ipcc
INTERGOVERNMENTAL PANEL ON climate change
Chair's Office

WORKSHOP ON ENGAGING DIVERSE KNOWLEDGE SYSTEMS
WORKSHOP ON METHODS OF ASSESSMENT

Reading, United Kingdom, 10–12 February 2026

Background material

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WMO
UN environment programme

This background document has been developed with the sole purpose of preparing participants for the IPCC Workshops on *Engaging Diverse Knowledge Systems* and *Methods of Assessment*. It has been authored by members of the Scientific Steering Committee (SSC) established for the Workshops, and edited by the Chair of IPCC and his team. IPCC has not endorsed or approved this document, nor has it been subject to review. The views in specific sections are those of individual authors alone, and may not reflect the views of other SSC members, or the SSC as a whole.

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BACKGROUND MATERIAL

Contents

IPCC acronyms

AR	Assessment Report, e.g. AR7 is the Seventh Assessment Report (one Assessment Report per IPCC assessment cycle)
BOG	Breakout Group
CA	Contributing Author
CLA	Coordinating Lead Author
CS	Chapter Scientist
DDC	Data Distribution Centre
ExCom	Executive Committee
FGD	Final Government Draft
FOD	First Order Draft
IPCC	Intergovernmental Panel on Climate Chage
LA	Lead Author
LAM	Lead Author Meeting
RE	Review Editor
SOD	Second Order Draft
SPM	Summary for Policymakers
TFI	Task Force on National Greenhouse Gas Inventories
TG-Data	Task Group on Data Support for Climate Change Assessments
TSU	Technical Support Unit
UNEP	UN Environment Programme
WG	Working Group
WMO	World Meteorological Organization
ZOD	Zero Order Draft

1. Introduction

The scope of the two co-located *Workshops on Engaging Diverse Knowledge Systems* and *Methods of Assessment*, as agreed by IPCC, is to:

- to consider what systems of knowledge can be engaged with and assessed by the IPCC within the framework of existing principles and procedures;
- to consider the means by which such knowledge systems can be engaged with and 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.

The specific aims of the *Workshop on Engaging Diverse Knowledge Systems* are:

- to address how Indigenous Knowledge (IK) systems could be accessed and assessed by the IPCC, in particular considering effective and equitable engagement of IK holders and building on experience;
- to address how local knowledge could be assessed by the IPCC, building on experience built up in other fora as appropriate;
- to address how practitioner knowledge could be assessed by the IPCC, building on experience built up in other fora as appropriate;
- to make recommendations for funding agencies as to how to support the engagement of knowledge holders in the IPCC programme of work.

The specific aims of the Workshop on *Methods of Assessment* are:

- 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 to the IPCC, Bureau and authors as to how new and extended methods of assessment such as AI might be built into the IPCC programme of work;
- to address how *ex-post* evaluation evidence could be assessed by the IPCC, building on experience built up in other fora as appropriate;
- to identify precautionary measures or limitations that might be necessary to ensure adherence to IPCC's principles and procedures for the preparation of reports; and
- 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.

The aims of the workshops have been refined by the Scientific Steering Committee set up to guide the preparation of the workshop. Notably, the consideration of *ex-post* evaluation now falls within the scope of the *Workshop on Methods of Assessment.* Particular attention has been given to connections between the two workshops.

The formal mandate for the workshops is to operate within the framework of existing IPCC principles and procedures.[1] Potential recommendations from the workshops can inform IPCC practices, within that framework. The IPCC is due to review its principles and procedures. Notwithstanding the formal mandate, workshop participants may wish to highlight ways in which refinement of the principles and procedures might assist in addressing the challenges covered by the workshops, recognising that taking up of any recommendations that are not consistent with

[1] IPCC, 'IPCC Procedures', accessed 1 February 2026, https://www.ipcc.ch/documentation/procedures/.

IPCC's fundamental *modus operandi* will face considerable challenges.

This background document is intended to brief workshop participants, many of whom have not participated in IPCC activities, on IPCC itself and the way it works, and on the current status with respect to engagement with various knowledge systems, within and outside IPCC, as well as the current status on methods of assessment.

Section 2 introduces the structure and functions of IPCC, as well as setting out the steps required to produce an IPCC assessment report. This serves to identify the specific points in the IPCC assessment process where diverse systems of knowledge can be engaged and where emerging methods of assessment can be applied.

Sections 3 and 4 respectively provide background information relevant to the two *Workshops on Engaging Diverse Knowledge Systems* and *Methods of Assessment*. The knowledge systems considered are **Indigenous Knowledge (IK)**, **local knowledge (LK)** and **practitioner knowledge**. The greater attention to IK reflects the level of attention given to this topic at the IPCC Plenary which approved the Workshop. The workshop on *Methods of Assessment* will cover **artificial intelligence (AI)**, **evidence synthesis (especially systematic review)** and ***ex-post* policy evaluation**. The emphasis given to AI reflects the technical nature of the topic, its relative novelty and the rapid pace of change.

Each section 1) describes background information on each system of knowledge or the state-of-the-art for assessment methods; 2) reviews current practice in IPCC and other relevant bodies; and 3) indicates implications for the workshops.

2. The IPCC

2.1. What is the IPCC and how does it work?

The Intergovernmental Panel on Climate Change (IPCC) is the United Nations (UN) body for assessing the science related to climate change. It assesses the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation. IPCC has no mandate to undertake capacity-building, though capacity-building outcomes may result from its assessment activities.

The IPCC was founded in 1988 and operates in cycles that generally last for seven years. The IPCC is supported by the World Meteorological Organisation (WMO) and the UN Environment Programme (UNEP) operating under a Memorandum of Understanding established in 1988. The current cycle started in 2023 and work on its Seventh Assessment Report (AR7) has just started.

IPCC's intergovernmental status means that that all major decisions are taken by the Panel itself (Figure 1), i.e. the 195 governments. IPCC also has 37 UN observer organisations, 37 intergovernmental observers and 189 NGO observers. The Panel *agrees* the number and scope of reports, *accepts* the reports (signs off yes/no) and *approves* line by line (negotiates) the Summaries for Policymakers of the reports. They use their best endeavours to reach decision by consensus, and have almost always done so.

IPCC's principles and procedures, which were last subject to a major revision in 2010-2011, guide the operations of the IPCC.[2] The principles and procedures are agreed by governments meeting in plenary session and should be reviewed every five years. A review is now due. They are supplemented by decisions that the Panel may make from time to time, and operational practices that have evolved in the light of emerging needs.

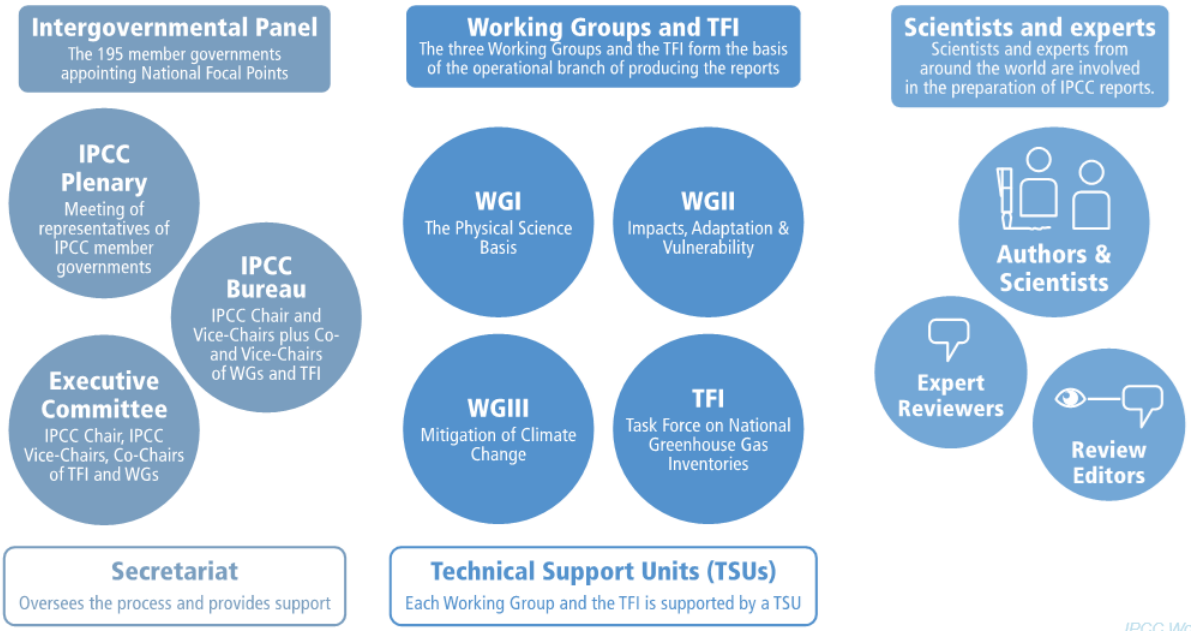

Figure 1. The structure of the IPCC.

[2] IPCC.

