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PROPOSALS FOR EXPERT MEETINGS AND WORKSHOPS FOR THE SEVENTH ASSESSMENT CYCLE

Workshop on New and Extended Methods of Assessment in the AR7 (NEMA)

(Prepared by the IPCC Chair)

(Submitted by the Secretary of the IPCC)

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PROPOSALS FOR EXPERT MEETINGS AND WORKSHOPS FOR THE SEVENTH ASSESSMENT CYCLE

Workshop on New and Extended Methods of Assessment (NEMA) in the AR7

Rule 7.1 on IPCC Workshops and Expert Meetings in the Appendix A to the Principles Governing IPCC Work[1] establishes, *inter alia*, that:

> *« IPCC Workshops and Expert Meetings are those that have been agreed upon in advance by an IPCC Working Group, or by the Panel as useful or necessary for the completion of the work plan of a Working Group, the Task Force on National Greenhouse Gas Inventories or a task of the IPCC. Only such activities may be designated as "IPCC" Workshops or Expert Meetings. Their funding should include full and complete provision for participation of experts from developing countries and countries with economies in transition.*
>
> *An **IPCC Expert Meeting** focuses on a specific topic bringing together a limited number of relevant experts. The relevant Working Group/Task Force Bureaux, or the IPCC Chair, will identify and select participants to Expert Meetings.*
>
> *An **IPCC Workshop** considers cross-cutting or complex topics requiring input from a broad community of experts. It requires nominations by Government Focal Points and, as appropriate, Observer Organisations. The relevant Working Group/Task Force Bureaux, or the IPCC Chair, may also nominate experts and will select the participants to the Workshop.*
>
> *Proposals for IPCC Workshops or Expert Meetings will be submitted to the Panel for its decision through the relevant Working Group/Task Force Bureaux, or the IPCC Chair. The proposals will include descriptions of the topic(s), and clarify the choice for an Expert Meeting or a Workshop.*
>
> *The composition of participants to Expert Meetings and Workshops shall aim to reflect:*
> *- The relevant range of scientific, technical and socio-economic views and expertise,*
> *- Geographical representation as appropriate,*
> *- A mixture of experts with and without previous experience in IPCC,*
> *- Gender balance. »*

The proposal for an IPCC Workshop on New and Extended Methods of Assessment in the AR7, contained in **Annex 1**, has been prepared by the Chair with the support of a drafting group which included representatives of all three Working Groups and external experts. The Workshop is proposed as a three-day event with 80 participants in all (a budget of CHF 160,000 is requested to support 40 participants from developing countries and countries with economies in transition) and tentatively scheduled for October 2025.

The proposed scope of the Workshop is 1) to consider what systems of knowledge — including scientific, Indigenous and local knowledge systems, and *ex-post* policy evaluation evidence — the IPCC can access and assess within the framework of existing principles and procedures; 2) to consider the means by which such knowledge systems can be assessed — such as artificial intelligence techniques, systematic review techniques, and participation of Indigenous knowledge holders; and 3) to consider the extent to which such means of synthesis and assessment may be conducted by the IPCC itself or by the knowledge holders and research communities who generate the literature on which the IPCC relies.

[1] 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/pdf/ipcc-principles/ipcc-principles-appendix-a-final.pdf.

A single Workshop is proposed, rather than an Expert Meeting or separate events, to integrate these topics into a single conversation, with input from a broad community of experts, thereby avoiding the risks of siloing each domain and the risks of separate events resulting in recommendations that pull in different directions. The Workshop will explore how to synthesise and represent knowledge in a way that is inclusive, equitable and aligned with future needs, and will generate recommendations for consideration by the Panel, the Working Group Bureaux and their Technical Support Units, and the author teams, and share these ahead of the first Lead Author Meeting of the AR7.

The Panel is invited to consider this proposal and authorize the use of the above-mentioned budget line for the funding of the Workshop.

PROPOSAL FOR AN IPCC WORKSHOP ON NEW AND EXTENDED METHODS OF ASSESSMENT (NEMA)

(Prepared by the Chair)

Outline of Annex 1

1. Context

A number of developments are posing challenges for the IPCC assessment process. These include:

- the exponential growth of the peer-reviewed scientific literature on which the IPCC has largely relied;
- calls to extend the knowledge base on which the assessments are based to include, for example, Indigenous Knowledge (IK) systems, local knowledge and practitioner knowledge.

The IPCC prioritises peer-reviewed scientific, technical and socio-economic literature if available, but recognises that other sources provide crucial information. However, these bring extra responsibility for the author teams to ensure the quality and validity of cited sources and information.[2]

Both scientists and some IPCC governments have called for an expansion of the knowledge base on which IPCC assessments rest by engaging, partnering and collaborating with IK holders.

The calls have been acknowledged in preparatory materials for the seventh assessment cycle,[3] but the specific means of ethically and meaningfully including diverse knowledge systems which are not in a format traditionally drawn on by the IPCC remain undefined. The IPBES[4] has made some progress in engaging with IK systems. Collaborating, interacting and connecting with these is a distinct though related challenge to that of the representation of Indigenous Peoples in the IPCC,

[2] IPCC, 'Annex 2: Procedure on the Use of Literature in IPCC Reports', in *Appendix A to the Principles Governing IPCC Work: Procedures for the Preparation, Review, Acceptance, Adoption, Approval and Publication of IPCC Reports*, 2013, 29, https://www.ipcc.ch/site/assets/uploads/2018/09/ipcc-principles-appendix-a-final.pdf.

[3] IPCC, 'Strategic Planning Schedule for the Seventh Assessment Cycle: Improving Inclusivity in AR7', *Sixty-First Session of the IPCC* IPCC-LXI/I, no. IPCC-LXI/INF.15 (2024): 2024, https://apps.ipcc.ch/eventmanager/documents/87/180720240325-INF. 15 - Improving inclusivity in AR7.pdf.

