	Nominator Employer
PATHAK	Minal	F	India	India	Ahmedabad University	Indian Institute for Human Settlements (IIHS)
PICHS MADRUGA	Ramon	M	Cuba	Cuba	IPCC Vice-Chair	
ROBERTSON	Michai	M	Antigua and Barbuda	UK	ODI	Overseas Development Institute (ODI) (UK)
SKEA	Jim	M	UK	UK	IPCC Chair	
SOKONA	Youba	M	Mali	Mali	Académie des Sciences du Mali	Agence Nationale de la Météorologie (MALI-METEO)
SÖRENSSON	Anna Amelia	F	Argentina	Argentina	Centro de Investigación del Mar y la Atmósfera	Directorate of Environmental Affairs of the Ministry of Foreign Affairs
SUGIYAMA	Masahiro	M	Japan	Japan	University of Tokyo, Institute for Future Initiatives	Climate Change Division, Ministry of Foreign Affairs
ÜRGE VORSATZ	Diana	F	Hungary	Hungary	IPCC Vice-Chair	
WEBER	Elke	F	United States of America	United States of America	Princeton University	U.S. Department of State
WREFORD	Anita	F	New Zealand	New Zealand	Lincoln University	Ministry for the Environment

ANNEX III — AR7 Scoping Meeting overall program

Day 0: Sunday, 8 December 2024

14:00-17:00 AR7 Scoping Meeting Registration (*Pre-function area, 10th floor*)

Day 1: Monday, 9 December 2024

08:00 AR7 Scoping Meeting Registration (*Pre-function area, 10th floor*)

OPEN SESSION (*Ballroom A*) | Moderator: Abdalah Mokssit

09:00 Opening Remarks

- Welcoming Remarks, Abdalah Mokssit, IPCC Secretary
- Introductory Remarks, Jim Skea, Chair of IPCC
- Introductory Remarks, Ko Barrett, Deputy Secretary-General of the World Meteorological Organization (WMO)
- Introductory Remarks, Jian Liu, Director of the Early Warning and Assessment Division, United Nations Environment Programme (UNEP)
- Officiating Remarks, Dr. Hartini binti Mohd Nasir, Undersecretary, Ministry of Natural Resources and Environmental Sustainability, Malaysia

CLOSED SESSION (*Ballroom A*) | Moderators: Diana Üрге-Vorsatz & Ladislaus Chang'a

09:30 Seventh Assessment Report Vision

- IPCC Code of Conduct, Ermira Fida, Deputy Secretary of IPCC
- Chair's Vision / Synthesis Report, Jim Skea
- Cross-Working Group Introduction, Working Group Co-Chairs

10:30 Break

FULL PLENARY SESSION (*Ballroom A*) | Moderators: Diana Üрге-Vorsatz & Ladislaus Chang'a

11:00 Working Group (WG) Introductions and Cross-Cutting Themes

- WGI, Robert Vautard & Xiaoye Zhang
- WGII, Bart van den Hurk & Winston Chow
- WGIII, Kate Calvin & Joy Jacqueline Pereira
- Cross-Cutting Themes, WG Co-Chairs
- Q&A

Meeting Logistics, David Dokken

12:45 Group Photo (*Ballroom A*)

13:00 Lunch (*Makan Kitchen, 11th floor*)

WORKING GROUP (WG) PLENARIES / BREAKOUT GROUPS (BOGs)**14:30** WG Plenaries / BOGs**16:30** Break**17:00** WG Plenaries / BOGs (cont.)**18:30** Welcome Reception**20:30** Evening Sessions (WG Bureau Meetings, etc.)**DAY 2: Tuesday, 10 December 2024****CROSS-WORKING GROUP (xWG) BREAKOUT GROUP (BOG) SESSION 1**

- 09:00** xWG BOG1.1: Equity and Justice [Co-Facilitators: Fatima Denton (WGII) & Eduardo Calvo Buendia (WGIII)] (*Pine*)
- xWG BOG1.2: Finance [Co-Facilitators: Carlos Mendez (WGII) & Gervais Itsoua Madzous (WGIII)] (*Willow*)
- xWG BOG1.3: Health and Well-Being [Co-Facilitators: Sherilee Harper (WGI) & Ramón Pichs-Madruga (IPCC Vice Chair)] (*Lotus*)
- xWG BOG1.4: Losses and Damages [Co-Facilitators: Aïda Diongue-Niang (WGI) & Adelle Thomas (WGII)] (*Ixora*)
- xWG BOG1.5: Overshoot [Co-Facilitators: Sonia Seneviratne (WGI) & Oliver Geden (WGIII)] (*Maple*)
- xWG BOG1.6: Risk Assessment Approaches and Regionalization [Co-Facilitators: Edvin Aldrian (WGI) & Zinta Zommers (WGII)] (*Ballroom A*)
- xWG BOG1.7: Scenarios [Co-Facilitators: Maheshwar Rupakheti (WGI), Raman Sukumar (WGII), & Jan Fuglestedt (WGIII)] (*Ballroom B*)
- xWG BOG1.8: Sectors and Systems [Co-Facilitators: Laura Gallardo (WGII) & Siir Kilkis (WGIII)] (*Hibiscus*)
- xWG BOG1.9: Solar Radiation Modification [Co-Facilitators: Ines Camilloni (WGI) & Malak AlNory (WGIII)] (*Mahogany*)
- WG BOG1.10:** Technical Guidelines on Impacts & Adaptation [Facilitator: Mark Howden (WGII)] (*Peony*)