The Panel typically meets twice a year. Every cycle, it elects a scientific leadership ("the Bureau") currently comprising 34 individuals consistent with regional quotas (Figure 1). They remain employed by and located at their national institutions. The Bureau also meets typically twice a year.

The senior posts of the Bureau are the Chair, three Vice-Chairs, and the Co-Chairs of the three Working Groups and the Task Force on National Greenhouse Gas Inventories[3] (TFI). They constitute the Executive Committee which meets more frequently and is mandated to take urgent decisions between Panel sessions.

The three Working Groups (WG) and the TFI drive the scientific assessments, select authors and guide the production of the reports. They are each led by two Co-chairs, one from a developed and one from a developing country, and are supported by seven to eight elected Vice-chairs.

In the past, the developed country co-chair's institution has hosted a Technical Support Unit (TSU), comprising 12 to 15 individuals, funded by the hosting government. In the last and current cycles, it has also been possible to provide developing country co-chairs with resources for technical support. The TSUs provide operational, communications and scientific support.

The largest number of IPCC participants comprise the IPCC authors, nominated by governments and selected by the WG Bureaux. They draft the reports and their efforts are at the core of IPCC activity. Their work is complemented by expert reviewers and Review Editors. Table 1 lists the roles associated with IPCC's scientific assessments, how people are appointed, and the tasks which they perform (the next section describes the steps taken to produce a report).

The work of the Panel, the Bureau and the Executive Committee is supported by the IPCC Secretariat, comprising 15 people, based at the WMO headquarters in Geneva, Switzerland. Developing country participation in IPCC activities (travel and subsistence) is supported by a Trust Fund relying on voluntary contributions mainly, though not exclusively, from developed countries. The Secretariat administers the Trust Fund under WMO rules and regulations. The Secretariat performs a variety of other roles including fundraising, negotiating agreements with countries hosting IPCC meetings and leading communications activity, notably in relation to outreach, media and social media engagement.

[3] The mandate of the Task Force on National Greenhouse Gas Inventories (TFI) is to produce guidelines on estimating emissions and removals of greenhouse gases to the atmosphere for use by national governments in reporting to the UN Framework Convention on Climate Change.

Table 1. Roles within the IPCC directly relevant for assessment.

Role	Appointment	Roles
WG Co-chair	Nominated by governments; elected by the Panel	Operates TSU Oversees scientific quality Agrees the list of authors, REs, expert reviewers
WG Vice-chair	Nominated by governments; elected by the Panel	Oversees scientific quality Agrees the list of authors, REs, expert reviewers May act as RE
Coordinating Lead Author (CLA)	Nominated by governments and observers; selected by WG Bureau	Takes overall responsibility for coordinating a chapter
Lead Author (LA)	Nominated by governments and observers; selected by WG Bureau	Produces designated sections on the basis of the best scientific, technical and socio-economic information available
Contributing Author (CA)	Enlisted by CLAs/LAs	Prepares technical information for assimilation by the LAs
Expert reviewer	Self-nominated subject to screening	Comments on draft text
Review Editor (RE)	Nominated by governments/ observers; selected by WG Bureau	Ensures comments are afforded consideration Advises on how to handle contentious or controversial issues 2-3 REs per chapter
Chapter Scientist (CS)	Selected by CLAs, or by WG co-chairs and CLAs following advertisement	Assessment support (graphics, reference checking, text checking) No mention of this role in IPCC procedures; it has emerged through WG practice
TSU members	Appointed by Co-chairs	Scientific, technical and operational support for Co-chairs and WG Bureau
Secretariat	Led by a Secretary (WMO) and a Deputy Secretary (UNEP) Appointed and employed by WMO, other than the Deputy Secretary 15 people overall, based at WMO, Geneva	Supports the Panel, the IPCC Chair and the IPCC Bureaux in the delivery of their mandate Manages the IPCC Trust Fund Supports the WGs in the organisation of their meetings
Task Group on Data Support for Climate Change Assessments (TG-Data)		Ensures the curation, traceability, stability, availability and transparency of data and scenarios underlying IPCC reports Follows the FAIR principles (Findability, Accessibility, Interoperability, and Reusability)

2.2. How reports are produced

Figure 2 show the main steps in the production of an IPCC report, from the point at which governments agree to its production. The entire process can take three to four years.

The formally mandated meetings are:

- a scientific scoping meeting (step 1);
- a Panel meeting at which the scope is agreed (step 2); and
- the Panel meeting (step 9) at which the report is *accepted* and its Summary for Policymakers (SPM) is *approved* line by line.

Between steps 4 and 7 there are four week-long Lead Authors Meetings (LAMs). Figure 3 provides an illustrative example of the agenda for a LAM.

LAM 1 is the “getting to know you” LAM and leads to the production of a rough “zero-order draft” (ZOD) which is reviewed internally but has no formal status.

LAM 2 leads to the production of a “first-order draft” (FOD, step 5) which, under IPCC procedures, is subject to external expert review.

LAM 3 considers the expert review comments and leads to the production of a “second-order draft” (SOD), as well as a first draft of the Summary for Policymakers. These are, again under IPCC procedures, subject to a combined expert and government review. The Summary for Policymakers is drafted by a smaller set of authors, usually CLAs plus some LAs deemed to have an essential contribution to make.

LAM 4 considers these comments and leads to the production of the Final Government Draft (FGD) and the final draft Summary for Policymakers (step 7). The final Summary for Policymakers is then reviewed by governments (step 8) and revised by the SPM drafting team before going to a Panel meeting for line-by-line approval (step 9). The underlying report may be revised slightly for consistency in light of changes made to the Summary for Policymakers during approval (a process known as “trickle-back”).

IPCC findings are qualified by confidence statements[4] (based on the quality of evidence and the degree of agreement in the literature (Figure 4). Authors make these judgements.

Within each of the steps set out in Figure 2, there are many specific tasks that must be performed. Table 2 sets these out and identifies who is responsible for undertaking these tasks (based on the list of roles in Table 1). It also notes the scale of the activity based on experience from the sixth assessment cycle, and any other pertinent information. Table 2 sets out the overall framework. In practice, WG Co-chairs and TSUs have some discretion in operationalising this framework and practices do vary, between WGs and across cycles.

The tasks set out in provide a framework for considering points in IPCC process at which more diverse systems of knowledge could be engaged, holders of that knowledge could participate, and innovations in assessment methods could take place.

Responding to external review comments is a particularly onerous task for authors. From the first-order draft onwards, all comments are recorded and authors must respond to each, either accepting the comment or stating the reason why they do not accept it. All external comments and

[4] IPCC, ‘Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties’, 2010, https://www.ipcc.ch/site/assets/uploads/2017/08/AR5_Uncertainty_Guidance_Note.pdf.

responses are published once the report is accepted by governments.

The scenarios and data underlying IPCC reports, notably tables and figures should be curated according to the FAIR Principles (Findability, Accessibility, Interoperability, and Reusability) following guidelines developed by TG-Data. Data underlying tables and figures are accessible on the IPCC website; other data is held by third-party Data Distribution Centres (DDCs) through voluntary support in kind from member governments.

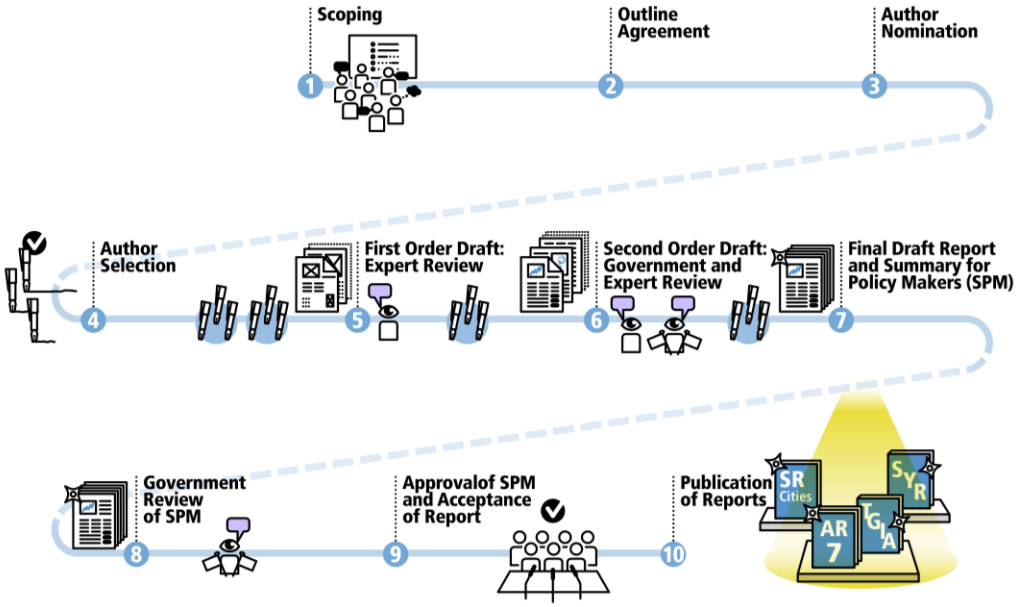

Figure 2. Ten steps in the production of an IPCC report.