[4] IBPES: the UN Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, https://www.ipbes.net/.

which is within the scope of the planned Expert Meeting on Gender, Inclusivity and Diversity.[5]

Members of the Bureau elected for the IPCC seventh assessment cycle have consistently expressed the desire for their assessments to generate findings that can inform practical action, and to engage practitioners more in IPCC activities. One important potential source of evidence comes from *ex-post* evaluations of policy interventions (that is evaluation of policy interventions after they were implemented, or "what works"). However, the evidence available from evaluations has not been sufficiently synthesised by the scientific community, leaving IPCC authors with the impossible task of doing so within the scope of the assessment.[6] The means for accessing evaluation evidence, generally sponsored by governments or government agencies, are largely unexplored.

Various approaches are also available that could help author teams assess the exponentially growing volume of scientific publications relevant to climate change, such as systematic reviews or artificial intelligence (AI).

Systematic review techniques, originating in the field of health, aim to identify, appraise and synthesise evidence from multiple studies to answer a specific research question using explicit, systematic methods aimed at minimizing bias, to produce reliable findings to inform decision-making.[7] This approach has not been widely used by the climate community.[8] Systematic review techniques have been applied occasionally in IPCC assessments at the discretion of individual author teams. However, not all author teams have accepted the approach, citing for example risk bias due to a reliance on subjective decisions about question setting, searching, study selection, analysis and interpretation of findings.[9]

More recently, AI and large language model techniques have started to have widespread consequences for society and employment. AI broadly divides into discriminative and generative types which, respectively, classify and analyse information, but also create new content. The UNEP[10] has already provided guidance to authors on the use of AI techniques for its seventh edition of the Global Environmental Outlook, including an explicit prohibition on the use of generative AI. The impact of AI, both in terms of potential opportunities and also risks, on IPCC assessment processes is yet unexplored. It would be valuable to evaluate whether AI could be integrated into IPCC processes, and if so, under what conditions and with what safeguards.

In-depth descriptions of the above knowledge systems and methods of assessment are provided in Appendix A and Appendix B respectively.

In the context of these multiple challenges, a single Workshop is proposed to draw together the different threads and to explore critical intersections of these topics. Doing so avoids the risks of siloing each domain and the risks of separate events resulting in recommendations that pull in

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[5] IPCC, 'IPCC Trust Fund Programme and Bugdet: Proposed Budget Components of Budget Line "Gender Action Team"', in *Fifty-Fourth (Bis) Session of the IPCC*, IPCC-LIV(bis)/Doc. 2, Rev.1, Add. 1, 2021, https://apps.ipcc.ch/eventmanager/documents/71/101220210326-Doc.%202,%20Rev.1%20-%20Add.%201%20-%20Gender%20Action%20Team.pdf.

[6] Lea Berrang-Ford et al., 'Editorial: Evidence Synthesis for Accelerated Learning on Climate Solutions', Campbell Systematic Reviews 16, no. 4 (December 2020), https://doi.org/10.1002/cl2.1128; Helen Pearson, ''Evidence Bank' Could Help Scientists To Tackle Climate Change', Nature 630, no. June (2024): 540–41, https://www.nature.com/articles/d41586-024-01683-4.

[7] Cochrane Database of Systematic Reviews**,** https://www.cochranelibrary.com/cdsr/about-cdsr

[8] Lea Berrang-Ford et al., 'Systematic Review Approaches for Climate Change Adaptation Research', *Regional Environmental Change* 15, no. 5 (June 2015): 755–69, https://doi.org/10.1007/s10113-014-0708-7; Jan C. Minx et al., 'Learning about Climate Change Solutions in the IPCC and Beyond', *Environmental Science & Policy* 77, no. October 2016 (November 2017): 252–59, https://doi.org/10.1016/j.envsci.2017.05.014.

[9] Lesley Uttley et al., 'The Problems with Systematic Reviews: A Living Systematic Review', *Journal of Clinical Epidemiology* 156 (April 2023): 30–41, https://doi.org/10.1016/j.jclinepi.2023.01.011.

[10] UNEP: UN Environmental Programme, https://www.unep.org/.

different directions. A Workshop, rather than an Expert Meeting or two separate but narrower, Workshops or Expert Meetings, will help to address the complex and cross-cutting nature of the topics and allow input to be drawn from a broad community of experts. As such, the event will require nominations for participants from Governments and Observer Organisations.

The Workshop will enable the IPCC to explore how to synthesise and represent knowledge in a way that is inclusive, equitable and aligned with future needs. The Workshop will generate recommendations for consideration by the Panel, by the Working Group Bureaux and their Technical Support Units, and by author teams.

2. Scope and aims of the Workshop

The **proposed scope** of the Workshop is:

- to consider what systems of knowledge can be accessed and assessed by the IPCC within the framework of existing principles and procedures;
- to consider the means by which such knowledge systems can be assessed; and
- to consider the extent to which such means of synthesis and assessment may be conducted by the IPCC itself or by the knowledge holders and research communities that generate the literature on which the IPCC relies.

This scope is intentionally broad, connecting a set of interrelated topics that depart from mainstream, established thinking and provide new avenues to strengthen further IPCC assessment practices. Systematic reviews and AI provide new means for assessing knowledge systems in times of rapidly expanding (peer-reviewed) publications. While systematic reviews offer a rich methodological toolkit for knowledge synthesis that can complement established procedures such as model-intercomparison exercises, AI introduces technological methodologies that challenge conventional manual synthesis and human-led interpretation promising improvements in scope, scale and pace.

Ex-post evaluation of what works, IK systems and local knowledge represent key knowledge domains that have not received the same level of attention within and outside the IPCC compared to other domains. Unlocking these for the IPCC would contribute further towards more comprehensive and balanced IPCC assessments. While *ex-post* evaluations of what works would complement modelled evidence with empirical, real-world experiences in climate policy, IK and local knowledge offer place-based insights that are crucial to understand and address climate change. Furthermore, IK systems offer relational, value-based, intergenerational understandings that differ fundamentally from the largely western, data-driven paradigms that dominate climate research. Drawing on wider sources of knowledge, such as knowledge systems of Indigenous Peoples and practitioners, would involve expanding the knowledge base and could entail new methods of assessment and levels of complexity.

The proposed integrated approach of the Workshop not only ensures consistency and coherence in recommendations, but also strengthens the IPCC's ability to develop equitable and inclusive methodologies for climate assessments. By considering the interplay between these topics, the IPCC can make meaningful progress in bridging diverse knowledge systems to address global climate challenges effectively.

