

# Scenarios Forum 2022 program

## Program overview

Day 1: Monday, June 20, 2022

|                 |       |       | Theatersaal                       | Marschallzim. 1         | Marschallzim. 2                | Kaminzimmer                           | Franz Josef   | Wodak                    | Gvishiani                      |   |
|-----------------|-------|-------|-----------------------------------|-------------------------|--------------------------------|---------------------------------------|---|--------------------------|--------------------------------|---|
| Registration    | 8:30  | 9:00  | On-site registration of attendees |                         |                                |                                       |   |                          |                                |   |
| Opening Plenary | 9:00  | 10:30 | Opening Plenary                   |                         |                                |                                       |   |                          |                                |   |
|                 | 10:30 | 11:00 | Coffee Break                      |                         |                                |                                       |   |                          |                                |   |
| Plenary         | 11:00 | 12:30 | Plenary 1                         |                         |                                |                                       |   |                          |                                |   |
| Lunch           | 12:30 | 14:30 | Lunch Break                       |                         |                                |                                       |   |                          |                                |   |
| Parallel 1      | 14:30 | 16:00 | Parallel 1                        | Adaptation ID #15 (R)   | Communication ID #201 (W)      | Regional socio-economic -1 ID #26 (R) | Transport ID #24 (W)  | Modeling SDGs ID #47 (R) | Cross-border ID #69 (R)        | Agriculture ID #83 (W)                      |
|                 | 16:00 | 16:30 | Coffee Break                      |                         |                                |                                       |   |                          |                                |   |
| Parallel 2      | 16:30 | 18:00 | Parallel 2                        | Biodiversity ID #50 (R) | AR7 recommendations ID #63 (W) | Regional socio-economic -2 ID #26 (R) | Gender equality ID #94 (W) / Climate change gender ID #93 (W) | Global South ID #56 (R)  | Physical Storylines ID #51 (R) | SSP Uncertainties (45 minutes) ID #30 (R)   |
|                 | 18:00 | 18:30 | Parallel 2 extension              |                         |                                |                                       |   |                          |                                | Beyond illustrative (45 minutes) ID #32 (W) |
| Reception       | 18:00 | 19:30 | Poster session                    |                         |                                |                                       |   |                          |                                |   |

## Day 2: Tuesday, June 21, 2022

|            |       |       |                   | Theatersaal                        | Marschallzim. 1                         | Marschallzim. 2                 | Kaminzimmer                          | Franz Josef                                      | Wodak                                | Gvishiani                   |
|------------|-------|-------|-------------------|------------------------------------|---|---------------------------------|--------------------------------------|--|--------------------------------------|-----------------------------|
| Plenary    | 9:00  | 10:30 |                   | <b>Plenary 2</b>                   |   |                                 |                                      |  |                                      |                             |
|            | 10:30 | 11:00 | Coffee Break      |                                    |   |                                 |                                      |  |                                      |                             |
| Parallel 3 | 11:00 | 12:30 | Parallel 3        | Demographic projections ID #85 (R) | Distributional impacts ID #25 (R)       | Integrated Scenarios ID #22 (R) | Reflexivity ID #12 (W)               | Mitig/Adapt Capacity ID #82 (R)                  | CDR ID #20 (W)                       | Oceans + 30 min ID #203 (W) |
| Lunch      | 12:30 | 14:30 | Lunch Break       |                                    |   |                                 |                                      |  |                                      |                             |
| Parallel 4 | 14:30 | 16:00 | Parallel 4        | Feasibility -1 ID #48 (R)          | Pop and economic projections ID #17 (W) | Human-Earth ID # 42 (R)         | Development process ID #202 (W)      | Materials ID #43 (R)                             | Non-CO2 emissions ID #6 (R)          | Finance -1 ID #10 (R)       |
|            | 16:00 | 16:30 | Coffee Break      |                                    |   |                                 |                                      |  |                                      |                             |
| Parallel 5 | 16:30 | 18:00 | Parallel 5        | Feasibility -2 ID #48 (R)          | CMIP6/7 ID #16 (W)                      | National Scale ID # 8 (R)       | Non-state actors Workshop ID #21 (W) | Digitalization ID #66 (R) / Lifestyle ID #64 (R) | Stakeholder participation ID #29 (W) | Finance -2 ID #10 (W)       |
| Dinner     | 18:00 | 21:00 | Conference Dinner |                                    |   |                                 |                                      |  |                                      |                             |