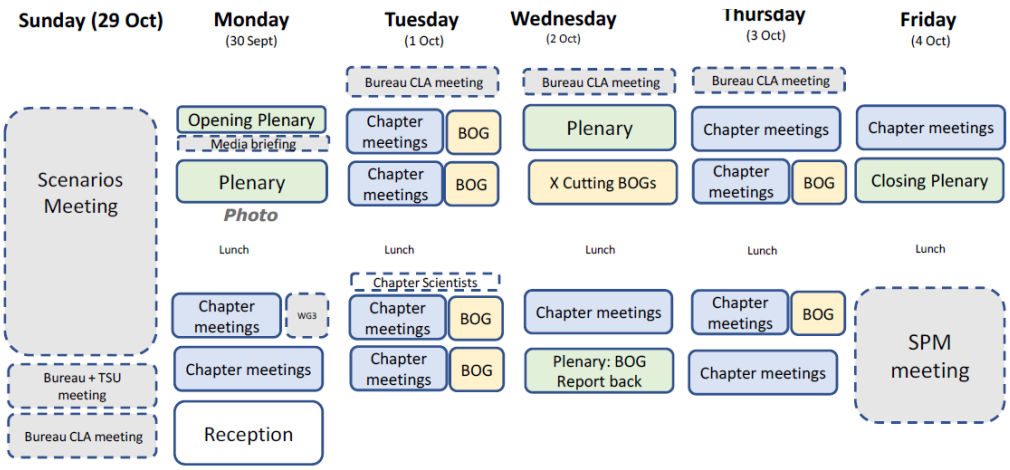

Figure 3. Outline agenda of a typical Lead Authors Meeting.

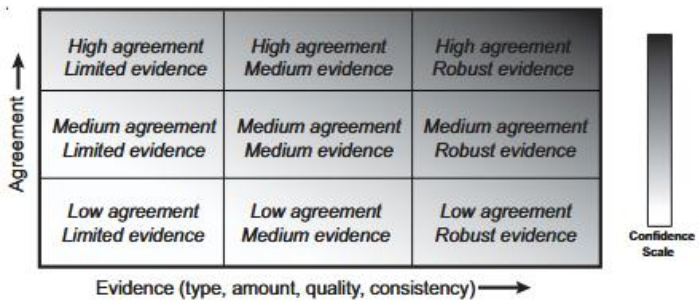

Figure 4. A depiction of evidence and agreement statements and their relationship to confidence. Confidence increases towards the top-right corner as suggested by the increasing strength of shading. Generally, evidence is more robust when there are multiple consistent independent lines of high-quality evidence.

Table 2. Stages in producing and communicating an IPCC report.

Stage	Actors	Notes
Nominating scoping meeting participants	Governments, observers, Bureau members	
Selecting scoping meeting participants	WG Bureaux supported by TSUs	AR7 scoping meeting attended by 240 participants spread across three Working Groups
Preparing materials for scoping meeting	WG Bureaux supported by TSUs	
Scoping meeting and draft outline	Scientific scoping meeting participants	Consists of: Chapter titles (unnegotiable); indicative bullet points for each chapter; explanatory notes. Explanatory notes are developed by the Working Group Bureaux. Outline is subject to refinement and agreement by the Panel.
Nominating authors	Governments, observers, Bureau members	The number of nominations typically exceeds the number of author places available by a factor of five or six to one.
Selecting authors	WG Bureaux supported by TSUs	10-20 authors per chapter, 10-20 chapters per report. 664 authors including REs across Working Groups in AR7. Nomination material includes a 2- page CV and a nomination form. Nominations are processed on a system developed and maintained by the Secretariat with exports to spreadsheets used by TSUs and Bureau members.
Preparing materials for Lead Author Meeting (LAMs)	WG Bureaux supported by TSUs	LAM for a single Working Group may have 200-250 participants and will last 5 days.
Assessing available literature	LAs with input from CAs	60,000 references in AR6 ranging from 14,000 for Working Groups I and III, up to 32,000 in Working Group II. References can account for 20-30% of the space in a chapter. “Priority should be given to peer-reviewed scientific, technical and socio-economic literature if available”.
Accessing material in languages other than English	LAs with input from CAs	Overwhelming majority of references are in English *“For any source written in a language other than English, an executive summary or abstract in English is required”*
Drafting text	LAs coordinated by CLAs, with input from CAs	Each WG report was 2,000 to 3,000 pages long in AR6
Coordination across chapters/WGs	Selected authors in collaboration with Bureau members and TSUs	Breakout groups (BOGs), ad-hoc cross-chapter teams and informal engagement
Checking integrity of material	TSUs under direction of WG Chairs	Using widely available checkers and detectors, currently for plagiarism, for potentially for AI-generated text
Preparing graphical material	LAs with support from CS and TSUs	TG-Data facilitates the curation of data behind graphical material Up to 40 figures per chapter in AR6, some multi-panel; 21 in the Synthesis Report, 7 in its Summary for Policymakers

Table 2. Continued.

Stage	Actors	Notes
Reviewing and responding to review comments	LAs with support from CS	22,000 expert comments 32,000 expert/government comments for Working Group III AR6
Checking review comments addressed	REs	2 to 3 REs per chapter May include a WG Vice-chair
Use of uncertainty language and establishing confidence statements	LAs	Using IPCC guidance referring to the type, amount, quality, and consistency of evidence Quantification for findings expressed probabilistically
Translation into official UN languages[a]	WMO translation services augmented by science editors	A new Publications and Translations policy is untested Sixth Assessment translations are incomplete
Translation into other languages[b]	Governments	Subject to WMO copyright policy[c]
Curating data and scenarios underlying IPCC reports	WG TSUs and DDCs following TG-Data guidance	TG-Data was established in the course of AR6 and its mandate was not completely fulfilled AR7 is the first full test
Production of derivative materials	Third parties	Subject to WMO copyright policy TSUs may also produce derivative material but sensitive with member governments
Reading and interpreting reports	Users across all sectors	Some use of large-language models already evident

[a] Only the Summary for Policymakers, Technical Summary, Frequently Asked Questions (FAQs) and Glossary are translated.
[b] Generally the Summary for Policymakers only.
[c] Reproduction of a limited number of figures or short excerpts is authorised for personal, non-commercial usages and without formal written permission. Permission can only be granted to use the material exactly as it is in the report. Figures cannot be altered in any way, including the full caption (www.ipcc.ch/copyright).

3. Engaging diverse knowledge systems

3.1. Current status

This workshop takes place in a context where there is both a growing recognition of the need to engage diverse knowledge systems and a clear body of evidence on the structural, procedural and epistemological barriers that must be addressed.

3.1.1. Indigenous Knowledge systems

Indigenous Knowledge (IK) is specific to a location and its unique ecology, culture and history. For that reason, reference is often made to Indigenous Knowledges in the plural. However, IK 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.[5] This definition is in line with that proposed by various Indigenous organisations and scholars, such as the Inuit Circumpolar Council.

A large body of scholarship emphasises that IK systems have historically been marginalised by the epistemic dominance of Western science, which is often treated as the only legitimate, universal and objective form of knowledge.[6] Practices of objectification and “parachute science” have frequently reduced IK to extractable data, detached from its spiritual, relational and political contexts, and used without adequate accountability or benefit-sharing. Recent work calls for a shift from extractive approaches towards relational and reparative engagements that recognise Indigenous Peoples as rights-holders and self-determining political actors, rather than stakeholders or data providers.[7]

A white paper from the International Co-Sponsored Meeting on Culture, Heritage, and Climate Change called for equitable collaboration between knowledge systems.[8] This call aligns with those made by Indigenous scholars, who also emphasize that engagement with their knowledge systems requires a rights-based approach[9], including Indigenous data sovereignty that respects communities' intellectual property and cultural protocols[10].

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[5] Inuit Circumpolar Council, ‘Ethical and Equitable Engagement Synthesis Report’, 2021, www.inuitcircumpolar.com/project/icc-ethical-and-equitable-engagement-synthesis-report/.

[6] Maria Tengö et al., ‘Connecting Diverse Knowledge Systems for Enhanced Ecosystem Governance: The Multiple Evidence Base Approach’, *AMBIO* 43, no. 5 (September 2014): 579–91, https://doi.org/10.1007/s13280-014-0501-3.

[7] Kyle Whyte, ‘Indigenous Climate Change Studies: Indigenizing Futures, Decolonizing the Anthropocene’, *English Language Notes* 55, no. 1–2 (1 March 2017): 153–62, https://doi.org/10.1215/00138282-55.1-2.153.

[8] B 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).

[9] 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 edn (Cambridge University Press, 2022), 116–25, https://doi.org/10.1017/9781009082099.017.

[10] 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.