Key to this process is to ensure that all relevant communities with particular attention to Indigenous Peoples are meaningfully included in defining the scope and governance of the Workshop. Their expertise and perspectives can help to guide discussions around issues like data sovereignty, where control over how knowledge is shared and used remains with Indigenous Peoples.

With these considerations in mind, the **specific aims** of the Workshop are:

- to address how IK systems could be accessed and assessed by the IPCC, in particular considering effective and equitable engagement of IK holders and building on experience built up in other fora as appropriate;
- to address how local knowledge could be assessed by the IPCC, building on experience built up in other fora as appropriate;
- to address how *ex-post* evaluation evidence could be assessed by the IPCC, building on experience built up in other fora as appropriate;
- to make recommendations as to how systematic review methods could be applied within and outside IPCC assessments and how they could contribute to strengthening established assessment practices including uncertainty assessments;
- to make recommendations as to how new and extended methods of assessment could be applied to different types of knowledge system (such as scientific, Indigenous, local, practitioner);
- to make recommendations to the IPCC, the Bureau and authors as to how new and extended methods of assessment might be built into the IPCC programme of work;
- to identify precautionary measures or limitations that might be necessary to ensure adherence to IPCC's principles and procedures for the preparation of reports;
- to make recommendations for scientific communities as to how new and extended methods could be used to develop literature which can more easily be assessed by the IPCC;
- to make recommendations for funding agencies as to how to support the engagement of knowledge holders in the IPCC programme of work.

More information on knowledge systems and methods of assessment discussed above is available in the appendices. Appendix A describes scientific knowledge, local knowledge, IK systems, and *ex-post* evaluation of "what works", while Appendix B covers the use of AI and large language models as well as systematic review techniques. For each, the current state of the art and challenges are presented, alongside approaches adopted in other assessments where applicable. Each section ends with a list of suggested questions for the Scientific Steering Committee to consider for the Workshop.

3. Development of proposal

This proposal has been developed by the drafting group convened by the Chair. This consists of representatives nominated by each of the Working Groups, and domain experts nominated by the Chair.

Members of the drafting group are:

- **Jim Skea (United Kingdom)**, IPCC Chair (Convenor);
- **Simon Anderson (United Kingdom)** and **Karen Wong-Perez (Mexico)** — alternates, International Institute for Environment and Development;
- **Rosario Carmona (Chile)**, Center for Intercultural and Indigenous Research;
- **Sherilee Harper (Canada)**, IPCC WG I Vice-chair;
- **Carlos Méndez (Venezuela)**, IPCC WG II Vice-chair;

- **Jan Minx (Germany)**, Potsdam Institute for Climate Impact Research;
- **Michal Nachmany (United Kingdom)**, Climate Policy Radar / London School of Economics;
- **Michael Westphal (United States of America)**, IPCC WGIII TSU Head of Science.

Countries listed are both countries of citizenship and affiliation.

4. Organisation of the Workshop

4.1. Timing, hosting and format

A Workshop would require nominations for participants from governments and Observer Organisations. Given the ambitious scope of the Workshop, a three-day event is proposed, with 80 participants in all and 40 requiring Trust Fund support.

A Scientific Steering Committee comprising about 15 members would be established to design the Workshop, support its execution, and prepare the Workshop report. The Scientific Steering Committee would also provide guidance to the Chair on the selection of participants. It would include approximately 50% IPCC Bureau members, nominated by the Working Group Co-Chairs, and 50% external domain experts identified by those Scientific Steering Committee members who are members of the IPCC Bureau.

As with the participants themselves, the Scientific Steering Committee would be selected with regard to the relevant range of expertise, geographical representation, and gender.

To maximise the potential impact of the Workshop, it should take place, and a report be prepared, prior to the first Lead Author Meeting of the AR7. The latter is likely to take place in late 2025 and it is desirable that recommendations are available for consideration by that time. Experience has shown that it is more difficult to apply recommendations or procedural changes that are applied retrospectively (e.g. IPCC's Conflict of Interested Policy in the AR5, the use of AI in the UNEP Global Environment Outlook report).

That is why the Workshop is proposed for October 2025. The Chair will explore the option of running the workshop back-to-back with the 63rd Session of the IPCC which will possibly be held in late October 2025.

4.2. Participation

Individuals participating in the Workshop would be selected with regard to:

- the relevant range of scientific, technical and socio-economic views and expertise;
- geographical representation (including regional representation);
- a mixture of experts with and without previous experience of IPCC;
- and gender balance.

Participation would include scientists, practitioners and knowledge holders with the requisite expertise, including:

- IK systems;
- local knowledge;

- techniques for the *ex-post* evaluation of policy interventions relevant to both adaptation and mitigation;
- AI and large language modelling;
- systematic reviews;
- practical experience from both within, and relevant to, the climate domain;
- relevant experience derived from other global environmental assessments; and
- expertise that bridges one or more of the preceding areas.

Nominations would be called from governments, Observer Organisations, and Bureau members. The Chair would formally make the selection, but with advice from the Scientific Steering Committee which would review nominations.

Appendix A — Knowledge systems

Knowledge systems are complex, dynamic social constructs that resist simple categorisation and often have blurred boundaries. Typically categorised into three primary types — Indigenous, local, and scientific — these systems represent interconnected yet distinct approaches to understanding the world, each with unique epistemological foundations. Also included here is the *ex-post* evaluation of what works.

Scientific knowledge is typically characterised by its hypothetico-deductive method.

Indigenous knowledge (IK) systems are fundamentally holistic, deeply rooted in cultural practices, spiritual connections, and multigenerational observations.

Local knowledge systems occupy a more nuanced space, encompassing personal and collective experiences that are shaped by historical and social processes

***Ex-post* evaluations of what works** complement modelled evidence with empirical, real-world experiences in climate policy.

What distinguishes these knowledge systems from one another is their underlying structures and relationships to place and culture. Both IK and local knowledge systems value experiential and oral knowledge, while scientific approaches prioritise reproducible, quantitative evidence. Nevertheless, IK systems also apply scientific methodologies, and scientific knowledge has evolved by borrowing from various knowledge traditions. Recent calls emphasise the importance of recognising diverse knowledge systems and establishing just, equitable collaborations in climate research.

