ipcc

INTERGOVERNMENTAL PANEL ON climate change

FORTY-SECOND SESSION OF THE IPCC
Dubrovnik, Croatia, 5-8 October 2015

IPCC-XLII/INF. 15
(23.IX.2015)
Agenda Item: 5.4
ENGLISH ONLY

REPORTS

Expert Meeting on Scenarios, 18-20 May 2015, Laxemburg, Austria

(Submitted by the Acting Secretary of the IPCC)
(Prepared by the Co-Chairs of Working Groups I, II and III)

IPCC Secretariat

c/o WMO • 7bis, Avenue de la Paix • C.P. 2300 • 1211 Geneva 2 • Switzerland
telephone : +41 (0) 22 730 8208 / 54 / 84 • fax : +41 (0) 22 730 8025 / 13 • email : IPCC-Sec@wmo.int • **www.ipcc.ch**

WMO UNEP

REPORTS

Expert Meeting on Scenarios, 18-20 May 2015, Laxemburg, Austria

Summary

Long-term scenarios of future societal development, climate change, and other environmental change are an essential ingredient to IPCC reports. They serve as the basis for evaluating potential climate change impacts as well as socio-economic mitigation and adaptation pathways. In 2006, the Panel decided to implement a new institutional setup for the development of long-term scenarios for the preparation of the Fifth Assessment Report (AR5): rather than coordinating and approving new scenarios itself, the process of new scenario development should be coordinated by the research community. The IPCC has catalyzed the development and assessed the results from the new scenarios in AR5.

With the organization of the IPCC joint expert meeting on scenarios, the IPCC brought together scientific groups with diverse expertise and backgrounds to share their experiences and expectations related to scenario activities. The meeting was hosted by the International Institute for Applied System Analysis (IIASA). We would like to thank IIASA for its generous contributions to the meeting, which provided the foundations for extremely productive and focused discussions across the three days. The meeting successfully addressed three main issues:

1) The use of scenarios of climate change and/or societal development in the three AR5 Working Group reports and the Synthesis report was assessed. Needs for improving the use of common scenarios in climate change research were identified to allow a more integrated assessment of mitigation, adaptation, climate change impacts and broader sustainable development concerns across the entirety of IPCC work in the future.

2) Progress and research achievements were evaluated from the scenario framework activities around the Representative Concentration Pathways (RCPs) and the Shared Socio-economic Pathways (SSPs). The focus was on the current status of the development of new socio-economic scenarios, including the development of narratives, quantifications of SSPs, related Integrated Assessment Model (IAM) scenarios as well as early applications to mitigation, adaptation, and climate change impacts analysis. The meeting provided the opportunity for sharing information on recently completed scenario products that are ready for use by the research community and for identifying gaps and needs for producing the relevant literature in order to allow a more integrated assessment of scenarios in future work of the IPCC.

3) Based on above stock-taking, the experts discussed the possible role of scenarios in future IPCC products, and particularly, how the IPCC can facilitate the community scenario process to make progress towards new and fully integrated scenarios.

Main Meeting/Workshop Recommendations

The main outcomes of the IPCC Expert Meeting on Scenarios are two sets of high-level recommendations: one for the Intergovernmental Panel on Climate Change (IPCC) and one for the research community. The recommendations build upon experiences from assessing scenarios for the IPCC's Fifth Assessment Report (AR5) as well as new information about scenarios that have recently become available as results of the ongoing community scenario process. A larger set of more specific recommendations emerged during the meeting. These are reported in the body of this report.

Recommendations to the IPCC

1. **Scenarios should play a key role during the Sixth Assessment Cycle in improving the integration of knowledge across the IPCC Working Groups.**

   a) An **IPCC Special Report** on the integrative use of scenarios across all three Working Groups could ensure a cohesive assessment of the relationship between mitigation, adaptation, and residual impacts from climate change in Sixth Assessment Report (AR6) that goes beyond the AR5. Participants considered two viable alternatives for the report:

      i) A dedicated *Special Report on Scenarios* (assessing the literature on socio-economic pathways to emissions, climate change, impacts, including sustainable development linkages);
      ii) A more broadly framed *Special Report on the Interaction between Adaptation, Mitigation and Sustainable Development* with the integration of scenario-based evidence across all three IPCC Working Groups at its core.