The conflation of IK and local knowledge – and other knowledges – is contentious, because it can be seen to obscure Indigenous peoples' status as collective rights-holders under international law and depoliticise knowledge systems that are inseparable from histories of colonialism, dispossession, and resistance. Treating IK as a form of place-based or experiential knowledge erases its nature as a holistic and self-standing epistemology, grounded in distinct ontologies, governance systems, ethics, and intergenerational transmission, and reduces it to extractable data that can be selectively instrumentalised to complement scientific knowledge. As emphasised in a joint statement[11] by the United Nations Permanent Forum on Indigenous Issues, the United Nations Expert Mechanism on the Rights of Indigenous Peoples, and the United Nations Special Rapporteur on the Rights of Indigenous Peoples, such approaches risk undermining Indigenous Peoples' rights by failing to recognise their authority over their knowledge systems. This conflation can allow institutions to claim inclusivity while failing to engage Indigenous peoples as distinct political actors with authority over their knowledge, thereby reinforcing existing power asymmetries and undermining both epistemic integrity and climate justice.

3.1.2. Local knowledge and practitioner knowledge

Local knowledge is defined broadly in the IPCC AR6 glossary as "The understandings and skills developed by individuals and populations, specific to the places where they live. Local knowledge informs decision-making about fundamental aspects of life, from day-to-day activities to longer-term actions. This knowledge is a key element of the social and cultural systems which influence observations of and responses to climate change; it also informs governance decisions." Therefore, as defined and operationalised by the IPCC, everyone holds local knowledge.

Although regularly used in conversations in the IPCC, there is no IPCC definition of "practitioner knowledge". "Practitioner" functions as a self-identifier for a certain group of IPCC authors, mainly in Working Group II, as professionals shaping things on the ground, as opposed to academics and policymakers.[12] It remains unclear whether "practitioner knowledge" constitutes a "knowledge system" in its own right.

Local knowledge is also gaining importance for developing sustainable, community-appropriate responses to local challenges. Local knowledge can contribute to strengthening both the *scientific credibility* and *political relevance* of an assessment. First, it contributes to broadening the knowledge base and its scientific quality by providing for more comprehensive data on climate impacts, particularly in remote areas. Second, it helps understand the broader context in which knowledge is embedded (such as local practices, cultures, values, and traditions). Local knowledge makes significant contributions to the assessment of politically relevant topics, including risks, vulnerability, resilience, governance, adaptive management, and justice.

Practitioner knowledge can be especially valuable for rendering assessment findings 'usable' or 'actionable' on the ground due to contextual, place-based, and embedded nature.[13] Practitioner knowledge provides a 'real-world check' for models, scenario and AI-based meta-assessments because through empirical results and long-term experiences based on what is actually needed and working on the ground in real-world societies. Specialist knowledge and skills can enhance the salience and legitimacy of IPCC reports. It helps to reconcile the supply of knowledge by climate science and the demand of information for decision-making at different levels. By making data,

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[11] https://www.ohchr.org/sites/default/files/documents/issues/indigenouspeoples/sr/statements/outcome-document-rome-feb-2024-meeting-un-mechanisms-indigenous-peoples-rights.pdf

[12] David Viner and Candice Howarth, 'Practitioners' Work and Evidence in IPCC Reports', *Nature Climate Change* 4, no. 10 (October 2014): 848–50, https://doi.org/10.1038/nclimate2362.

[13] https://climateurope2.eu/resources/public-deliverables

scenarios, and pathways *actionable*, practitioner knowledge can also enhance policy implementation and compliance.[14]

The challenges of engaging with local knowledge and practitioner knowledge include: broadening the spectrum of knowledge producers and target groups affected by and contributing to climate adaptation and mitigation; recognising different knowledge systems, diverse publication, review/valuation and communication practices; understanding the mechanisms and contexts in which the knowledge is embedded, as well as processes for engagement with knowledge holders themselves; considering criteria other than scientific credibility to assess the value and fitness for purpose of diverse systems of knowledge; reaching a diversified understanding of quality to achieve some degree of formalization.[15]

3.2. Practice in the IPCC and other relevant bodies

3.2.1. IPBES: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

Progressively, UN assessment bodies have created dedicated mechanisms to engage Indigenous Peoples and local knowledge holders in their processes. IPBES actively involves ILK[16] systems through its conceptual framework and a dedicated Task Force. Their 2019 Global Assessment[17], incorporated Indigenous perspectives and was endorsed by the UN Permanent Forum on Indigenous Issues.

The IPBES Plenary at its fifth session approved an “Approach to recognizing and working with Indigenous and local knowledge in IPBES” (annex II to decision IPBES-5/1). The implementation of this approach is overseen by a task force on ILK and coordinated by a TSU hosted at UNESCO. The work on ILK cuts across all assessments and other work of IPBES.

Each assessment establishes, as a practice, an ILK liaison group to coordinate work on ILK across all chapters. Assessments informally designate a co-chair ‘champion’ and have specific authors focus on ILK through formation of a liaison group that meets regularly and works on ILK-related questions that are woven into chapter structure and content from the earliest outlines

Reflection of the views of Indigenous Peoples and local communities as key stakeholders and contributors is enabled by holding dialogue workshops from start to end of each assessment, beginning with a dialogue on the scoping of an assessment, and then through additional dialogues coinciding with the first and second public review periods. Clear rules of procedure for ILK dialogues on Free, Prior and Informed Consent (FPIC) of participants, and guidelines on data sovereignty related to Indigenous Peoples and local communities.

Formal comments from participants in ILK dialogues are submitted during the public review periods to ensure author responses. A call for contributions is issued for each assessment to identify other forms and systems of knowledge that may not be easily found in the peer-reviewed literature. For the 2019 Global Assessment, an online call resulted in 1,199 additional documents for review by authors. Authors who are Indigenous are identified during the selection of CLAs and LAs, as well

[14] https://climateurope2.eu/resources/public-deliverable

[15] Dilling, L., & Lemos, M. C. (2011). Creating usable science: Opportunities and constraints for climate knowledge use and their implications for science policy. *Global environmental change*, *21*(2), 680-689.

[16] The concepts of Indigenous Knowledge (IK) and local knowledge (LK) are distinguished from each other by IPCC and other bodies. IPBES uses the term Indigenous and local knowledge (ILK). In this document, we distinguish between IK and LK, but use the term ILK when referring to IPBES specifically.

[17] 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.

as others who can contribute specific content as contributing authors. For example, four lead authors on the Nexus Assessment were themselves Indigenous.

IPBES has widened the concept of what counts as knowledge by including arts, songs, videos, and other approaches as types of evidence within the assessments.

3.2.2. Other UN bodies

The seventh edition of the Global Environment Outlook (GEO-7) 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 (LCIPP) enhances Indigenous engagement in climate discussions through its Facilitative Working Group (FWG) - the first UN mechanism with equal Indigenous and State representation that allows self-selection. The FWG has established guidelines for the 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.

3.2.3. National assessments

Several countries, including Australia, Brazil, Canada and New Zealand, have published IK-centred reports. One example is the *For Our Future: Indigenous Resilience Report*, published in 2024 as part of Canada's National Climate Assessment. This first Indigenous-led assessment of climate change impacts and adaptation strategies focuses 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, grounded in First Nations, Inuit and Métis knowledge, governance and priorities.

3.2.4. IPCC

The international scientific community, including the IPCC, has gradually acknowledged Indigenous Peoples' critical contributions to biodiversity conservation, climate change mitigation and adaptation strategies. Recognition is inconsistent across Working Groups and Indigenous Peoples and local communities' participation is limited.

The IPCC's initial acknowledgment began in the AR4 (2007) and expanded in the AR5 (2014) – with coverage that was 'general in scope and limited in length. IK were often framed as static and at risk' from climate change, rather than recognised as dynamic, adaptive, and actively transmitted.[18]

AR6 marked significant progress through several first-time inclusions: the Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC) explicitly discusses and characterises

[18] Pamela McElwee, 'A Tale of Two Panels: Learning and Coordinating across IPCC, IPBES, and Other Science-Policy Interfaces', *Climatic Change* 178, no. 3 (March 2025): 45, https://doi.org/10.1007/s10584-025-03869-9.

Indigenous knowledge, outlining how these knowledge systems provide context-specific understandings and complement scientific knowledge in assessing and responding to ocean and cryosphere changes, while the Summary for Policymakers of the Special Report on Climate Change and Land highlighted land rights as a key climate strategy. AR6 explicitly acknowledged the value of multiple knowledge forms – scientific, Indigenous, and local – for understanding climate adaptation, with citations of Indigenous content increasing across all WGII chapters (Carmona et al,, 2023).

However, these improvements were not accompanied by formal guidelines for IK inclusion (McElwee, 2025). The absence of clear criteria for what constitutes credible knowledge within the IPCC process often marginalises Indigenous perspectives. Procedural barriers persist, particularly the IPCC's reliance on peer-reviewed literature, which makes it difficult to incorporate IK that is often orally transmitted or recorded in grey literature.

Engagement with local knowledge and practitioner knowledge has been most visible in WGII, where chapters increasingly cite community-based adaptation experiences, case studies and grey literature. Nevertheless, analyses of past assessment cycles show that such material constitutes only a small fraction of the overall evidence base (Ford et al., 2012;). Barriers include language, access to non-indexed literature, and the absence of standardised methods for assessing the quality and relevance of non-peer-reviewed sources within IPCC procedures (McElwee, 2025).