This appendix describes each of the above, including current state of the art, challenges, approaches adopted in other assessment exercises where applicable and ending with a list of suggestions for the Scientific Steering Committee to consider for the Workshop.

A.1. Scientific knowledge

The volume of publications relevant to climate change has been growing exponentially, roughly doubling in volume with each IPCC cycle (Figure A.1).[11] This poses ever increasing challenges for author teams. The various approaches available that could help author teams meet these challenges are addressed in Appendix B.

A.2. Local knowledge

Local knowledge comprises the place-specific wisdom, capabilities and understandings developed by communities within their distinct geographical and cultural contexts. It reflects accumulated experience about local environments, resources, cultural traditions and social relationships. Transmitted across generations, this knowledge shapes how communities make decisions about their territories, particularly regarding land use, environmental stewardship, and collective wellbeing. Unlike IK systems, which typically stem from specific cultures and broader frameworks, local knowledge systems may emerge from diverse communities collaborating on shared challenges.[12]

[11] Helen Pearson, ‘‘Evidence Bank’ Could Help Scientists To Tackle Climate Change’, *Nature* 630, no. June (2024): 540–41, https://www.nature.com/articles/d41586-024-01683-4.

[12] Ben Orlove et al., ‘ICSM CHC White Paper I: Intangible Cultural Heritage, Diverse Knowledge Systems and Climate Change: Contribution of Knowledge Systems Group I to the International Co-Sponsored Meeting on Culture, Heritage and Climate Change’ (Charenton-le-Pont & Paris, France: ICOMOS & ICSM CHC., 2022).

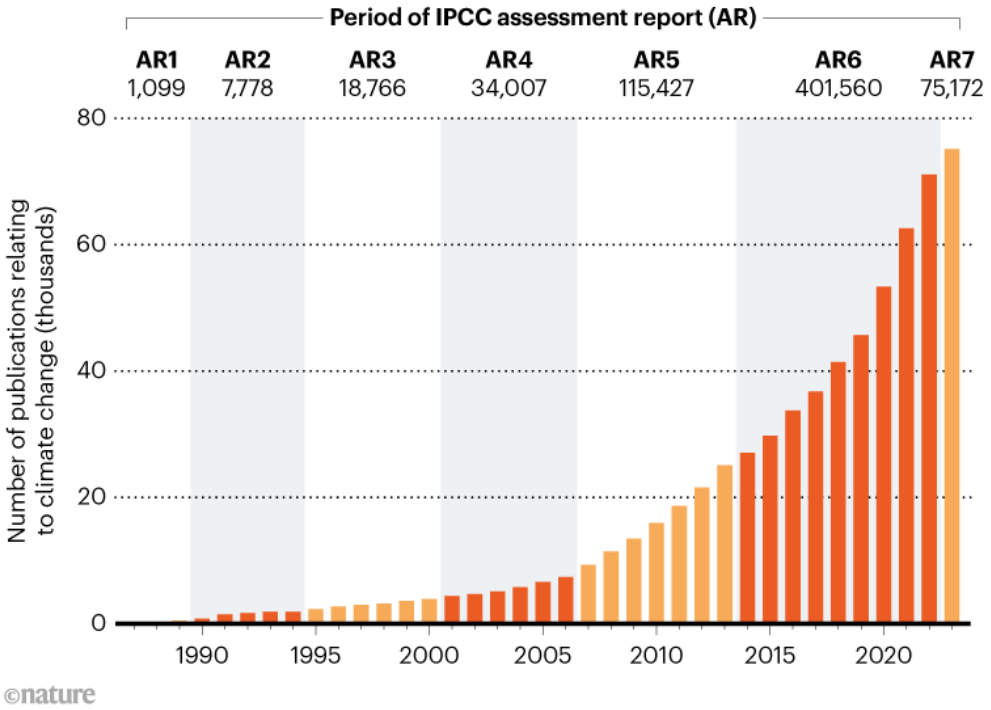

Figure A.1. The annual number of scientific publications related to climate change has soared since the IPCC began assessing the science of global warming for its periodic Assessments Reports (ARs). (Source: see footnote 11.)

Local knowledge systems exhibit considerable diversity, from newly settled migrant communities to populations with long-standing environmental relationships. Its contextual nature makes local knowledge especially valuable for developing sustainable, community-appropriate responses to local environmental challenges.

A.3. Indigenous knowledge systems

State of the art

Due to territorial and cultural diversity, there is no single definition of IK systems. However, these systems share some common elements. The IPCC defines IK as the understandings, skills and philosophies developed by societies with long histories of interaction with their natural surroundings, emerging from direct, long-term experiences and multigenerational observations. IK systems are living, evolving processes passed down through generations. Transmitted through kinship networks, community participation, apprenticeship, and oral traditions, these systems view knowledge as relational, deeply connecting human experiences to territory and ecological systems. Fundamentally, IK remains inseparable from its cultural context, with Indigenous languages and governance systems forming an integral part of its existence.[13]

The international scientific community, including the IPCC, acknowledges Indigenous Peoples' critical contributions to biodiversity conservation, climate change mitigation and adaptation strategies. The IPCC's initial acknowledgment began in the AR4 (2007) and expanded in the AR5 (2014). Significant advancements occurred in the 2018 and 2019 Special Reports that highlighted

[13] Inuit Circumpolar Council, 'Ethical and Equitable Engagement Synthesis Report', 2021, www.inuitcircumpolar.com/project/icc-ethical-and-equitable-engage ment-synthesis-report/.

vulnerability and included Indigenous authors. The SROCC[14] and AR6 (2023) marked a pivotal shift, recognising the impact of colonialism on vulnerability and valuing Indigenous Peoples as partners in climate science, especially in WGII, which emphasises Indigenous contributions to ecological resilience and climate justice.