## Day 3: Wednesday, June 22, 2022

|                          |       |       |                        | Theatersaal                     | Marschallzim. 1                     | Marschallzim. 2                       | Kaminzimmer            | Franz Josef                             | Wodak                   | Gvishiani                    |
|--------------------------|-------|-------|------------------------|---------------------------------|-------------------------------------|---------------------------------------|------------------------|---|-------------------------|------------------------------|
| Parallel 6               | 9:00  | 10:30 | Parallel 6             | Emulators -1 ID #46 (R)         | Beyond GDP ID #38 (W)               | National Decarbonization -1 ID #7 (R) |                        | Target-seeking ID #52 (R)               | Migration -1 ID #31 (R) | Socio-political ID #23 (W)   |
| 10:30 11:00 Coffee Break |       |       |                        |                                 |                                     |                                       |                        |   |                         |                              |
| Parallel 7               | 11:00 | 12:30 | Parallel 7             | Emulators -2 +45 min ID #46 (R) | Climate and Biodiversity ID #59 (W) | National Decarbonization -2 ID #7 (R) | Post-growth ID #37 (R) | Subnational decarbonization ID #104 (R) | Migration -2 ID #31 (R) | Low Energy Demand ID #70 (W) |
| Lunch                    | 12:30 | 14:30 | Lunch Break            |                                 |                                     |                                       |                        |   |                         |                              |
| Plenary                  | 14:30 | 16:00 | <b>Plenary 3</b>       |                                 |                                     |                                       |                        |   |                         |                              |
| 16:00 16:30 Coffee Break |       |       |                        |                                 |                                     |                                       |                        |   |                         |                              |
| Closing plenary          | 16:30 | 18:00 | <b>Closing Plenary</b> |                                 |                                     |                                       |                        |   |                         |                              |

# Scenarios Forum Plenary Sessions

Monday, June 20, 2022

| 9:00  | 10:30 | Opening Plenary: Status of Scenario Process                             | Chair: Bas van Ruijven   |
|-------|-------|---|--|
| Time  |       | Room: Theatersaal   | Speakers   |
| 9:00  | 9:20  | Opening and welcome   | IIASA (Albert van Jaarsveld), ICONICS (Kris Ebi), IAMC/IIASA (Keywan Riahi), IPCC (Jim Skea) |
| 9:20  | 9:40  | Applications of the SSPs: insights from the ICONICS literature database | Carole Green (UW)  |
| 9:40  | 9:50  | Memorial for Guillaume Rohat  | Hy Dao (UNIGE), Johannes Flacke (UTwente)  |
| 9:50  | 10:05 | History of the scenarios process  | Tim Carter (SYKE)  |
| 10:05 | 10:15 | Insights from the Scenarios Forum 2019                                  | Brian O'Neill (JGCRI)  |
| 10:15 | 10:30 | Goals of the Scenarios Forum 2022                                       | Bas van Ruijven (IIASA)  |

Monday, June 20, 2022

| <b>11:00 12:30 Plenary 1: The role of community scenarios in IPCC and other global assessments</b> |   |   |                         |
|--|---|---|-------------------------|
| <b>Time</b>  | <b>Room: Theatersaal</b>  | <b>Speakers</b>   | <b>Chair:</b>           |
| 11:00 11:45  | The role of scenarios in the IPCC 6 <sup>th</sup> Assessment Report | Valérie Masson-Delmotte (WG1), Hans Pörtner (WG2), Jim Skea (WG3) | Jan Fuglestedt (CICERO) |
| 11:45 12:05  | The global community scenario landscape – SSPs & IPBES scenarios    | Paula Harrison (UKCEH)  |                         |
| 12:05 12:30  | Community scenario projects and updates to SSP drivers              | Detlef van Vuuren (PBL)   |                         |