3.3. Implications for the workshops

Any discussion on “engaging diverse knowledge systems” within the IPCC cannot start from a blank slate. Over the past decades, Indigenous Peoples have not only contributed knowledge to climate and biodiversity processes, but have also led their own assessment, monitoring and governance initiatives, and developed detailed ethical and methodological guidelines for how their knowledges should – and should not – be engaged (see for example, Inuit Circumpolar Council protocols).

Indigenous scholars and communities have developed rich methodological and ethical frameworks for research and assessment – including Elder-centred methodologies, community-based participatory research, “Two-Eyed Seeing”, and “honourable harvest” approaches to data – which explicitly aim to decolonise and indigenise knowledge production. These frameworks foreground relational accountability, reciprocity, Indigenous governance over knowledge, and long-term relationship-building, and they already offer concrete guidance on how collaborations between Indigenous and Western sciences can be conducted more ethically.

For the workshop, this has three main implications. First, the workshop should engage with Indigenous-led work. Second, the workshop provides an opportunity to recognise Indigenous leadership in setting terms of engagement. Third, engagement with diverse knowledge systems need to be considered together with questions about rights, Free, Prior and Informed Consent (FPIC), participation and power-sharing.

The IPBES experience indicates that the engagement of IK benefits from dialogue from the start, as well as networks of trust to ensure engagement and support from Indigenous Peoples and local communities The workshop can learn from documented tensions in previous assessments. For instance, the epistemological barrier where IK are perceived as “anecdotal” by some participants reflects institutional cultures that prioritise certain forms of evidence over others.[19] Addressing this could require capacity-building among authors and Bureau members to understand and value diverse epistemologies.

[19] McElwee.

4. Methods of assessment

The IPCC is operating at a time of unprecedented change in information technology. It is faced with a dual transformation: an exponential increase in scientific data and a fundamental shift in the tools available to process it.

- **The synthesis crisis:** the volume of climate-related literature is expanding exponentially, currently roughly doubling every five to six years. For the Seventh Assessment Report (AR7), author teams must navigate a sea of evidence that is physically impossible to review through traditional manual methods alone. The aspiration to engage with more diverse systems of knowledge and different types of evidence adds to this challenge.
- **The artificial intelligence (AI) revolution:** the AI field is characterised by a rapid pace and scale of change. New models, architectures and capabilities emerge monthly. AI is evolving faster than IPCC can conduct assessments. Since the conclusion of the AR6, "generative AI" has moved from a specialised data-science niche to a ubiquitous general-purpose tool. This technological shift is both a challenge to be managed and an opportunity to harness new tools to improve the breadth and quality of assessments.

4.1. Current status

4.1.1. Artificial intelligence

AI systems use statistical models trained on large datasets to identify patterns, make predictions, and perform tasks that traditionally required human judgment, including categorising documents, generating text and conducting multi-step research workflows.

The potential benefits to IPCC of integrating AI include:

- **Accelerating timeliness:** reducing the time between the publication of new science and its integration into assessment, providing more responsive information to global policymakers.
- **Enhancing comprehensiveness:** using automated screening to ensure that no relevant paper (including those in non-English languages or from the global south) is overlooked.
- **Preserving quality and rigor:** use digital "provenance tracking" to enhance transparency and create more robust links between the final report findings and the underlying evidence base.

At the same time the risks are high. Improper use of AI could undermine scientific authority through hallucinations, opacity, or loss of traceability, thereby risking erosion of the trust of member governments and the global public. There are also more general concerns regarding unequal representation and access, transparency, and implicit biases that the IPCC would need to acknowledge and address.

AI is already a widespread and integral component of the climate science that the IPCC assesses. The underlying materials of the assessments, from complex climate models and remote sensing datasets to the primary peer-reviewed literature, increasingly rely on AI and machine learning for data processing, pattern recognition, and simulation, including multimodal AI systems that analyse satellite imagery, extract data from visualisations, and process climate model outputs.

Defining the AI landscape

It is important to distinguish between specific AI methods. Each carries distinct implications in terms of transparency and scientific rigour (Table 3).

While AI tools offer significant capabilities for accelerating and scaling certain aspects of the assessment process, it is equally important to understand their fundamental limitations (Table 4). These are not limitations that will be resolved through incremental improvements; they reflect the inherent architecture of how these systems operate.

Table 3. AI methodologies: strengths, shortfalls and relevance. “Data requirements” relates to the “Equitable access” question – some approaches require resources that may not be available to all author teams.

Primary function	Core strength	IPCC task relevance	Data requirements	Known shortfalls
Discriminative (ML)				
Categorisation	Speed & consistency	Literature screening: filtering 50,000+ records for relevance. Comment routing: categorising review comments.	Requires large labelled training datasets (thousands of examples) specific to IPCC categories.	Systemic bias: may favour global north data if not balanced. Reproducibility requires frozen models and versioned data.
Embedding models				
Semantic indexing	Conceptual similarity	Literature discovery: finding related papers across languages and terminology. Duplicate detection.	Requires quality text corpus but no labelled data. Pre-trained models available.	Semantic precision: may conflate distinct scientific concepts. Language imbalance: lower quality for non-English text.
Generative (large language models (LLM))				
Transformation & generation	Linguistic versatility	Drafting and translation: summarising tables; translating abstracts. Accessibility: alternative text formats.	No task-specific data needed. Relies on provider's training.	Hallucinations: can create confident but false claims. Non-deterministic outputs. Copyright concerns. High energy cost.
Small language models (SLMs)				
Specialised classification	Technical precision	Technical classification: distinguishing nuanced terms (e.g., transition vs. physical risk). Confidence calibration.	Requires domain-specific training corpus (e.g., climate literature). Lower computational needs than LLMs.	Narrow scope: macks broad "world knowledge." Training data obsolescence: frozen at training date.
Agentic / retrieval-augmented generation (RAG)				
Iterative research	Traceability & provenance	Synthesis support: mapping contradictory claims across a specific corpus with citation trails.	Requires access to document corpus (via model context protocol or similar). Potentially high API costs.	Cascade errors: multi-step errors compound. Cost barriers: creates access inequality. Technical volatility: emerging standards.

Table 4. What AI cannot do.

What AI cannot do	Explanations
AI cannot replace expert judgment on scientific quality	AI systems can identify patterns in existing literature, but they cannot independently assess the methodological rigor or trustworthiness of a study. An AI might surface a highly cited paper, but only human experts can judge whether that citation count reflects scientific merit or controversy.
AI cannot assess causation or resolve genuine scientific disagreement	AI can identify that two papers reach different conclusions and can even assess which position has more empirical support in published literature, but AI cannot evaluate which set of physical assumptions is more defensible or judge the relative weight of different lines of evidence. The assessment process fundamentally depends on expert judgment to synthesise conflicting evidence and determine the balance of scientific understanding.
AI cannot understand context beyond its training data	AI models operate by pattern-matching against their training data and cannot reason about genuinely novel situations. AI trained on pre-2020 literature cannot meaningfully assess entirely new climate phenomena first observed in 2024–2025. Models trained predominantly on global north literature may not recognize the significance of region-specific impacts or miss critical connections to IK and social systems if these relationships are not well represented in training data.
AI cannot assign confidence or likelihood ratings	The IPCC's calibrated uncertainty language (e.g., "very high confidence", "likely", "virtually certain") requires human judgment integrating evidence quality, mechanistic understanding and expert knowledge that may not yet be published. Recent research shows that general-purpose LLMs tend toward overconfidence, while specialised models struggle to capture the nuanced reasoning behind IPCC confidence levels.
AI cannot navigate normative or value-laden questions	While the IPCC strives to be policy-neutral, assessment necessarily involves choices about scope, emphasis, and framing that require human deliberation to ensure diverse voices and values are represented.
AI cannot ensure its own transparency or auditability	Current AI systems operate as complex statistical black boxes with fundamental limits to explainability. We cannot fully explain why models classify particular papers as "relevant" beyond pointing to statistical patterns. Model updates, non-deterministic outputs and proprietary training data mean the same query may yield different results over time. AI must be deployed in ways where human experts can verify, question and override its outputs – not as a self-validating authority.
AI cannot function independently without human direction	AI cannot determine what questions the assessment should address, recognise when an entire approach is flawed or autonomously adjust analysis when the scope changes (e.g., in response to reviewer comments). AI is a tool requiring continuous human guidance, oversight, and course-correction, not a substitute for the intellectual leadership of author teams.

Environmental impact

The environmental costs associated with AI include water for data centre cooling, rare earth materials for hardware, and electronic waste, as well as high levels of energy use.

