

Submission by the International Institute for Applied Systems Analysis (IIASA)
The Energy, Climate, and Environment (ECE) Program
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Subject: Views on possible themes for the eighteenth meeting of the Research Dialogue, to be held in conjunction with SBSTA 64

The Energy, Climate, and Environment (ECE) Program of the International Institute for Applied Systems Analysis (IIASA) welcomes the invitation by the Subsidiary Body for Scientific and Technological Advice (SBSTA) to submit views on possible themes for the eighteenth meeting of the Research Dialogue to be held in conjunction with SBSTA 64, in accordance with FCCC/SBSTA/2025/4.

IIASA is an international research institute founded in 1972 that advances systems analysis to address complex global challenges. Through interdisciplinary research and international collaboration, IIASA develops analytical tools and scientific insights that support evidence-based policymaking on climate change, energy transitions, and sustainable development.

The Energy, Climate, and Environment (ECE) Program at IIASA conducts research on the interactions between energy systems, climate change mitigation, air pollution, land use, and sustainable development. Through integrated assessment modeling, scenario analysis, and systems approaches, the program explores pathways consistent with the goals of the Paris Agreement while considering environmental, economic, and social dimensions of sustainable development.

Researchers from IIASA contribute actively to international scientific assessments and policy processes, including the work of the Intergovernmental Panel on Climate Change (IPCC) and research initiatives supporting the UNFCCC process. The Research Dialogue provides an important platform for exchange between the scientific community and Parties to the UNFCCC.

In this context, the Energy, Climate, and Environment (ECE) Program at the International Institute for Applied Systems Analysis (IIASA) proposes to focus discussion at the eighteenth meeting of the Research Dialogue on **major advances in climate change scenario research since the IPCC Sixth Assessment Report (AR6)**. Quantitative scenarios play a central role in assessing pathways consistent with the long-term temperature goals of the Paris Agreement by translating socio-economic developments into greenhouse gas emissions trajectories and climate outcomes, enabling the evaluation of mitigation strategies, technological transitions, and policy options. Since AR6, substantial progress has been made in the development of global mitigation scenarios and modeling frameworks, alongside new initiatives aimed at improving the transparency, diversity, and policy relevance of scenario analysis. These efforts respond to research needs identified during AR6 and provide more comprehensive and flexible scenario resources for researchers and policymakers. An overview of these developments would help the UNFCCC community better understand the scenario benchmarks used in international assessments and support future evaluations of progress toward the

goals of the Paris Agreement, including the Global Stocktake. The sections below highlight key research strands and methodological advances since AR6.

Continuously updated scenario collections to inform climate action

Recent research initiatives aim to improve access to up-to-date scenario information and enhance transparency in scenario assessment. One example is the **Scenario Compass Initiative**, which introduces a continuously updated and curated collection of global emissions scenarios. The current release represents the **first major update of the global scenario database since the IPCC Sixth Assessment Report (AR6)** and is designed to be updated on an annual basis. The dynamic database enables the ongoing submission and evaluation of new scenarios while maintaining quality control and transparency. The initiative assesses scenarios against feasibility and sustainability criteria and **derives policy-relevant benchmarks across key mitigation dimensions**, including near-term emissions reductions, renewable energy deployment, fossil fuel phase-down, net-zero timing, and the reliance on net-negative emissions technologies. Such initiatives help ensure that scenario assessments remain aligned with rapidly evolving technological, policy, and socio-economic developments.

Scenario frameworks incorporating justice considerations

Recent research also advances the explicit integration of justice considerations into integrated assessment modeling frameworks. The **JustMIP** model intercomparison initiative, for example, explores how different justice dimensions can be incorporated directly into scenario design. These scenarios examine differentiated regional effort-sharing, universal achievement of decent living standards and minimum energy access, and stronger sustainability constraints on biomass and carbon storage. By analyzing how these elements interact with Paris Agreement temperature goals, they provide insights into trade-offs and synergies between climate mitigation, development objectives, and justice considerations.

Scenarios exploring circular economy strategies in deep decarbonization pathways

Emerging research also highlights the role of circular economy strategies in achieving net-zero greenhouse gas emissions. In many mitigation strategies, emissions embodied in infrastructure, buildings, vehicles, and other goods receive less attention than emissions associated with their use. Circular economy approaches—including eco-design, reuse, repair, sharing, and recycling—can significantly reduce embodied emissions while lowering material demand, energy use, and waste generation. Scenario analyses suggest that these strategies become increasingly important as economies approach net-zero emissions, when operational emissions are largely reduced and embodied emissions represent a growing share of remaining emissions. Circular economy strategies can therefore reduce residual emissions and lower the reliance on carbon dioxide removal technologies.

Concluding remarks

The ECE Program at IIASA considers that a discussion of recent advances in scenario development would provide valuable insights for Parties by highlighting new analytical tools, emerging scenario frameworks, and evolving mitigation pathways since IPCC AR6. Such exchanges could help strengthen the interface between scientific research and policy discussions under the UN.