      Possible drawbacks to such Special Reports were highlighted, including the timing during the sixth assessment cycle and the ongoing scenario related activities in the community, and the workload imposed on scenario experts. The possibility of a *Community-based Scenario Assessment* should be considered if no IPCC Special Report is commissioned (see also the recommendations for the community further below).

   b) The integrative role of scenarios should be defined in the **scoping process** of the AR6, particularly the scoping of the Synthesis Report.

   c) With respect to the structure of the AR6 report, **joint Working Group (WG) chapters** on scenario-related issues with involvement of expert authors from all IPCC Working Groups could enhance integration and help to overcome assessment barriers between the WGs. Such joint chapters could be included in all three WG reports. The complementary nature of joint chapters and the idea of a Special Report were highlighted.

   d) A series of coordinated **IPCC Expert Meetings, Workshops and co-sponsored meetings** could facilitate regular exchange of information and the planning of scenario-related community research activities. This will be critical for the coordination between IPCC Working Groups as well as between the IPCC and the scenario research communities.

   e) The new IPCC leadership should consider **installing an "Author Scenario Group"** that would coordinate throughout the writing process of the AR6 cycle the use and assessment of scenarios across the IPCC Working Groups, thus fostering enhanced integration of the scientific knowledge. This group would consist of authors from all three IPCC Working Groups and coordinate with the on-going activities of the IPCC Task Group on Data and Scenario Support for Impacts and Climate Analysis (TGICA).[1] Ideally, the establishment of such a group should already be considered during the author nomination and selection phase of the AR6.

2. **The IPCC should support increasing participation of developing country representatives in scenario development as well as scenario-related capacity building activities.** It is still difficult for many experts from developing countries to actively participate in the scenario development process due to resource constraints or a lack of capacity. Recognizing its limited institutional capacity for expanding beyond its core activities, the IPCC should support developing country participation in scenario activities, for example, by co-sponsoring scenario meetings and contributing to scenario-related capacity building activities (including potential activities by TGICA).

[1] The future role of TGICA is the subject of an IPCC Expert Meeting in early 2016.

3. **The IPCC should pursue synergies with other organizations and assessment bodies interested in scenario analysis.** There is scope for the IPCC to enhance its coordination and connections in the area of scenario analysis with other organizations such as National Academies of Sciences or international research platforms like Future Earth. This should involve the effective communication of research gaps identified in the IPCC assessment process as well as challenges experienced by IPCC authors in the assessment. Closer coordination with other assessment bodies/processes like the Intergovernmental Platform on Biodiversity and Ecosystems Services (IPBES) or the Global Environmental Outlook (GEO) should be explored to reap synergies with on-going IPCC assessments. In addition, strengthening connections to these other intergovernmental platforms could help to better connect climate change to a broader range of sustainable development objectives.

Recommendations to the scenario research community

The meeting identified a set of recommendations to the community on scenario-related **research priorities**, which would be important to address for a comprehensive and more integrated assessment of future scenarios in the AR6:

1. **Fostering further bi-directional integration in scenario applications is a key priority in the current phase of the scenario process.** The early stages of the new outputs of the scenario process – particularly the RCPs and RCP-based climate simulations but also the broader set of mitigation scenarios – provided a common thread through AR5. However, important elements like the shared socio-economic pathways (SSPs) and scenarios integrating socio-economic and climate futures were still missing, making a stronger integration of scenario-based research across research communities impossible at that time. Since then, SSPs have become available and integrated studies are starting to emerge in the peer-reviewed literature. Areas of research that require attention include:

    a) **Closing the loop** between climate change, climate change impacts and adaptation as well as mitigation scenarios in order to improve understanding of the relationship between mitigation, adaptation and residual impacts at different levels of warming.
    b) Understanding climate policies in the context of a broader set of **sustainable development objectives, including co-benefits and trade-offs for a range of societal objectives**. This is a requirement for learning about the opportunities and challenges of climate policy in the context of developing countries.
    c) **Bridging spatial scales** in scenario applications from the global to the regional and local and vice versa. This requires further progress in the challenge of downscaling global information for location-specific scenario research as well as upscaling local and regional scenario information to the global level. It also implies a refinement of the SSPs from global to regional, national and local scale.
    d) **Bridging time scales** from the very short to the very long, such as exploring the implications of short-term policy actions for the costs and feasibility of alternative long-term climate goals (and socio-economic futures).
    e) Making further progress in understanding how to explore outcomes of a larger number of possible future forcing pathways, via **pattern-scaling methods or similar emulation approaches** to represent regional climate responses. Pattern scaling could be particularly useful in the application of the SSP framework for comprehensive assessments of impacts, adaptation and vulnerability especially for pathways intermediate to those simulated by general circulation models. Additional research is, however, necessary to fully identify the limits of applicability of pattern-scaling/ emulation techniques, especially for diagnostics other than surface temperature and forcing pathways reflecting strong mitigation or more extreme than those simulated.
    f) Develop approaches that integrate qualitative (narratives) and quantitative scenario information more effectively. This includes more systematic approaches to build quantitative scenarios from narratives as well as the further integration of qualitative and quantitative information that can be derived from the underlying narratives.

2. Improve the understanding of the **propagation of uncertainties across the whole process chain in climate change research and** covering a wider scenario space.

3. A deeper integration across scenario communities (Earth System Modelling (ESM), Impacts, Adaptation and Vulnerability (IAV) and Integrated Assessment Model (IAM)) for AR6 would greatly benefit from an intermediate scenario assessment product. While an IPCC Special Report could be considered, another possibility would be the organization of a **scenario assessment report** within the scientific community.

Several process-related recommendations to the research community have been made:

1. A key priority for the community is to identify and clearly communicate key research questions/gaps and their relevance. Coordinated international efforts are needed to address these research gaps, with strong involvement from experts from all regions, incl. from developing countries. A high-level paper describing research agenda and key research gaps could complement this effort.
2. To facilitate coordination and integration of scenario work, there is a need for a transparent timeline for further development and application of the scenario framework with indications of milestones and participants, including coordination between relevant scientific community institutions.
3. Continued **flexibility and openness of the scenario process needs to be ensured**. This includes the exchange of data and methods, the modularity of the scenario architecture so that different parts can be used for different purposes as well as an encouragement to engage a broader community of experts in the development of new scenario extensions.
4. A **best practices guidance note for users of scenarios** on the new scenario framework would help foster widespread application. Guidance on how to link local/regional and sector-based studies into the global scenario framework is needed.
5. Communicating the rather complex scenario framework to a non-expert audience is a challenge. For this purpose, a **communication strategy** should be developed by the research community.

Annex 1

SCOPING NOTE

Background

Long-term scenarios of future societal development, climate change, and other environmental change are an essential ingredient to IPCC reports. They serve as the basis for evaluating potential climate change impacts as well as socio-economic mitigation and adaptation pathways. In 2006, the Panel decided to implement a new institutional setup for the development of long-term scenarios for the preparation of the Fifth Assessment Report (AR5): rather than coordinating and approving new scenarios itself, the process of new scenario development should be coordinated by the research community. The IPCC has catalyzed the development and assessed the results from the new scenarios in AR5.

At the IPCC Expert Meeting in Noordwijkerhout in 2007, the community identified four Representative Concentration Pathways (RCPs) as an initial step to jump-start the scenario process for the integrated assessment of climate change, adaptation, mitigation and related impacts. The research community designed the "parallel process" (Moss et al., 2010) for the development of new scenarios, comprising three main phases: 1) the development of climate projections based on the RCPs; 2) the provision of Shared Socioeconomic Pathways (SSPs); and 3) and an integration phase to combine information from the climate models with the socio-economic pathways for the integrated analysis of future climate changes.