Resource requirements vary dramatically across AI approaches. Agentic systems making multiple iterative queries can use five to ten times more resources per task than simpler methods. Training bespoke models (e.g., for literature classification) is resource-intensive upfront, but enables cheap repeated use across thousands of authors. General-purpose LLMs require no training, but have higher per-use costs. Different approaches can differ by 100x in resource consumption for similar tasks. While the IPCC would likely use pre-trained models, inference at scale still requires

substantial resources. Infrastructure choices such as local versus cloud processing, specialised versus general-purpose models, and batch versus real-time operations have significant environmental implications.

IPCC may wish to weigh environmental costs against the benefits in terms of the potential for more comprehensive assessment and the carbon footprint of alternative approaches involving extended timelines, international travel, and potentially duplicated effort.

4.1.2. Evidence synthesis: systematic reviews and other approaches

Evidence synthesis refers to a family of structured, transparent, and reproducible approaches for identifying, appraising, and integrating existing research to answer well-defined questions and inform decision-making. A suite of Nature commentaries[20] provides an easy introduction to the topic and its relevance today. Similar to primary research, it employs rigorous methods to synthesise evidence through a common set of methodological steps[21,22]:

1. scoping (objective and question formulation);
2. systematic searching of the scientific literature;
3. transparent selection of relevant studies;
4. data extraction and harmonisation;
5. critical appraisal to assess study quality;
6. assessment of the body of evidence using transparent synthesis methodologies

Methodological guidance and reporting standards are provided, and work is coordinated across fields by international evidence synthesis collaboratives, including the Cochrane Collaboration in the health sciences[23], the Campbell Collaboration in the social science[24], and the Collaboration for Environmental Evidence in the environmental sciences[25].

A large and diverse set of evidence synthesis methodologies has been developed to address different types of review questions and to synthesise quantitative, qualitative, and mixed-methods evidence[26]. For example, evidence mapping approaches (such as scoping reviews, systematic maps and evidence gap maps) are designed to comprehensively catalogue and describe the distribution, characteristics and gaps in evidence across broad thematic domains, without necessarily synthesising findings. Systematic reviews, by contrast, are built around more narrowly framed questions and aim to synthesise evidence quantitatively or qualitatively. These include

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[20] 'Evidence Synthesis Needs Greater Incentives', *Nature* 558, no. 7710 (21 June 2018): 344–344, https://doi.org/10.1038/d41586-018-05464-8.

[21] 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.

[22] 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.

[23] 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.

[24] Ariel M. Aloe et al., 'Campbell Standards: Modernizing Campbell's Methodologic Expectations for Campbell Collaboration Intervention Reviews (MECCIR)', *Campbell Systematic Reviews* 20, no. 4 (December 2024): e1445, https://doi.org/10.1002/cl2.1445.

[25] Collaboration for Environmental Evidence, 'Guidelines and Standards for Evidence Synthesis in Environmental Management. Version 5.1', ed. Andrew S Pullin et al., 2022, https://environmentalevidence.org/information-for-authors/.

[26] e.g. James D. Ford et al., 'Recommendations for Producing Knowledge Syntheses to Inform Climate Change Assessments', *Nature Climate Change* 15, no. 7 (July 2025): 698–708, https://doi.org/10.1038/s41558-025-02354-6.

meta-analyses, realist synthesis, qualitative comparative analysis, and concept synthesis, among many others.

Depending on how evidence synthesis methods are classified, there are up to 20 different methods available to address different review questions and deal with different lines of evidence.[27] Umbrella reviews focus on synthesising evidence from existing reviews, while rapid reviews and living syntheses offer alternative approaches that explicitly trade off breadth, rigour and timeliness.

The evidence synthesis community has also developed structured frameworks – such as GRADE (Grading of Recommendations, Assessment, Development and Evaluations) – to assess the certainty of scientific evidence and the strength of findings. GRADE[28], for example, provides a transparent and systematic approach to judging the level of confidence that decision-makers can place in a given body of evidence. Assessments typically consider five domains – risk of bias, inconsistency, indirectness, imprecision, and publication bias – and can be applied to both quantitative and qualitative evidence. As such, these frameworks are complementary to the IPCC uncertainty guidance[29] and offer opportunities for cross-fertilisation, as well as for more detailed, line-of-evidence–specific supplementary guidance. A recent working paper[30] outlines several of these opportunities.

Importantly, these methods need not be limited to quantitative meta-analyses: they can be adapted to incorporate qualitative studies, grey literature, community-generated reports and, where appropriate and with consent, IK, provided that protocols explicitly account for different epistemologies and validation practices.

Links to the other workshop themes: diverse knowledge systems and AI

Within the evidence synthesis community, sustained efforts have been made to engage with a broader range of methodologies (ranging from systematic reviews to deliberative dialogues) and diverse forms of evidence and knowledge, including empirical, scientific, Indigenous, and practitioner knowledge. This expanded set of approaches is often referred to as knowledge synthesis[31]. Within the scope of this workshop, we therefore consider not only evidence synthesis in the narrow sense, but also these broader knowledge synthesis approaches.

At the same time, there is a large and rapidly growing global effort to use AI to make evidence synthesis faster, cheaper, more useful, and continuously updated (“living”). A recent report by the Wellcome Trust[32] provides an overview of the state of the field in the development and application of digital evidence synthesis tools and highlights the current lack of rigorous evaluations of tool performance. The Evidence Synthesis Infrastructure Collaborative[33] is a cross-sector partnership that coordinates the development, integration, and governance of shared data systems, digital tools, standards, and capacity to make evidence synthesis faster, more rigorous, and more decision-relevant. In parallel, the evidence synthesis community has begun developing

[27] Danielle Pollock et al., ‘Over 1000 Terms Have Been Used to Describe Evidence Synthesis: A Scoping Review’, *BMJ Evidence-Based Medicine*, 2025, bmjebm-2024-113391, https://doi.org/10.1136/bmjebm-2024-113391.

[28] GRADE Working Group, *The GRADE Book Version 1.0 (Updated September 2024)*, ed. I Neumann and H Schünemann, n.d., https://book.gradepro.org.

[29] IPCC, ‘Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties’.

[30] Klaas Miersch et al., ‘Operationalising the IPCC Uncertainty Guidance for Climate Policy Evaluation’ (MetaArXiv, 21 January 2026), https://doi.org/10.31222/osf.io/fqtdr_v1.

[31] Ford et al., ‘Recommendations for Producing Knowledge Syntheses to Inform Climate Change Assessments’.

[32] The Wellcome Trust, ‘Digital Evidence Synthesis Tools for Climate & Health’, 17 December 2024, https://doi.org/10.21955/wellcomeopenres.1115400.1.

[33] see 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.

comprehensive guidelines for the responsible use of AI in evidence synthesis.[34]

4.1.3. *Ex-post* evaluation of climate action and other relevant actions

Assessing the effects of climate-relevant actions (including targeted climate policies or policy packages), taking different framework conditions in real-world settings into account can help to inform future action that is not only effective but also efficient and equitable at scale.[35,36,37]

There is a growing demand to identify which interventions achieve the intended effects, under what conditions, why they succeed or fail, and who benefits or bears the costs. This includes assessing the broader implications of individual policies or complex policy mixes – such as their effects on innovation, labour markets, inequality, and public health – to enable evidence-informed policymaking[38].

Over the last decades, national governments, subnational and non-state actors have accumulated vast experience in designing and implementing climate-relevant policies and interventions – challenging traditional ways of policy impact evaluation[39]. Current efforts to track these activities, such as the mitigation-focused *OECD's Climate Action Dashboard*[40], document over a thousand policies to date, and *Climate Policy Radar*'s AI-augmented database of 30,000+ national climate law and policy documents[41]. This data is analysed by an emerging body of research examining the real-world impacts of these policies across various political contexts and outcomes, often based on systematic reviews.

The IPCC has increasingly been asked to assess policy options and actions relevant for mitigation and adaptation. In the AR6, the final part of the Synthesis Report focused on "Near-Term Responses" across sectors and systems. In the AR7, the Working Group II outline includes requests for information on "policy contexts" and "monitoring and evaluation to design better policies, options and actions". The Working Group III outline includes a whole chapter on "Enablers and Barriers" and draws specific attention to "policy innovation, learning, and diffusion, and assessment of policy instruments". However, policymaking does not exist independently from politics and other contextual factors, and transitions are non-linear and characterised by deep uncertainty.[42,43] Modelling the effects of specific policies is complex and robust scientific methods to facilitate predictions or accounting for complex causal mechanisms are often lacking, further

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[34] James Thomas et al., 'Responsible Use of AI in Evidence SynthEsis (RAISE): Recommendations and Guidance', *Open Science Framework*, 2025, https://doi.org/10.17605/OSF.IO/FWAUD.

[35] 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.

[36] Matilda Miljand, 'Using Systematic Review Methods to Evaluate Environmental Public Policy: Methodological Challenges and Potential Usefulness', *Environmental Science & Policy* 105 (March 2020): 47–55, https://doi.org/10.1016/j.envsci.2019.12.008.

[37] Pauline F D Scheelbeek et al., 'The Effects on Public Health of Climate Change Adaptation Responses: A Systematic Review of Evidence from Low- and Middle-Income Countries', *Environmental Research Letters* 16, no. 7 (1 July 2021): 073001, https://doi.org/10.1088/1748-9326/ac092c.

