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Climate Change Mitigation Pathways: Scientific Strategies for Achieving Net-Zero Emissions

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Limiting global warming to internationally agreed targets requires immediate and substantial reductions in greenhouse gas emissions across every sector of society. This presentation explores the latest scientific evidence supporting net-zero emission pathways, with a focus on integrated climate models, carbon budgeting, and long-term mitigation strategies. Advances in Earth system modeling have significantly improved the ability to evaluate future climate scenarios and assess the impacts of policy decisions on global temperature, biodiversity, and socioeconomic development.

The session discusses the rapid expansion of renewable energy technologies, electrification of transportation, industrial decarbonization, carbon capture and storage (CCS), hydrogen-based energy systems, and nature-based climate solutions. Emerging digital technologies, satellite-based emissions monitoring, artificial intelligence, and climate analytics are enhancing emissions tracking and supporting evidence-based climate policy. Particular emphasis will be placed on international collaboration under the Paris Agreement, adaptation planning, climate finance, and resilience-building strategies that help countries achieve sustainable development while reducing climate risks. Future perspectives include next-generation climate modeling, integrated policy frameworks, and innovative technologies that support a resilient, low-carbon future.

Biography

Joeri Rogelj is Professor of Climate Science and Policy at Imperial College London, United Kingdom. His research focuses on climate modeling, carbon budgets, mitigation pathways, and international climate policy. He is a lead author for the Intergovernmental Panel on Climate Change (IPCC).