So far, the RCPs were completed (van Vuuren et al., 2011) and climate projections have been developed in the multi-model project CMIP5 and assessed in the IPCC WGI AR5. A series of workshops and meetings led to the design of a new scenario framework (O'Neill et al., 2013) and the identification of main characteristics of the Shared Socioeconomic Pathways (SSPs). While the new scenario framework has been firmly established and published in a special issue of Climatic Change (Ebi et al., 2014), various streams of activities are still underway (or near completion) to provide qualitative and quantitative information on the SSPs. In addition, the development of Integrated Assessment Model (IAM) scenarios based on the SSPs is currently being completed. A number of different impact assessments have used preliminary versions of the SSPs for different impact studies.

Despite enormous efforts and measurable progress in the development of new scenarios for climate change analysis, the objective of using them as an integrating element of the assessment reports of the three IPCC Working Groups was not fully realized. The RCPs were produced in time for use in the new climate change projections (CMIP5) to be assessed by Working Group I, while associated socio-economic scenarios had not been published for inclusion in the AR5.

Expert meeting objectives

After completion of the Fifth Assessment Report, and reflecting the division of labor in the development of long-term scenarios, the IPCC intends to continue the dialogue with the research communities in a timely manner. This expert meeting on scenarios is to facilitate this dialogue, to take stock on the achievements of the process during the AR5 cycle, to share available information across scientific communities, and to discuss the role of scenarios in future IPCC products.

With the organization of the meeting, the IPCC intends to bring together scientific groups with diverse expertise and backgrounds to share their experiences and expectations related to the scenario community activities.

The three main objectives of this expert meeting are:

1) Assess the use of scenarios of climate change and/or societal development in the three AR5 Working Group reports and the Synthesis report, with the goal to identify needs for improving the use of common scenarios in climate change research to allow a more integrated assessment of mitigation, adaptation, and climate change impacts across the entirety of IPCC work in the future.

2) Evaluate progress and research achievements from the scenario framework activities around the RCPs and the SSPs. The focus will be on the current status of the development of new socio-economic scenarios, including the development of narratives, quantifications of SSPs, related IAM scenarios as well as early applications to mitigation, adaptation, and climate change impacts analysis. The meeting provides the opportunity for sharing information on recently completed scenario products that are ready for use by the research community and for identifying gaps and needs for producing the relevant literature in order to allow a more integrated assessment of scenarios in future work of the IPCC.

3) Based on above stock-taking, the experts will discuss the possible role of scenarios in future IPCC products, and particularly, how the IPCC can facilitate the community scenario process to make progress towards new and fully integrated scenarios.

References

Ebi K.L., S. Hallegatte, T. Kram, N.W. Arnell, T.R. Carter, J. Edmonds, E. Kriegler, R. Mathur, B.C. O'Neill, K. Riahi, H. Winkler, D.P.V. Vuuren, and T. Zwickel (2014). A new scenario framework for climate change research: background, process, and future directions. *Climatic Change* 122, 363–372. doi: 10.1007/s10584-013-0912-3, ISSN: 0165-0009, 1573-1480.

Moss R.H., J.A. Edmonds, K.A. Hibbard, M.R. Manning, S.K. Rose, D.P. van Vuuren, T.R. Carter, S. Emori, M. Kainuma, T. Kram, G.A. Meehl, J.F.B. Mitchell, N. Nakicenovic, K. Riahi, S.J. Smith, R.J. Stouffer, A.M. Thomson, J.P. Weyant, and T.J. Wilbanks (2010). The next generation of scenarios for climate change research and assessment. *Nature* 463, 747–756. doi: 10.1038/nature08823, ISSN: 0028-0836.

O'Neill B.C., E. Kriegler, K. Riahi, K.L. Ebi, S. Hallegatte, T.R. Carter, R. Mathur, and D.P. van Vuuren (2013). A new scenario framework for climate change research: the concept of shared socioeconomic pathways. *Climatic Change*. doi: 10.1007/s10584-013-0905-2.