[38] Paul Cairney, *The Politics of Evidence-Based Policy Making* (London: Palgrave Macmillan UK, 2016), https://doi.org/10.1057/978-1-137-51781-4.

[39] Christian Adam et al., 'Neglected Challenges to Evidence-Based Policy-Making: The Problem of Policy Accumulation', *Policy Sciences* 51, no. 3 (September 2018): 269–90, https://doi.org/10.1007/s11077-018-9318-4.

[40] OECD, 'Climate Action Dashboard', accessed 1 February 2026, https://www.oecd.org/en/data/dashboards/climate-action-dashboard.html.

[41] www.climatepolicyradar.org

[42] Oliver Geden, 'The Paris Agreement and the Inherent Inconsistency of Climate Policymaking', *WIREs Climate Change* 7, no. 6 (November 2016): 790–97, https://doi.org/10.1002/wcc.427.

[43] Cameron Hepburn et al., 'Economic Models and Frameworks to Guide Climate Policy', *Oxford Review of Economic Policy* 41, no. 2 (23 December 2025): 616–52, https://doi.org/10.1093/oxrep/graf020.

complicating global assessments. Specifically, in the case of adaptation, evaluation limitations may be logistical, may result from difficulties in measuring long term impacts, but may also reflect the theoretical complexity of adaptation.[44]

4.2. AI-related practice in the IPCC and other relevant bodies

4.2.1. Principles for the ethical use of AI in the UN system

The UN has established principles to guide the ethical use of AI in the UN system, noting its potential as a positive force for addressing and accelerating progress in achieving the Sustainable Development Goals while recognising the risks and challenges, such as those resulting from the malicious use of technology or from deepening inequalities and divides.

The principles cover:

- **Do no harm**: AI systems should not be used in ways that cause or exacerbate harm, whether individual or collective, including harm to social, cultural, economic, natural or political environments.
- **Defined purpose, necessity and proportionality**: the use of AI systems should be justified, appropriate in the context and not exceed what is necessary, and proportionate to achieve legitimate aims
- **Safety and security**: safety and security risks should be identified, addressed and mitigated throughout the artificial intelligence system's life cycle to prevent or, at least, limit any potential or actual harm to humans, the environment or ecosystems.
- **Fairness and non-discrimination**: UN system organizations should aim to ensure the equal and just distribution of the benefits, risks and costs associated with AI systems and to prevent bias, discrimination and stigmatization of any kind.
- **Sustainability**: AI should be aimed at promoting environmental, economic and social sustainability.
- **Right to privacy, data protection and data governance**: individuals' privacy and rights as data subjects must be respected, protected and promoted throughout the life cycle of artificial intelligence systems.

4.2.2. UNEP GEO-7 generative AI guidance

UNEP required all contributions to the most recent Global Environmental outlook (GEO-7) to be original work, with text, research, and graphics solely drafted by the contributing experts.[45]

Guidance on the use of generative AI-based tools was developed clarifying how experts can potentially utilise such tools while ensuring that all contributions to GEO-7 uphold this requirement. It outlines potential strengths of AI-based natural language processing (NLP) systems, including enhanced inclusivity for non-native English speakers, enhanced literature search and more comprehensive coverage, and weaknesses such as errors, inaccuracies and hallucinations, lack of

[44] Adaptation Fund, 'Ex Post Evaluation Toolkit', accessed 1 February 2026, https://www.adaptation-fund.org/about/evaluation/evaluation-resources/ex-post-toolkit/.

[45] 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.

critical thinking and domain expertise, ethical concerns and risk of bias. It highlights key considerations of responsible use such as verification by domain experts, author responsibility, transparent disclosure of AI use in research and analysis and data integrity.

UNEP excludes direct use of NLP generated text in manuscripts. Any use of generative AI/NLP systems in the GEO-7 assessment was subject to prior approval by UNEP and public disclosure in each publication.

In addition, the note underscores the risk of video and audio-material being used to create avatars impersonating experts involved in the GEO process and calls for limiting such recording to the extent possible.

4.2.3. Approach in the IPCC Special Report on Climate Change and Cities

The Special Report on Climate Change and Cities is the first product of the seventh assessment cycle. The cross-Working Group Co-chairs and TSUs have developed and shared a guidance note[46] concerning the responsible use of AI technologies and tools by authors.

The core principle is that authors are fully responsible for their delivered text, and while AI can support certain tasks with proper documentation and verification (e.g. search, translation, dataset organisation), the core assessment process requires direct human expertise and judgment. Hence authors should not use AI for writing assessment text, drawing scientific conclusions, creating summaries or developing figures.

Any use of AI should align with Principles for the Ethical Use of Artificial Intelligence in the United Nations System (see section 4.2.1) and adhere to the relevant principles governing IPCC work[47].

The guidance note has been revised to incorporate feedback from authors and now contains a 7-page-long table of use cases for which AI based tools are available and/or commonly used within the scientific community, grouped by specific tasks[48]. A colour code (Figure 5) is used to designate what constitutes permitted use of AI, use with caution, and prohibited use.

All author teams must document AI usage and report it per chapter through the mandatory AI Usage Declaration form, and all submitted material will be systematically checked by TSU for AI usage as well as plagiarism. To the extent possible, Co-chairs plan to incorporate the recommendations from the *Workshop on Methods of Assessment* into the ongoing assessment process for the Special Report on Climate Change and Cities.

✓	Permitted	AI use is acceptable with proper documentation and verification (as specified in ~~application~~ Usage requirements column)
!	Caution	AI use requires extensive expert verification, has significant limitations, and should be used sparingly
×	Prohibited	AI use is strictly forbidden under any circumstances

Figure 5. Current colour code used in the guidance note.

[46] Guidance Note of Use of AI in SRCities - October 2025.pdf (see SharePoint site set up for workshops).

[47] IPCC, 'IPCC Procedures'.

[48] Assessment Writing and Content Creation Text Refinement, Scientific Analysis and Interpretation, Figure and Visualization Creation, Literature Discovery and Organisation, Translation Support, Data Organisation and Analysis, Brainstorming and Conceptual Support, Code Generation and Analysis Support, and Quality Control and Verification.

4.3. Implications for the workshops

4.3.1. Artificial intelligence

The task of this workshop is to address the opportunities and risks associated with the use of AI in IPCC assessments. The opportunities lie in making existing science and other sources of knowledge more discoverable and the synthesis process more comprehensive, ensuring that the vast volume of literature already produced (including via AI-enhanced methods) is captured with the highest degree of rigour and transparency.[49,50] By formalising these methods, the IPCC can ensure its reports are both timely and authoritative, reflecting the modern digital landscape in which science is now conducted.

However, the limitations outlined above raise important questions: where can AI reliably augment expert judgment, and where does the risk of undetectable failure modes make automation inappropriate? A first set of questions the workshop may start from are:

- Which tasks involve primarily pattern recognition and highly repetitive work (where AI assistance may be appropriate with oversight) versus complex synthesis and judgment (where AI's limitations may be fundamental)?
- For tasks where AI assistance is considered, what level and type of human verification is feasible given practical constraints on author team time?
- How can workflows ensure AI outputs requiring expert judgment receive it, rather than being accepted by default due to volume or time pressure?
- Where AI is used for efficiency gains, what documentation and transparency standards maintain IPCC credibility?
- What are the boundary cases – tasks between clear “appropriate” and “inappropriate” categories – and what safeguards might make them viable?
- How should environmental costs (energy, water, materials, infrastructure) factor into decisions about AI adoption?

In addition to known challenges, uncertainties arise from future developments. Table 5 maps a set of issues against critical questions that require expert judgment. These unknowns are not barriers to AI adoption, but rather decision points where the workshop could recommend guidelines and safeguards for IPCC workflows.

Each issue identified in this table involves addressing questions requiring expert deliberation. The workshop could prioritise which issues can be resolved during AR7, which can be addressed tin the longer term.

[49] Holly Jean Buck et al., ‘Four Scenarios for an IPCC Navigating Artificial Intelligence’, SWP Working Paper, September 2025, https://www.swp-berlin.org/publications/products/arbeitspapiere/WP_Geden_etal_IPCC_290925.pdf.

[50] Alaa Al Khourdajie, ‘The Role of Artificial Intelligence in Climate Change Scientific Assessments’, ed. Taoyuan Wei, *PLOS Climate* 4, no. 9 (12 September 2025): e0000706, https://doi.org/10.1371/journal.pclm.0000706.

Table 5. Map of issues and questions related to AI.