Despite this progress, challenges remain, notably inconsistent recognition across Working Groups and limited Indigenous participation. Engaging with IK faces significant barriers, including informational, financial, institutional and cultural challenges stemming from a colonial legacy. This often leads to the undervaluing of IK in favour of western perspectives. When approached, IK is frequently misappropriated and oversimplified, overlooking its dynamic and contextual relevance.[15]

Approaches adopted in other assessments

Progressively, UN environmental bodies and assessments have created dedicated mechanisms to engage Indigenous Peoples and local knowledge holders in their processes. Among them, we can highlight **IPBES**[4], which actively involves IK systems through its conceptual framework and dedicated Task Force. Their 2019 Global Assessment[16] incorporated Indigenous perspectives and was endorsed by the UN Permanent Forum on Indigenous Issues.

The seventh edition of the Global Environment Outlook, due in 2026, represents UNEP's innovative approach to Indigenous partnership. Its **Indigenous Knowledge and Local Knowledge Taskforce** ensures Indigenous perspectives are central to the drafting process.

The UNFCCC's **Local Communities and Indigenous Peoples Platform** enhances Indigenous engagement in climate discussions through its **Facilitative Working Group** — the first UN mechanism with equal Indigenous and State representation that allows self-selection. The Facilitative Working Group has established guidelines for ethical engagement of Indigenous knowledge in climate change discussions and created new spaces for Indigenous participation in global climate dialogue.

Despite growing recognition, significant limitations persist. Current initiatives lack concrete commitments and guidance for Indigenous participation, especially during primary stages, resulting in inconsistent implementation. Furthermore, participation frameworks provide no genuine negotiating power, lack binding obligations, and consistently favour paradigms from non-Indigenous science.

At the national level, **For Our Future: Indigenous Resilience Report**, published in 2024 as part of Canada's National Climate Assessment, represents the first Indigenous-led assessment of climate change impacts and adaptation strategies, focusing specifically on the experiences and knowledge of First Nations, Inuit and Métis Peoples. The report draws on the teachings and perceptions of Indigenous elders and knowledge holders, and presents guiding principles shared across various Indigenous cultures, which highlight the importance of engaging with IK in climate strategies.

A white paper from the International Co-Sponsored Meeting on Culture, Heritage, and Climate Change called for equitable collaboration between knowledge systems.[12] This call aligns with those made by Indigenous scholars, who also emphasize that engagement with their knowledge systems

[14] Special Report on the Ocean and Cryosphere in a Changing Climate, 2019, https://www.ipcc.ch/srocc/.

[15] Bianca van Bavel et al., 'Indigenous Knowledge Systems', in *A Critical Assessment of the Intergovernmental Panel on Climate Change*, Mike Hulme, ed. Kari De Pryck, 1st ed. (Cambridge University Press, 2022), 116–25, https://doi.org/10.1017/9781009082099.017.

[16] IPBES, 'Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services' (Zenodo, 4 May 2019), https://doi.org/10.5281/ZENODO.3831673.

requires a rights-based approach[15], including Indigenous data sovereignty that respects communities' intellectual property and cultural protocols[17].

Suggestions for the Scientific Steering Committee to consider for the Workshop

The proposed Workshop can help the IPCC to go beyond increasing Indigenous-related content and to determine how to increase participation of Indigenous Peoples and IK holders. It could consider the following questions:

1. How to assess and engage with IK systems while protecting Indigenous rights and cultural protocols? How can we ensure that IK systems are not misappropriated or oversimplified?
2. What barriers currently prevent full and effective Indigenous participation in IPCC processes, and how can these be overcome?
3. What concrete mechanisms can be implemented to ensure meaningful Indigenous participation throughout the entire assessment process?
4. How to apply and incorporate Indigenous methodologies that emphasise collective, interdependent ethics of co-production?

A.4. *Ex-post* policy evaluation

State of the art

Limiting global warming to well below 2°C requires the rapid implementation of effective and equitable climate policies. While the IPCC assessments have provided robust evidence on the anticipated impacts of climate change and outlined potential mitigation and adaptation pathways[18], much more can be learned on understanding how these pathways can be operationalized through a balanced mix of effective and fair policies in real-world settings.[19]

With limited time and constrained resources, it is imperative that policy innovation translates into actions that are not only effective but also efficient and equitable at scale. There is a growing demand to identify which climate policies work, under what conditions, why they succeed or fail, and who benefits or bears the costs.[20] This includes assessing the broader implications of policies, such as their effects on innovation, labour markets, inequality, and public health.

Encouragingly, countries worldwide have accumulated valuable experience in designing and implementing climate policies. Current efforts to track these activities, such as the OECD's Climate

[17] Chidi Oguamanam, 'Indigenous Peoples, Data Sovereignty, and Self-Determination: Current Realities and Imperatives', *The African Journal of Information and Communication*, no. 26 (15 December 2020): 1–20, https://doi.org/10.23962/10539/30360.

[18] IPCC, *Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (Eds.)]. IPCC, Geneva, Switzerland.*, ed. Core Writing Team et al. (Geneva, Switzerland: IPCC, 2023), https://doi.org/10.59327/IPCC/AR6-9789291691647.

[19] Lea Berrang-Ford et al., 'Editorial: Evidence Synthesis for Accelerated Learning on Climate Solutions', *Campbell Systematic Reviews* 16, no. 4 (2020), https://doi.org/10.1002/cl2.1128; Jan C. Minx et al., 'Learning about Climate Change Solutions in the IPCC and Beyond', *Environmental Science & Policy* 77 (2017): 252–59, https://doi.org/10.1016/j.envsci.2017.05.014.

[20] The Economist, 'Why It's so Hard to Tell Which Climate Policies Actually Work', 2 October 2024, https://www.economist.com/science-and-technology/2024/10/02/why-its-so-hard-to-tell-which-climate-policies-actually-work; Pearson, ''Evidence Bank' Could Help Scientists To Tackle Climate Change', 2024.

Action Dashboard[21], document over a thousand policies to date — some of which have achieved significant reductions in greenhouse gas emissions[22], and Climate Policy Radar's AI-augmented database of nearly 5000 national climate laws and policies from every single national government, as well as all Party submissions to the UNFCCC[23]. This practical experience is further supported by a growing body of research examining the real-world impacts of these policies across various outcomes.[24] Despite this wealth of evidence, the IPCC has yet to effectively synthesize these insights more effectively into its assessments.