Van Vuuren D.P., J.A. Edmonds, M. Kainuma, K. Riahi, and J. Weyant (2011). A special issue on the RCPs - Springer. *Climatic Change*. doi: 10.1007/s10584-011-0157-y.

Annex 2

AGENDA

MONDAY, 18 MAY 2015	
8:15	*Shuttle bus departure from Albertinaplatz to IIASA (2 buses)*
9:00-9:30 Theater Room	**Welcome from host** Pavel Kabat, Director General and Chief Executive Officer, IIASA Nebojsa Nakicenovic, Deputy Director General, IIASA **Opening Remarks from IPCC** Ismail El Gizouli, Acting Chair, IPCC **Introduction and meeting objectives** Keywan Riahi, Director, Energy Program, IIASA
(9:30-11:00)	**Plenary Session 1: Use of Scenarios in the IPCC AR5** ***Chairperson: Youba Sokona*** The aim of this session is to take stock and to explain how scenarios were used in the IPCC Fifth Assessment Report (AR5) across the different Working Group (WG) contributions. Which questions were addressed by the scenarios? How did the scenarios and their use in AR5 differ from earlier IPCC assessments? Did scenarios facilitate integration across the WGs and in the AR5 Synthesis Report? How can the use of scenarios be improved for future IPCC assessments?
9:30-10:00	**Scenarios in the AR5 for the assessment of future climate change projections** *[20 minute presentation +10 minute discussion]* Gian-Kasper Plattner
10:00-10:30	**Scenarios in the AR5 for the assessment of impacts, adaptation, and vulnerabilities** *[20 minute presentation +10 minute discussion]* Chris Field/Vicente Barros
10:30-11:00	**Scenarios in the AR5 for the assessment of climate change mitigation** *[20 minute presentation +10 minute discussion]* Ottmar Edenhofer
11:00-11:30	**Coffee break**
(11:30-15:45)	**Plenary Session 2: The RCP/SSP Framework for Integrated Climate Change Research** ***Chairperson: Nebojsa Nakicenovic*** This session provides a comprehensive introduction of the Shared Socioeconomic reference Pathways (SSPs), including the overall framework and concepts; the basic elements of the SSPs (socio-economic drivers) as well as representative SSP scenarios.

	Which SSP products are available, how can they be used, where are we in the "parallel process", and what are the next steps? In this session attention will also be given to Shared Policy Assumptions (SPAs), which characterize the mitigation and adaptation policies at work.
11:30-11:50	**Introduction to the RCP/SSP framework: main concepts and process (including SPAs)** *[15 minute presentation + 5 minute discussion]* Detlef van Vuuren
11:50-12:10	**SSP Narratives** *[15 minute presentation + 5 minute discussion]* Elmar Kriegler
12:10-12:35	**Overview of the SSP-based quantitative projections and the use of SPAs** *[20 minute presentation + 5 minute discussion]* Keywan Riahi
12:35-13:15	**Discussion: Q&A**
13:15-14:15	**Lunch (at the venue)**
14:15-14:35	**Basic elements: socioeconomic projections of the SSPs (economic development, demographic change, and urbanization)** *[15 minute presentation + 5 minute discussion]* Rob Dellink
14:35-14:55	**Energy transformations following alternative SSPs** *[15 minute presentation + 5 minute discussion]* Nico Bauer
14:55-15:15	**SSP Land use projections** *[15 minute presentation + 5 minute discussion]* Kate Calvin
15:15-15:45	**Discussion of the SSP quantifications**
15:45-16:00	**Coffee break and departure into breakout groups**
16:00-17:30	**Breakout Group (BOG) Session 1: Interactions between IPCC WGs** This BOG session will review integration efforts through scenarios across IPCC Working Groups during AR5. What worked well and what did not? Why? What are critical scenario-related user and assessment needs given the experience in AR5?
17:30-18:30	**Plenary: Reporting back from BOGs with brief Q&A**
18:30 **Oval Room**	**Social Event hosted by Pavel Kabat, Director General and Chief Executive Officer, IIASA**
21:00	*Shuttle bus departure from IIASA to Albertinaplatz*