Issue	Questions
Human role	Expert judgment is required for “Confidence” and “Likelihood” ratings and for assessing study quality. At what specific stages does human oversight become insufficient or overwhelmed? How do we ensure AI assistance doesn't inadvertently shift judgment from domain experts to those most comfortable with AI tools?
Traceability	How do we maintain an “audit trail” that is transparent to non-experts, including policymakers and the public?
Bias and equity	AI reflects the biases of its training data, which is predominantly from the Global North and in English. How do we ensure AI does not further marginalize non-English literature, Indigenous knowledge, or research from developing nations?
Stability and reproducibility	Models change rapidly as providers update them. How do we ensure a finding generated in 2026 remains reproducible in 2029 or beyond?
Legal and intellectual property	AI training data often includes copyrighted material; legal frameworks vary by jurisdiction. Who owns AI-generated content in IPCC reports? Are there copyright or IP implications that vary across c legal systems?
Model continuity and vendor lock-in	Commercial AI providers regularly update or deprecate models with limited notice to users. If a critical model is deprecated mid-assessment cycle, what is the contingency plan?
Adversarial robustness	AI systems can be manipulated through carefully crafted inputs. Could bad actors game AI screening systems to boost low-quality papers or suppress important findings?
Interpretability and explainability	We can log inputs and outputs, but cannot fully explain internal decision-making of complex models (especially neural networks). Can we explain *why* an AI flagged or didn't flag a specific paper beyond pointing to statistical patterns?
Data sovereignty and privacy	Different member nations have varying requirements for data handling (e.g., GDPR in EU, data localization requirements in other regions). How do we ensure AI workflows comply with all member nations' data protection requirements?
Governance and decision authority	Individual author teams and Technical Support Units currently make their own methodological choices within IPCC procedures. When should there be IPCC-wide mandatory standards, working group-level guidelines, or individual author team discretion?

4.3.2. Evidence synthesis: systematic reviews and other approaches

The task of conducting IPCC assessments is becoming increasingly challenging as the volume of scientific literature on climate change grows exponentially. Keeping abreast of the science, even within narrowly defined fields, and extracting what is new and relevant is becoming ever more difficult. For example, each year the number of new scientific studies on climate change is now comparable to the total literature assessed across the first four IPCC assessment cycles (Figure 6**Error! Reference source not found.**). Given this sheer volume, IPCC authors cannot comprehensively assess primary studies individually. As a result, the provision of comprehensive

and rigorous assessments increasingly relies on the availability of curated evidence derived from robust evidence synthesis efforts.[51]

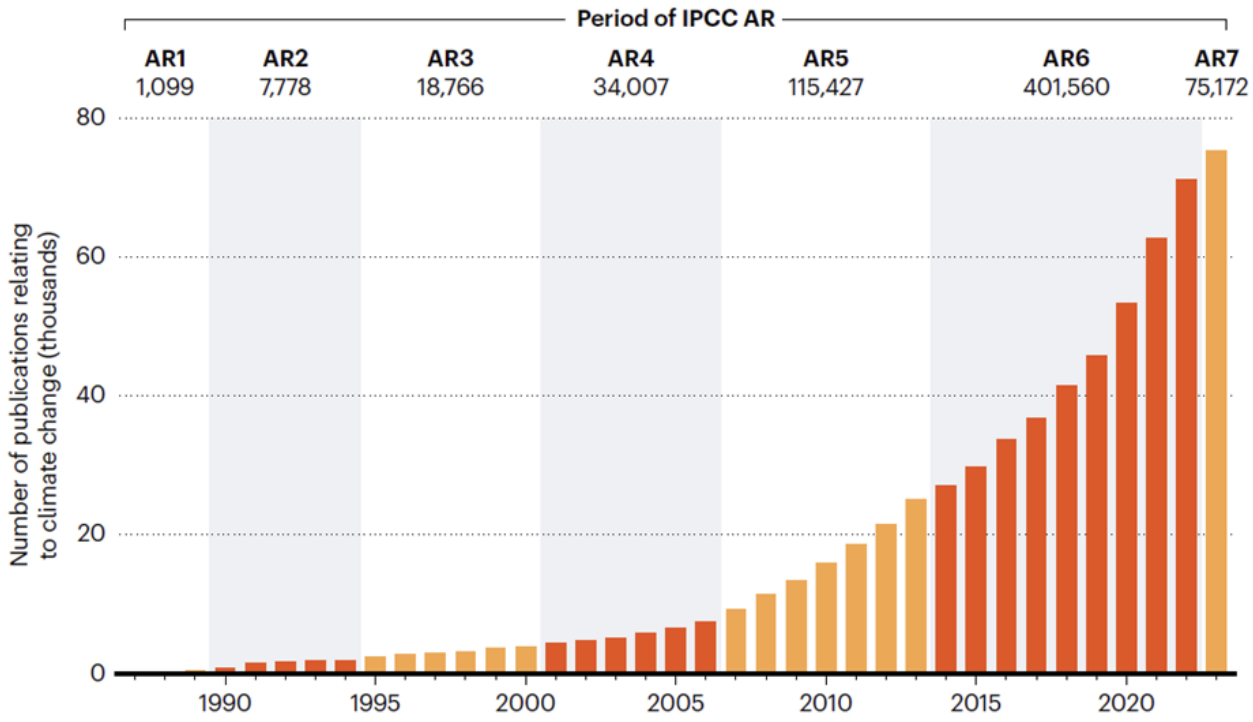

Figure 6. The annual number of scientific publications related to climate change has soared since the IPCC began assessing the science of climate change for its periodic assessment reports (ARs).[52]

In the field of modelling, IPCC authors have been able to draw on evidence from model intercomparison exercises such as CMIP[53], ISI-MIP[54] or ScenarioMIP[55]. These initiatives, organised by a global modelling community, harmonise and aggregate results from multiple individual models and facilitate systematic learning.[56] By contrast, no comparable methodological frameworks are widely applied within the climate community to systematically synthesise empirical evidence, where traditional literature reviews remain the dominant approach.

Traditional literature reviews typically lack a clear, transparent, and reproducible synthesis methodology. A substantial body of literature across disciplines has documented the biases to which such reviews are commonly subject. Critically, many lack an explicit and transparent research protocol to ensure rigour and reproducibility. Other frequent limitations include selection bias (due to incomplete search and selection strategies), publication bias (stemming from the exclusion of grey literature), insufficient critical appraisal of study quality, and inconsistent data

[51] see Minx et al., 'Learning about Climate Change Solutions in the IPCC and Beyond'; Ford et al., 'Recommendations for Producing Knowledge Syntheses to Inform Climate Change Assessments'.

[52] Pearson, '"Evidence Bank" Could Help Scientists To Tackle Climate Change'.

[53] John P. Dunne et al., 'An Evolving Coupled Model Intercomparison Project Phase 7 (CMIP7) and Fast Track in Support of Future Climate Assessment', *Geoscientific Model Development* 18, no. 19 (1 October 2025): 6671–6700, https://doi.org/10.5194/gmd-18-6671-2025.

[54] 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.

[55] Detlef Van Vuuren et al., 'The Scenario Model Intercomparison Project for CMIP7 (ScenarioMIP-CMIP7)' (Climate and Earth system modeling, 30 January 2025), https://doi.org/10.5194/egusphere-2024-3765.

[56] An IPCC Workshop held in 2023 identified ways that scenario practices and the approach to scenario databases could be enhanced to address issues linked to equity and the comprehensiveness of the databases. https://www.ipcc.ch/site/assets/uploads/2023/07/IPCC_2023_Workshop_Report_Scenarios.pdf

extraction and harmonisation.[57] It has therefore been argued that learning from empirical evidence in IPCC assessments could be substantially strengthened through the systematic application of evidence synthesis methods in the field of climate. Community efforts that contribute to collecting rigorous, synthetic evidence in open data banks could be help to further improve science assessments such as those by the IPCC.[58]

Others recommend that climate change assessments move towards a culture of "knowledge synthesis" in which clearly scoped, protocol-driven reviews are routinely commissioned to inform key assessment questions, including those related to Indigenous, local and practitioner knowledges.[59] They highlight the importance of involving decision-makers and knowledge holders early in scoping, using inclusive search strategies that go beyond major databases, and documenting selection and appraisal criteria transparently so that users can trace how particular lines of evidence, including non-academic sources, inform assessment findings.

4.3.3. *Ex-post* evaluation

The workshop will explore approaches for integrating both quantitative and qualitative evidence from policy impact evaluations into IPCC reports, evidence that is often only available from sources other than peer-reviewed literature.

While the primary focus is on ***ex-post*** (retrospective) evaluation evidence that examines the effects of implemented policies and interventions, discussions can also address ***ex-ante*** (prospective) approaches from modelling and policy design studies, or combinations of both, such as the politically prominent but methodologically challenging combination of ***ex-post*** and ***ex-ante*** evaluation of global climate policy post-Paris, a comparison often expressed in terms of end-of-century temperature estimates.[60]

[57] e.g., 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.

[58] Pearson, '"Evidence Bank" Could Help Scientists To Tackle Climate Change'.

[59] Ford et al., 'Recommendations for Producing Knowledge Syntheses to Inform Climate Change Assessments'.

[60] UNEP, 'Emissions Gap Report 2025: Off Target - Continued Collective Inaction Puts Global Temperature Goal at Risk', trans. A. Olhoff et al., 2025, https://doi.org/10.59117/20.500.11822/48854.