Suggested questions for the Scientific Steering Committee to consider for the Workshop

The workshop will aim to explore pathways for integrating available evidence from policy impact evaluations into IPCC reports, providing new insights into what works in climate policy and what does not. While the primary focus would be on *ex-post* evaluation evidence that examines the effects of implemented policies, discussions may also address the development of a unified framework that integrates *ex-post* (retrospective) evaluations with *ex-ante* (prospective) evidence from modelling and policy design studies. This could include the following questions:

- What frameworks for policy impact assessment would be needed to assess effectively the impacts of climate policies? How could *ex-ante* and *ex-post* evidence be integrated to provide a comprehensive understanding of policy impacts?
- How could the IPCC incorporate real-world policy evaluation evidence more effectively into its assessments? What types of evidence would be required for comprehensive assessments? What key topics should be addressed, and what expertise would be needed within author teams to achieve this?
- What methodological advances would be needed in primary and secondary research to answer rigorously the question of "what works" in climate policy? What synthesis methods could effectively unify findings across diverse contexts and outcomes?

[21] OECD: Organisation for Economic Co-operation and Development. Climate Action Dashboard: https://www.oecd.org/en/data/dashboards/climate-action-dashboard.html.

[22] Annika Stechemesser et al., 'Climate Policies That Achieved Major Emission Reductions: Global Evidence from Two Decades', *Science* 385, no. 6711 (23 August 2024): 884–92, https://doi.org/10.1126/science.adl6547.

[23] Climate Policy Radar, https://www.climatepolicyradar.org/.

[24] Max Callaghan et al., 'What Is the Evidence on Climate Mitigation Policies, and to What Extent Can It Be Identified and Classified Using Machine Learning? A Machine-Learning-Assisted Systematic Map Protocol' (Protocol Exchange, 26 August 2022), https://doi.org/10.21203/rs.3.pex-1910/v1.

Appendix B — Methods of assessment

The IPCC assessment process requires author teams to synthesize a wealth of information. In recent assessment cycles, this has been increasingly challenging due to the ever-increasing number of climate-related publications available. Various approaches are available that could help authors assess the exponentially growing volume of scientific publications relevant to climate change, such as systematic reviews or artificial intelligence.

Artificial intelligence (AI) and **large language model (LLM)** techniques have started to have widespread consequences for society and employment. AI provides potential opportunities for the IPCC, but also risks.

Systematic review techniques aim to identify, appraise and synthesize evidence from multiple studies to answer a specific research question using explicit, systematic methods aimed at minimizing bias, to produce reliable findings to inform decision-making.

Both are discussed further in this appendix, including current state of the art, challenges, approaches adopted in other assessment exercises where applicable, and ending with a list of suggestions for the Scientific Steering Committee to consider for the Workshop.

B.1. Artificial intelligence and large language models

State of the art

The rapid growth of climate-related publications challenges IPCC teams to synthesise vast literature within limited time and resources. AI, including LLMs, offers a set of tools that could help address this challenge, but their application also raises critical questions.

AI refers to systems that analyse data, recognise patterns, and generate summaries. AI tools could streamline literature synthesis by categorising information, identifying trends, and producing summaries. In the longer term, this could enable the assessment process to transition from a static, cycle-based approach to a more dynamic system that monitors and flags new findings and trends, reducing the lag between findings and outputs.

Many IPCC authors may already be using AI tools in their scientific research. Techniques like machine learning are employed to analyse climate datasets, model the Earth system, or accelerate literature reviews. Tools such as citation analysis platforms or text-mining software — often powered by AI — are becoming commonplace in academia. However, whether these tools align with the rigorous standards and expectations of IPCC assessments, or whether their use introduces unintended risks, remains an open question.

AI is also often associated with high energy consumption, emissions, biases and ethical concerns, as well as limited trust in its applications. The scepticism surrounding AI reflects broader concerns about its political, social, and environmental implications. Even if AI were to be found to offer benefits in IPCC processes, there would be fundamental questions about how its use should be introduced, socialised and governed to build trust and acceptance within and beyond the IPCC.

Such potential must be carefully balanced against significant risks. Over-reliance on black-boxed AI models or tools (LLMs in particular) could lead to a loss of transparency. Bias is another critical concern, as AI reflects inequities in training data (including historical inequities and regional disparities). Moreover, automation of synthesis tasks could inadvertently exclude nuanced human judgment. The risks associated with generative AI, such as inaccuracies, hallucinations, or misinterpretation of findings, pose further complications.

Addressing these risks would require inclusive dialogue to assess whether AI aligns with IPCC's principles and methodological needs. Clear guidelines, safeguards, and mechanisms would be needed to ensure AI complements IPCC's rigour and trustworthiness.

A Workshop could provide a useful exploratory forum to convene experts, evaluate whether AI may be appropriate for IPCC processes, and, if deemed suitable, establish clear conditions for its use. This would ensure that the IPCC's decisions on AI are grounded in evidence and aligned with its mandate.

Approaches adopted in other assessments

International organisations are increasingly engaging with AI to enhance decision-making, synthesis, and evaluation processes, offering varying degrees of guidance and operational tools.

The UNDP[25], through its AIDA[26] platform uses machine learning for evidence synthesis, providing rapid insights to support progress towards Sustainable Development Goals (SDG).[27] Similarly, the Global SDG Synthesis Coalition employs AI to synthesise evidence across UN entities, leveraging data to improve SDG outcomes.[28]

Other UN and international organisations provide additional frameworks for AI use. UNEP offers explicit restrictions on generative AI, while encouraging the use of discriminative AI under controlled conditions for the seventh edition of its Global Environment Outlook (GEO-7).[29] The OECD's updated AI Principles address the governance challenges of generative AI, offering guidance on privacy, safety, and accountability.[30] The World Bank emphasises ethical and inclusive AI applications, highlighting the need for representative datasets.[31] The WHO[32] issued over 40 recommendations for managing generative AI in healthcare, focusing on safety, equity, and transparency.[33] Finally, the UN as a whole has adopted overarching ethical principles for AI, promoting fairness, transparency, and alignment with human rights, leaving specific operational guidance to individual agencies.[34]

Concrete guidance varies, with UNEP's GEO-7 offering specific rules and others focusing on principles. The UNDP's AIDA platform stands out as a practical tool already in use, demonstrating AI's potential to streamline evidence synthesis and decision-making. Together, these efforts highlight the growing recognition of AI's potential while underscoring the need for robust, actionable frameworks tailored to specific contexts.