TUESDAY, 19 MAY 2015	
8:15	*Shuttle bus departure from Albertinaplatz to IIASA (2 buses)*
(9:00-10:40)	**Plenary Session 3: The Use of Scenarios in Future Climate Projections by ESMs** ***Chairperson: Claudia Tebaldi*** The aim of this session is to inform the community about ongoing activities and plans of using scenarios (and particularly the SSPs) in the climate model intercomparison project CMIP6.
9:00-9:20	**CMIP6 – an overview of activities** *[15 minute presentation + 5 minute discussion]* Veronika Eyring
9:20-9:40	**Use of scenarios in ScenarioMIP and related MIPs: LuMIP & AerchemMIP** *[15 minute presentation + 5 minute discussion]* Brian O'Neill
9:40-10:00	**Downscaling of CMIP6 for regional climate modeling: experiences from CORDEX** *[15 minute presentation + 5 minute discussion]* Claas Teichmann
10:00-10:40	**Discussion**
10:40-11:10	**Coffee Break**
(11:10-13:00)	**Plenary Session 4: Ongoing SSP-related Community Activities, including Sectoral and Regional Extensions for IAV and IAM Analysis** ***Chairperson: Mercedes Bustamante*** The aim of this session is to report some of the ongoing activities to extend the SSPs for impacts, adaptation, vulnerability, and mitigation assessments.
11:10-11:30	**Sectoral and Cross-sectoral Applications in ISI-MIP** *[15 minute presentation + 5 minute discussion]* Hermann Lotze-Campen
11:30-11:45	**Overview of AgMIP activities** *[10 minute presentation + 5 minute discussion]* John Antle
11:45-12:00	**Regional AgMIP activities** *[10 minute presentation + 5 minute discussion]* Sabine Homann-Kee Tui

12:00-13:00	**Panel on "Extensions for improved impacts, adaptation, vulnerability, and mitigation assessments (3 minute statements)":** **Socio-economic heterogeneity:** Bas van Ruijven **Spatial population projections:** Bryan Jones **Development & Climate:** Marc Levy **Health:** Kris Ebi **SSPs for South America:** Ana-Paula Aguiar **SSPs for the U.S. and the Arctic:** Ben Preston
13:00-14:00	**Lunch (at the venue)**
(14:00-18:00)	**Plenary Session 5: The User Perspective - Assessment of "Needs" from Future Scenario-based Research Activities** ***Chairperson: Ben Preston*** The aim of this session is to identify priority activities for further development and use of the scenario framework in the future. Resulting recommendations should focus on possible improvements that would enable a better assessment of scenarios in future IPCC reports.
(14:00-15:00)	**Short Plenary Talks**
14:00-14:10	**Scenario needs by the broader policy community** *[7 minute presentation + 3 minute discussion]* Jim Skea
14:10-14:20	**Climate Science** *[7 minute presentation + 3 minute discussion]* Piers Forster
14:20-14:30	**Local and regional scenario-based research** *[7 minute presentation + 3 minute discussion]* Kendra Gontangco
14:30-15:00	**Discussion and instructions for BOGs**
15:00-15:15	**Coffee break and departure into breakout groups**
15:15-17:00	**BOG Session 2: Scientific Gaps and Recommendations for High Priority Activities (development and use) in Future Scenario-related Research Activities** This BOG session aims to identify key knowledge gaps and research priorities. The discussion should be guided by the question what would enable a better assessment of scenarios in the IPCC in the future.
17:00-18:00	**Plenary: Reporting back from BOGs including Q&A**
18:00	*Shuttle bus departure from IIASA to Albertinaplatz*