Tuesday, June 21, 2022

| <b>9:00 10:30 Plenary 2: Frontiers in Scenarios 1</b> |  |                         |                             |
|---|--|-------------------------|-----------------------------|
| <b>Time</b>   | <b>Room: Theatersaal</b>                                       | <b>Speakers</b>         | <b>Chair: Kris Ebi (UW)</b> |
| 9:00 9:30   | Examples of translating global narratives to local stories     | Kasper Kok (WUR)        |                             |
| 9:30 10:00  | Use of adaptation scenarios / Adaptation policies in scenarios | Paul Desanker (UNFCCC)  |                             |
| 10:00 10:30   | Towards continuous evaluation of plausible ranges for the RCPs | Bas van Ruijven (IIASA) |                             |

Wednesday, June 22, 2022

| Time        | Room: Theatersaal  | Speakers                                      |
|-------------|--|---|
| 14:30 16:00 | <b>Plenary 3: Frontiers in Scenarios 2</b>   | <b>Chair: Laura Pereira (U Witwatersrand)</b> |
| 14:30 15:00 | Increasing policy relevance: connecting the SSPs and SPAs with the Paris Agreement | Elmar Kriegler (PIK)                          |
| 15:00 15:30 | Integrated Scenarios with impacts, mitigation and adaptation                       | Franziska Piontek (PIK)                       |
| 15:30 16:00 | In which world do we want to live – Eco-governance of future societies             | Julia Leininger (DIE)                         |

| Time        | Room: Theatersaal                                  | Speakers  | Chair                   |
|-------------|--|---|-------------------------|
| 16:30 18:00 | <b>Closing Plenary: Status of Scenario Process</b> |   |                         |
| 16:30 16:50 | Improving Scenario Services                        | Keywan Riahi (IIASA)  |                         |
| 16:50 17:25 | Panel on insights from the Scenarios Forum 2022    | Bjoern Soergel (PIK), Elisabeth Gilmore (Carleton), Laura Pereira (U Witwatersrand), Claudia Tebaldi (LBL) (more selected during the Forum) | Henrik Carlsen (SEI)    |
| 17:25 18:00 | Panel on next steps for the scenarios process      | Jim Skea (IPCC), Roberto Schaefer (IAMC), Paula Harrison (IPBES), Alex Roehrl (UN DESA)   | Bas van Ruijven (IIASA) |

# Overview of Sessions

| Topic                          | Research Session or Workshop session | ID  | Short Title             | Session Full Title   |
|--------------------------------|--------------------------------------|-----|-------------------------|--|
| Across scales                  | Workshop                             | 24  | Transport               | Scenario development and modeling that bridges scales and communities: the rich diversity of global transport futures  |
|                                | Research                             | 8   | National Scale          | Challenges and opportunities in constructing national scale scenarios from the SSPs/RCPs                               |
|                                | Research                             | 26  | Regional socio-economic | Applying global socio-economic scenarios for regional climate change impact and adaptation analysis                    |
| Communication / Scenario Users | Workshop                             | 201 | Communication           | Synthesis and communication of climate change risks in scientific assessments  |
|                                | Workshop                             | 21  | Non-state actors        | What do non-state actors (e.g., corporations, NGOs, financial institutions, etc.) need from climate change scenarios?  |
|                                | Research                             | 52  | Target-seeking          | Interacting with integrated assessment models for target-seeking under uncertainty                                     |
|                                | Workshop                             | 10  | Finance                 | Building better climate scenarios for supervisors, private sector financial institutions, and development institutions |
|                                | Research                             | 30  | SSP Uncertainties       | Interpreting and debiasing uncertainties in SSP-based model ensembles  |
|                                | Workshop                             | 63  | AR7 recommendations     | Scenarios in IPCC assessments: lessons from AR6 and recommendations for AR7  |
| Earth System Modeling          | Workshop                             | 203 | Oceans                  | Blue scenarios: ocean and fisheries in Earth System models   |
|                                | Workshop                             | 16  | CMIP6/7                 | Scenarios in CMIP6 and CMIP7: lessons learned and new design considerations.   |
|                                | Research                             | 42  | Human-Earth             | Advances in human-Earth System interactions in scenario development  |
|                                | Research                             | 46  | Emulators               | Emulators: new methods and role in integrating research across climate research communities                            |
|                                | Research                             | 51  | Physical Storylines     | Physical climate storylines: applications and perspectives   |