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[25] UNDP: United Nations Development Programme.

[26] AIDA: Artificial Intelligence for Development Analytics.

[27] UNDP, 'Artificial Intelligence Powers UNDP's Evaluation Solutions', 18 April 2022, https://www.unicc.org/news/2022/04/18/artificial-intelligence-aida-powers-undp-evaluation-solutions/.

[28] Kate Pond, 'What Is the Global SDG Synthesis Coalition Trying to Achieve?', Global SDG Synthesis Coalition, 15 June 2023, https://www.sdgsynthesiscoalition.org/news/what-global-sdg-synthesis-coalition-trying-achieve.

[29] UNEP, 'Guidance on the Use of Generative Artificial Intelligence (AI)-Based Tools in the Context of UNEP's Seventh Edition of the Global Environment Outlook (GEO-7) - Draft', 2023, https://wedocs.unep.org/handle/20.500.11822/43133.

[30] OECD, 'AI Principles', 2024, https://www.oecd.org/en/topics/ai-principles.html.

[31] Rabi Thapa, 'Developing AI for Development', The World Bank, Accountability Mechanisms, 9 April 2024, https://accountability.worldbank.org/en/news/2024/Developing-AI-for-development.

[32] WHO: World Health Organization.

[33] WHO, *Ethics and Governance of Artificial Intelligence for Health: Guidance on Large Multi-Modal Models* (Geneva, Switzerland: World Health Organization, 2024), https://www.who.int/publications/i/item/9789240084759.

[34] UN, 'Principles for the Ethical Use of Artificial Intelligence in the United Nations System', 2022, https://unsceb.org/sites/default/files/2022-09/Principles%20for%20the%20Ethical%20Use%20of%20AI%20in%20the%20UN%20System_1.pdf.

Suggested questions for the Scientific Steering Committee to consider for the Workshop

The proposed Workshop would evaluate whether AI should be integrated into IPCC processes, and if so, under what conditions and with what safeguards.

The following questions could be considered:

- Are AI tools trustworthy, methodologically robust, and aligned with IPCC principles?
- Could they gain acceptance through transparency, safeguards, and inclusive design?

B.2. Systematic review

State of the art

Science assessments like those by the IPCC depend on a well-working evidence pyramid (see Figure B.1), synthesising research to provide authoritative assessments that help to inform climate policy.[35] However, the strength of the IPCC's assessments depends on the rigor and comprehensiveness of the evidence base supporting them. As such, it is dependent on rigorous synthesis efforts — the middle layer of the pyramid.

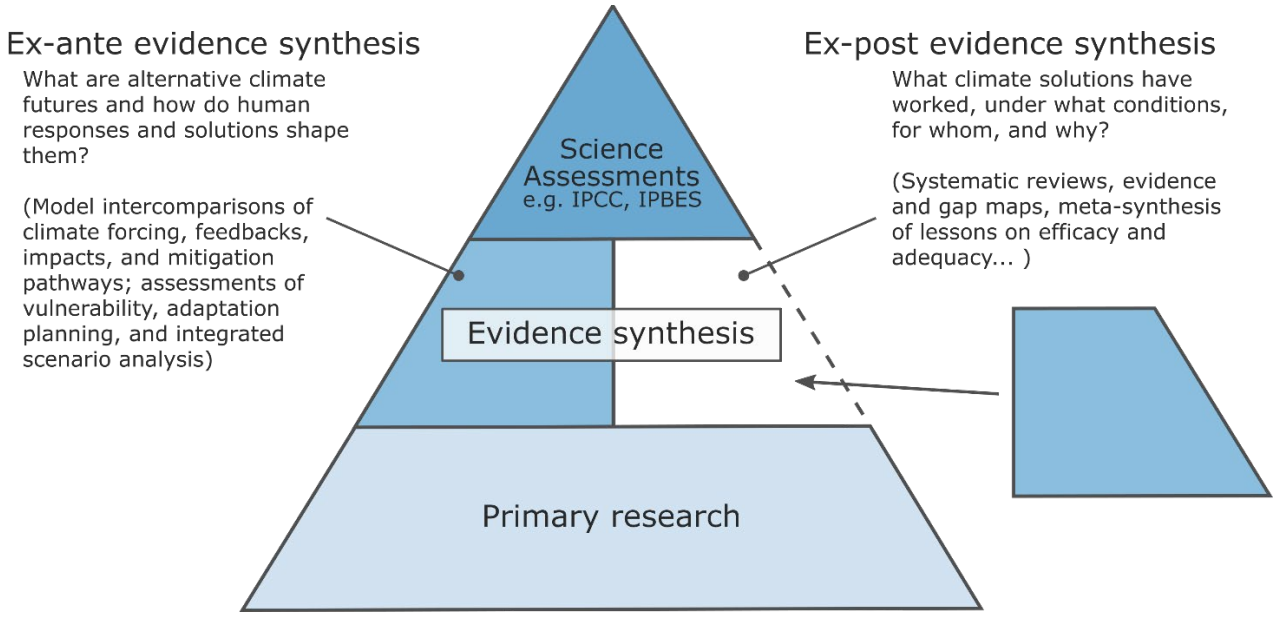

Figure B.1. IPCC assessment depend on a well-working evidence pyramid. Science assessments are strongest when they based on rigorous and systematic syntheses of the available primary research. In climate change research these are successfully conducted for modelling evidence, but less so for empirical evidence. (Source: based on footnote 35.)

Currently, a key element of this foundation — systematic synthesis of empirical evidence — remains underdeveloped. While model intercomparison projects provide a robust mechanism for synthesizing evidence from climate, climate impacts and integrated assessment models that have

[35] Minx et al., 'Learning about Climate Change Solutions in the IPCC and Beyond', 2017; Berrang-Ford et al., 'Editorial: Evidence Synthesis for Accelerated Learning on Climate Solutions', 2020.

provided continuous knowledge accumulation within the IPCC[36]. there is no comparable process for aggregating and evaluating empirical research. This gap may limit the IPCC's ability to deliver balanced, transparent, and context-specific insights, particularly in areas like adaptation, vulnerability, and mitigation, where empirical evidence is critical.