WEDNESDAY, 20 MAY 2015	
8:15	*Shuttle bus departure from Albertinaplatz to IIASA (2 buses)*
(9:00-17:00)	**Plenary Session 6: Possible Role of Scenarios in Future IPCC Products, and of the IPCC in the Continuing Scenario Process** ***Chairperson: Keywan Riahi*** This session focuses on the future role of scenarios in the IPCC; different options for the IPCC to support the scenario process; and IPCC products that could be useful to enable an integrated assessment of future impacts, adaptation, vulnerabilities, and mitigation. The aim of the session is to develop concrete recommendations for the IPCC as well as the scenario development process within the research community.
(9:00-9:50)	**Brief panel presentations on "The role of scenarios in IPCC and IPCC in scenarios"**
9:00-9:30	**The IPCC perspective (four brief talks, each 5 min)** WGI/II/III/TGICA Co-Chairs
9:30-9:40	**Milestones: products, processes, activities until 2020** Elmar Kriegler
9:40-9:50	**Synthesis of the meeting, objectives of day 3** Brian O'Neill
9:50-10:00	**Grab a coffee on your way to the BOGs**
10:00-12:00	**BOG Session 3: On the Future Role of the Scenarios in the IPCC - Required Processes, Options, and Possible Products.** This BOG session is arranged around two sets of overarching questions to derive recommendations to the IPCC and the research community: BOG1: Recommendations to the IPCC How can the IPCC facilitate the scenario process? How can the IPCC make best use of scenario-based research? BOG2: Recommendations to research community What are the research priorities for the scenario process? What are needed elements of the process to support this work?
12:00-13:00	**Plenary: Reporting back from the breakout groups including Q&A**
13:00-14:30	**Lunch**
14:30-17:00	**Plenary: Discussion & conclusions**
17:00	*Shuttle bus departure from IIASA to Albertinaplatz*

Annex 3

LIST OF PARTICIPANTS

John Agard
University of the West Indies
Trinidad and Tobago

Ana Paula Aguiar
Instituto Nacional de Pesquisas Espaciais
Brazil

Keigo Akimoto
Research Institute of Innovative Technology for the Earth
Japan

Rob Alkemade
Netherlands Environmental Assessment Agency (PBL)
Netherlands

John Antle
Oregon State University
USA

Nigel Arnell
University of Reading
United Kingdom

Mustafa Babiker
Energy/Environment Consultant
Saudi Arabia

Vicente Barros
University of Buenos Aires
Argentina

Nico Bauer
Potsdam Institute for Climate Impact Research (PIK)
Germany

Mercedes Bustamante
University of Brasilia
Brazil

Katherine Calvin
Pacific Northwest National Laboratory
USA

Eduardo Calvo
Universidad Nacional Mayor de San Marcos
Peru

Timothy Carter
Finnish Environment Institute
Finland

Edwin Castellanos
Universidad del Valle de Guatemala
Guatemala

Wenying Chen
Tsinghua University
China

Renate Christ
Intergovernmental Panel on Climate Change
Switzerland

Stewart Cohen
Environment Canada
Canada

Cecilia Conde
INECC / SEMARNAT
Mexico

Purnamita Dasgupta
Institute of Economic Growth
India

Rob Dellink
Organization for Economic Cooperation and Development
France

Shobhakar Dhakal
Asian Institute of Technology
Thailand

Kristie Ebi
University of Washington
USA

Ottmar Edenhofer
Potsdam Institute for Climate Impact Research (PIK)
Germany

James Edmonds
Pacific Northwest National Laboratory
USA

Ismail El Gizouli
Acting Chair of the IPCC
Sudan

Seita Emori
National Institute for Environmental Studies
Japan

Veronika Eyring
German Aerospace Center (DLR)
Germany

Chris Field
Carnegie Institution for Science
USA

Piers Forster
University of Leeds
United Kingdom

Pierre Friedlingstein
University of Exeter
United Kingdom

Jan Fuglestvedt
Center for International Climate and Environmental Research
Norway