|                                  |          |     |                          |   |
|----------------------------------|----------|-----|--------------------------|---|
| Ecological                       | Workshop | 83  | Agriculture              | Representative Agricultural Pathways – Cross-scale and trans-disciplinary storylines for agricultural development and decision-making                 |
|                                  | Research | 50  | Biodiversity             | New and on-going work on scenarios for biodiversity & nature contributions to people  |
|                                  | Workshop | 59  | Climate and Biodiversity | Catalyzing climate and biodiversity coupled scenarios for assessments and policy  |
| Impacts/vulnerability/adaptation | Research | 15  | Adaptation               | Quantitative scenarios for adaptation and adaptive capacity   |
|                                  | Workshop | 32  | Beyond illustrative      | Beyond illustrative scenarios - novel approaches to assess future climate risks   |
|                                  | Research | 69  | Cross-border             | Exploring and expanding the cross-border dimensions of the SSPs   |
|                                  | Workshop | 93  | Climate change gender    | Addressing the gender dimension in socioeconomic scenarios, Part I: impacts of climate change and policy on gender inequality                         |
| Mitigation/energy                | Research | 64  | Lifestyle                | Future lifestyle changes at different geographical scales and in response to societal shocks (e.g., Covid-19)   |
|                                  | Research | 66  | Digitalization           | Digitalization scenarios and implications for climate change  |
|                                  | Workshop | 20  | CDR                      | Improving the representations of Carbon Dioxide Removal (CDR) options in the SSPs   |
|                                  | Research | 43  | Materials                | Scenarios of material stocks, flows, services, and practices: exploring nexus approaches to address climate change, air pollution and sustainability. |
|                                  | Workshop | 70  | Low Energy Demand        | Narratives for scenarios and pathways to provide decent levels of energy services at low demand of energy and resources                               |
|                                  | Research | 6   | Non-CO2 emissions        | The role of non-CO2 greenhouse gas emissions in mitigation scenarios and climate change   |
|                                  | Research | 7   | National Decarbonization | National deep decarbonization scenarios: policy analysis and global narratives  |
|                                  | Research | 48  | Feasibility              | Feasibility of scenarios  |
|                                  | Research | 56  | Global South             | Assessing the impacts of the Global Energy Transition in the global south   |
|                                  | Research | 104 | Subnational              | Regional and subnational scenarios of decarbonization and sustainable development   |



|  |          |     |                              |  |
|--|----------|-----|------------------------------|--|
| Population/gender/Socioeconomic change | Workshop | 17  | Pop and economic projections | Updating the population and economic projections in the SSPs   |
|  | Research | 85  | Demographic projections      | Multiscale and multidimensional demographic projections for the extended global scenario frameworks  |
|  | Workshop | 23  | Socio-political              | Improving the representation and usability of socio-political factors in the Shared Socioeconomic Pathways (SSPs)                                |
|  | Research | 82  | Mitig/Adapt capacity         | Qualitative and quantitative approaches to represent regional capacity for mitigation and adaptation in the Shared Socioeconomic Pathways (SSPs) |
|  | Research | 31  | Migration                    | Scenario-based approaches to modeling migration futures  |
|  | Workshop | 94  | Gender equality              | Addressing the gender dimension in socioeconomic scenarios, Part II: promoting gender equality as a driver of change                             |
|  | Research | 25  | Distributional impacts       | Poverty, inequality, distributional impacts of climate change mitigation and impacts   |
|  | Research | 37  | Post-growth                  | Economic pluralism and post-growth scenarios   |
|  | Workshop | 38  | Beyond GDP                   | Beyond GDP: economic dimensions of integrated assessment scenarios   |
| Scenario methodology                   | Workshop | 12  | Reflexivity                  | Reflexivity for sustainable and equitable futures: broadening scenario inputs for linkages across methods, scales, and levels                    |
|  | Research | 22  | Integrated Scenarios         | Integrated scenarios of impacts, mitigation and adaptation   |
|  | Workshop | 29  | Stakeholder participation    | Learnings from stakeholder participation for the development and implementation of scenarios and long-term pathways towards sustainable systems. |
|  | Research | 47  | Modeling SDGs                | Modelling integrated scenarios for reaching climate and sustainable development goals  |
|  | Workshop | 202 | Development process          | Improving the scenario development process   |