10:30 Break**11:00** xWG BOGs (cont.)**FULL PLENARY SESSION (*Ballroom A*) | Moderators: Diana Ürge-Vorsatz & Ramón Pichs-Madruga****12:00** Report Back from xWG BOGs

13:00	Cross-Working Group Co-Chair Meeting (<i>Makan Kitchen, 11th floor</i>)
13:00	Lunch (<i>Makan Kitchen, 11th floor</i>)
WORKING GROUP (WG) MEETINGS / SYNTHESIS REPORT (SYR) MEETING	
14:30	WG Plenaries / BOGs SYR Meeting
16:30	Break
17:00	WG Plenaries / BOGs (cont.) SYR (cont.)
18:30	Evening High Tea
20:00	Evening Sessions (WG Bureau Meetings, etc.)

DAY 3: Wednesday, 11 December 2024

WORKING GROUP (WG) MEETINGS	
09:00	WG Plenaries / BOGs
10:30	Break
11:00	WG Plenaries / BOGs (cont.)
CROSS-WORKING GROUP (xWG) BREAKOUT GROUP (BOG) SESSION 2	
12:00	xWG BOG2.1: Biodiversity [Co-Facilitators: Edvin Aldrian (WGI) & Zinta Zommers (WGII)] (<i>Lotus</i>) xWG BOG2.2: Finance [Co-Facilitators: Carlos Mendez (WGII) & Gervais Itsoua Madzous (WGIII)] (<i>Willow</i>) xWG BOG2.3: Health and Well-Being & Sectors and Systems [Co-Facilitators: Sherilee Harper (WGI), Laura Gallardo (WGII), & Siir Kilkis (WGIII)] (<i>Hibiscus</i>) xWG BOG2.4: Losses and Damages [Co-Facilitators: Aïda Diongue-Niang (WGI) & Adelle Thomas (WGII)] (<i>Ixora</i>) xWG BOG2.5: Overshoot [Co-Facilitators: Sonia Seneviratne (WGI) & Oliver Geden (WGIII)] (<i>Maple</i>) xWG BOG2.6: Societal Development, including CRD [Facilitator: Fatima Denton (WGII)] (<i>Ballroom A</i>) xWG BOG2.7: Scenarios [Co-Facilitators: Maheshwar Rupakheti (WGI), Raman Sukumar (WGII), & Jan Fuglestedt (WGIII)] (<i>Ballroom B</i>) xWG BOG2.8: Tipping Points / Large Singular Events [Co-Facilitator: Mark Howden (WGII)] (<i>Pine</i>) xWG BOG2.9: Solar Radiation Modification [Co-Facilitators: Ines Camilloni (WGI) & Malak

AINory (WGIII)] (*Mahogany*)
13:00 Informal Bureau Meeting (tbc) (*Pine*)
13:00 Lunch (*Makan Kitchen, 11th floor*)
14:30 xWG BOGs (cont.)
FULL PLENARY SESSION (*Ballroom A*) | Moderators: Ramón Pichs-Madruga & Ladislaus Chang'a
15:30 Report Back from xWG BOGs
16:30 Break
WORKING GROUP (WG) MEETINGS
17:00 WG Plenaries / BOGs
18:30 Evening High Tea
20:00 Evening Sessions (WG Bureau Meetings, etc.)

DAY 4: Thursday, 12 December 2024
WORKING GROUP (WG) MEETINGS / SYNTHESIS REPORT MEETING
**09:00 WG Plenaries / BOGs
SYR Meeting**
10:30 Break
**11:00 WG Plenaries / BOGs (cont.)
SYR Meeting (cont.)**
13:00 (Optional) Discussion on Inclusivity (IPCC Vice Chairs) (*Pine*)
13:00 Lunch (*Makan Kitchen, 11th floor*)
WORKING GROUP (WG) MEETINGS / CROSS-WORKING GROUP (xWG) MEETINGS
14:30 WG Plenaries / BOGs
16:30 Break
17:00 WG Plenaries / BOGs (cont.)
FULL PLENARY SESSION (*Ballroom A*) | Moderators: Diana Üрге-Vorsatz & Ladislaus Chang'a

18:00 Working Group Status

18:30 Evening High Tea

20:00 Evening Sessions (WG Bureau Meetings, etc.)

DAY 5: Friday, 13 December 2024

WORKING GROUP (WG) MEETINGS / SYNTHESIS REPORT MEETING

09:00 WG Plenaries / BOGs

SYR Meeting

10:30 Break

11:00 WG Plenaries / BOGs (cont.)

SYR Meeting (cont.)

13:00 Informal Bureau Meeting (tbc) (*Pine*)

13:00 Lunch (*Makan Kitchen, 11th floor*)

WORKING GROUP (WG) MEETINGS

14:30 WG Plenaries

16:30 Break

CLOSING FULL PLENARY SESSION (*Ballroom A*) | Moderators: Diana Üрге-Vorsatz & Ramón Pichs-Madruga

17:00 Sharing of Agreed Outlines

- WGI
- WGII
- WGIII

Sharing of Outcomes

- SYR

18:30 End of Meeting