Shinichiro Fujimori
National Institute for Environmental Studies
Japan

Clare Goodess
University East Anglia
United Kingdom

Charlotte Kendra Gotangco
Ateneo de Manila University
Philippines

Celine Guivarch
CIRED
France

Petr Havlik
IIASA
Austria

Jan Heemann-Minx
IPCC WGIII TSU
Germany

Sabine Homann - Kee Tui
ICRISAT
Kenya

George Hurtt
University of Maryland
USA

Lisa Israel
IPCC WGIII TSU
Germany

Kejun Jiang
Energy Research Institute
China

Tong Jiang
China Meteorological Administration
China

Bryan Jones
City University of New York
USA

Fortunat Joos
University of Bern
Switzerland

Pavel Kabat
IIASA
Austria

Eric Kemp-Benedict
Stockholm Environment Institute
Sweden

Zbigniew Klimont
IIASA
Austria

Tom Kram
Netherlands Environmental Assessment Agency (PBL)
Netherlands

Volker Krey
IIASA
Austria

Elmar Kriegler
Potsdam Institute for Climate Impact Research (PIK)
Germany

Jean-Francois Lamarque
University Corporation for Atmospheric Research
USA

Marc Levy
Columbia University
USA

Hong Liao
Institute of Atmospheric Physics
China

Juan Llanes
University of Havana
Cuba

Hermann Lotze-Campen
Potsdam Institute for Climate Impact Research (PIK)
Germany

Xianfu Lu
UNFCCC Secretariat
Germany

Wolfgang Lutz
IIASA
Austria

Katharine Mach
IPCC WGII TSU
Germany

Ritu Mathur
The Energy and Resources Institute
India

Malte Meinshausen
University of Melbourne
Australia

Richard Millar
University of Oxford
United Kingdom

Nebojsa Nakicenovic
IIASA
Austria

Leonard Nurse
University of the West Indies
Barbados

Brian O'Neill
National Center for Atmospheric Research
USA

Anand Patwardhan
University of Maryland
USA

Ramon Pichs-Madruga
Centro de Investigaciones de la Economia Mundial (CIEM)
Cuba

Gian-Kasper Plattner
University of Bern
Switzerland

Alexander Popp
Potsdam Institute for Climate Impact Research (PIK)
Germany

Michael Prather
University of California Irvine
USA

Benjamin Preston
Oak Ridge National Laboratory
USA

Dahe Qin
China Meteorological Administration
China

Narasimha Rao
IIASA
Austria

Keywan Riahi
IIASA
Austria

Joeri Rogelj
IIASA
Austria

Dale Rothman
University of Denver
USA

Julie Rozenberg
World Bank
USA

Roberto Schaeffer
Universidade Federal do Rio de Janeiro
Brazil

Robert Scholes
University of the Witwatersrand
South Africa

Mxolisi Shongwe
IPCC Secretariat
Switzerland

Vanessa Schweizer
University of Waterloo
Canada

Priyadarshi Shukla
Indian Institute of Management, Ahmedabad
India

Jim Skea
Imperial College London
United Kingdom

Youba Sokona
The South Centre
Switzerland

Thomas Stocker
University of Bern
Switzerland

Claudia Tebaldi
National Center for Atmospheric Research
USA

Claas Teichmann
Helmholtz-Zentrum Geesthacht
Germany

Bastiaan van Ruijven
National Center for Atmospheric Research
USA

Detlef van Vuuren
Netherlands Envirionmental Assessment Agency (PBL)
Netherlands

Jean-Pascal van Ypersele
Université catholique de Louvain
Belgium

Iulian Florin Vladu
UNFCCC Secretariat
Germany

John Weyant
Stanford University
USA

Harald Winkler
University of Cape Town
South Africa

Francis Yamba
University of Zambia
Zambia

Panmao Zhai
China Meteorological Administration
China

Xiao-Ye Zhang
Chinese Academy of Meteorological Sciences
China

Botao Zhou
China Meteorological Administration
China

Tianjun Zhou
Chinese Academy of Sciences
China