# Scenarios Forum: detailed program

## Session ID # 15: Quantitative scenarios for adaptation and adaptive capacity

06/20/2022, 14:30 - 16:00

Laxenburg Conference Center - Theatersaal

**Lead organizer(s):** Nicole van Maanen<sup>1</sup>, Tabea Lissner<sup>1</sup>, and Marina Andrijevic<sup>2</sup>

**Institutional Affiliation(s):** Climate Analytics<sup>1</sup> and International Institute for Applied Systems Analysis<sup>2</sup>

**Session Type:** Research Session

### Session Description:

In this session, we call for submissions from researchers and practitioners working on quantitative approaches to assess concepts relevant to better understanding adaptation broadly, and within the context of Shared Socioeconomic Pathways (SSPs) specifically.

Adaptation is currently underrepresented in quantitative global assessments of climate change. At the same time, adaptation is pivotal for reducing the magnitude of damages caused by extreme weather events, or slow onset climate change such as sea level rise. By not accounting for possible pathways of adaptation or when just assuming a certain level of adaptation will take place, models could risk to underestimate climate impacts, as well as possibly downplay the urgency and the extent of mitigation that is required.

Compared to mitigation, adaptation and adaptive capacity are more challenging to define, as adaptation is primarily context-specific, interacts on many scales, involves various stakeholders and actors, and provides more local rather than global benefits. Whether and to what extent an adaptation option can be deployed depends on adaptive capacity, which in turn depends on the present and future socio-economic conditions of countries. In this context, “adaptation challenges” pillar of the SSPs should be advanced to address the gap in research which is currently missing quantitative assessments of adaptation pathways and adaptive capacity. Quantifying adaptive capacity in a fashion suitable for inclusion into climate impact models and integrated assessment models is an important step towards better-constrained estimates of the future co-evolution of impacts and adaptation. Proposals on how to assess adaptive capacity have become available (e.g., Andrijevic *et al.*, 2021), but an inclusion by the modelling community is the next necessary step. To that end, we would particularly encourage submissions from researchers and practitioners working directly within modelling community to understand the entry-points in IAMs and/or other impact models.

### Presenters:

**Vanessa Völz**, Global Climate Forum e.V. Berlin

*Oral presentation:* Using learning scenarios to quantify future adaptation.

**Esther Boere**, International Institute for Applied Systems Analysis (IIASA)

*Oral presentation:* Integrated climate change impacts and adaptations of agriculture, forestry and fisheries in Europe, and their impacts on the economy and the environment.

**Eva Preinfalk**, Wegener Center for Climate and Global Change (University of Graz)

*Oral presentation:* The macroeconomic and budgetary implications of public climate change adaptation in EU Member States – the case for Austria, Spain & the Netherlands.

**Kai Wan**, University of Edinburgh

*Oral presentation:* Projection of heat-health burden in Scotland under aligned Shared Socioeconomic Pathways of climate, population and adaptation.

**Sepehr Marzi**, Fincons SpA external service provider of European Commission Joint Research Centre

*Oral presentation:* INFORM Risk. Climate Change: assessing the Enhanced Coping Capacity required to counteract the adverse impacts of Amplified Climate-Related Hazards.

**Giacomo Falchetta**, Centro Euro-Mediterraneo sui Cambiamenti Climatici (Università Ca'Foscari Venezia) and RFF-CMCC European Institute on Economics and the Environment

*Poster presentation:* Household-level scenarios of air conditioning-induced electricity consumption.