Systematic reviews provide a well-established methodology that could address this. Instead of relying on traditional literature reviews that are prone to various sources of bias[37], systematic review provide a transparent and replicable process for identifying, harmonising, appraising and synthesizing the entire body of evidence on a particular research question[38]. It is important to note that there is a whole universe of systematic review methods beyond quantitative meta-analysis building on different lines of qualitative and quantitative evidence. However, the application of systematic reviews in climate science remains mostly sporadic, and methodologies may need to be adapted to meet the complexity of the field. As this could provide a basis for continuous learning from empirical evidence similar to the field of modelling, systematic review methodologies have been proposed as a means to support IPCC assessments.[39]

Approaches adopted in other assessments

IPBES[4] encourages authors in its uncertainty guidance to prioritise the use of systematic review evidence in IPBES assessments whenever possible. IPBES reports have made direct use of systematic review methodology in its assessment process.[40]

The OECD's Inclusive Forum on Carbon Mitigation Approaches aims to better understand and optimise the global impact of emissions reduction efforts around the world through better data and information sharing, evidence-based mutual learning and inclusive multilateral dialogue. Part of the evidence generation process is a comprehensive assessment of the scientific evidence on the effectiveness of different climate policy instruments across major economic sectors. This assessment borrows from systematic reviews methodologies and integrates insights from hundreds of primary studies.

The Global SDG Synthesis Coalition is a collaboration of more than 40 UN entities to harness the power of evaluation and evidence synthesis to accelerate the achievement of the 2030 agenda. It aims to synthesize rigorous and evaluative evidence organized around the five pillars of the SDGs — People, Planet, Prosperity, Peace and Partnership. Synthesis efforts are rooted in rigorous systematic review methods.

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[36] Veronika Eyring et al., 'Overview of the Coupled Model Intercomparison Project Phase 6 (CMIP6) Experimental Design and Organization', *Geoscientific Model Development* 9, no. 5 (2016): 1937–58, https://doi.org/10.5194/gmd-9-1937-2016; Lila Warszawski et al., 'The Inter-Sectoral Impact Model Intercomparison Project (ISI–MIP): Project Framework', *Proceedings of the National Academy of Sciences* 111, no. 9 (2014): 3228–32, https://doi.org/10.1073/pnas.1312330110; Brian C. O'Neill et al., 'The Scenario Model Intercomparison Project (ScenarioMIP) for CMIP6', *Geoscientific Model Development* 9, no. 9 (2016): 3461–82, https://doi.org/10.5194/gmd-9-3461-2016.

[37] Neal R. Haddaway et al., 'Eight Problems with Literature Reviews and How to Fix Them', *Nature Ecology & Evolution* 4, no. 12 (2020): 1582–89, https://doi.org/10.1038/s41559-020-01295-x.

[38] JPT Higgins et al., eds., *Cochrane Handbook for Systematic Reviews of Interventions*, Version 6.5 (Updated August 2024) (Cochrane, 2024), www.training.cochrane.org/handbook.

[39] Lea Berrang-Ford et al., 'Systematic Review Approaches for Climate Change Adaptation Research', *Regional Environmental Change* 15, no. 5 (2015): 755–69, https://doi.org/10.1007/s10113-014-0708-7; Minx et al., 'Learning about Climate Change Solutions in the IPCC and Beyond', 2017; Mark Petticrew and Gerry McCartney, 'Using Systematic Reviews to Separate Scientific from Policy Debate Relevant to Climate Change', *American Journal of Preventive Medicine* 40, no. 5 (2011): 576–78, https://doi.org/10.1016/j.amepre.2010.12.022.

[40] M. Fischer et al., eds., 'ECA Appendix 2.1 Protocol of the Systematic Review Used for Chapter 2 of the ECA Assessment', in *The IPBES Regional Assessment Report on Biodiversity and Ecosystem Services for Europe and Central Asia*, IPBES, vol. SUP/ECA/1 (Bonn, Germany: IPBES Secretariat, 2018), https://doi.org/10.5281/ZENODO.3237428.

ANNEX 1

Suggested questions for the Scientific Steering Committee to consider for the Workshop

The proposed Workshop would discuss how enhanced systematic review practices within and outside the IPCC could strengthen IPCC assessments, building on lessons from other disciplines to enhance the synthesis of empirical evidence.

To explore how systematic reviews can enhance the IPCC process, the workshop could focus on a series of critical questions, such as:

1. **Strengthening IPCC assessments:**
    a. In what specific ways could systematic reviews strengthen the credibility, comprehensiveness, and transparency of IPCC assessments?
    b. How could systematic reviews provide more robust evidence to support key findings, particularly for adaptation, vulnerability, and mitigation assessments?
    c. What examples exist, either within or outside climate science, where systematic reviews have successfully clarified complex evidence bases?
2. **Enhancing uncertainty assessments:**
    a. How could evidence synthesized through systematic reviews improve the evaluation of confidence levels in IPCC assessments?
    b. In what ways might systematic reviews contribute to better characterisation of the evidence, agreement and confidence framework used by the IPCC?
    c. How could systematic reviews help clarify or reduce uncertainties by identifying consistent trends, context-specific outcomes, or critical gaps in knowledge?
3. **Application of systematic reviews within and outside the IPCC process:**
    a. To what extent could current systematic review practices be directly applied within the IPCC's unique structure and timelines? Could the IPCC build capacity to incorporate systematic reviews into its workflow without overburdening existing processes?
    b. Could and should the IPCC foster collaborations or guidelines to encourage systematic reviews in areas critical to its assessments?
    c. What infrastructure, incentives, or partnerships may be needed to ensure systematic review evidence is readily available and relevant for IPCC authors?
4. **Additional considerations:**
    a. What are the limitations of systematic reviews, and how could they be addressed to maximize their utility in climate science?
    b. What role could emerging technologies (such as AI tools for literature synthesis) play in making systematic reviews more feasible and efficient for climate research?