**Alessio Mastrucci**, International Institute for Applied Systems Analysis (IIASA)

*Poster presentation:* Global scenarios of access to basic residential cooling and adaptation to heat stress

## Session ID # 201: Synthesis and communication of climate change risks in scientific assessments

06/20/2022, 14:30 - 16:00

Laxenburg Conference Center - Marschallzimmer 1

**Lead organizer(s):** Brian O'Neill<sup>1</sup> and Lena Reimann<sup>2</sup>

**Institutional Affiliation(s):** Pacific Northwest National Laboratory<sup>1</sup> and Vrije Universiteit Amsterdam<sup>2</sup>

**Session Type:** Workshop Session

### **Session Description:**

Assessments of the scientific literature on climate change impacts and risks requires drawing on a wide variety of studies that use different methodologies and examine many different types of impacts to different regions, sectors, and population groups. Risks will further depend on levels and rates of climate change, societal conditions, and assumed adaptation efforts and effectiveness. Accurately synthesizing and clearly communicating these risks is therefore complex and difficult. The use of scenarios is one means of carrying out such synthesis, by combining results from various impact studies to produce a cohesive vision of how the world may unfold in terms of the consequences of climate change. Alternatives include assessing and synthesizing impacts by global warming level, time period, or specified levels of exposure, vulnerability, or adaptation.

This workshop session will explore the various approaches to synthesizing and communicating climate change impacts, with an eye toward identifying the strengths and weaknesses of scenario-related approaches and how they could be improved. It will consist of 4-5 short presentations followed by substantial discussion with all participants. We seek abstracts for brief presentations (or posters) that could include (but are not limited to) reflections on experience within existing climate impacts assessments from the IPCC, national institutions, or other organizations; relevant experience with assessments of other issues with impacts on society; and proposals for new approaches to synthesis and communication of scenario-based work. Note that abstracts on individual impact studies are not suitable for this session, which focuses on assessing large bodies of evidence.

### **Presenters:**

**Jan C Minx**, Mercator Research Institute on Global Commons and Climate Change

*Oral presentation:* A data science revolution for synthesizing scenario evidence in IPCC assessments

**Hans-Martin Füßel**, European Environment Agency

*Oral presentation:* Scenario use in European climate hazard, impact and risk assessments

**Veruska Muccione**, University of Zurich

*Oral presentation:* From key risks to pathways for adaptation in Europe

**Carl-Friedrich Schleussner**, Climate Analytics

*Oral presentation:* Quantifying uncertainty in aggregated climate change risk assessments

**Brian O'Neill**, Pacific Northwest National Laboratory

*Oral presentation:* Scenarios of outcomes for climate change impacts, mitigation, and adaptation

## **Session ID # 26: Applying global socio-economic scenarios for regional climate change impact and adaptation analysis**

06/20/2022, 14:30 - 16:00, 16:30 - 18:00

Laxenburg Conference Center - Marschallzimmer 2

**Lead organizer(s):** Kasper Kok<sup>1</sup> and Timothy Carter<sup>2</sup>

**Institutional Affiliation(s):** Wageningen University<sup>1</sup> and Research and Finnish Environment Institute<sup>2</sup>

**Session Type:** Research Session

### **Session Description:**

The global Shared Socioeconomic Pathways (SSPs) have been developed to serve a variety of scenario needs for analysing future climate change, in particular for supporting adaptation and mitigation policy. Scenario application for supporting adaptation is primarily addressed by the impacts, adaptation and vulnerability (IAV) community. Since SSPs provide a global frame, their application in regional or sectoral IAV studies can potentially enhance comparability among studies. A key question is how the SSPs have been used to develop regional scenarios, particularly by the IAV community. A central challenge is that the relevance and credibility of global scenarios can seem remote from the complexity and uniqueness of local conditions and needs. This double session examines how such an apparent quandary can be reconciled. It first presents the state-of-the-art of regional SSP development, followed by an overview of how regional SSPs have been used in the IAV community, thus testing the applicability of downscaled SSPs. The session will start with results from a systematic review that has been undertaken including thousands of peer-reviewed papers, out of which about 170 were selected. The review focused on papers that developed the broader global qualitative component of the SSPs into regional scenarios. Two invited speakers will present downscaling efforts. Subsequently, this session invites abstracts that illustrate applications from the IAV community, stocktaking how SSPs were regionally/locally extended, for what purpose, and which methods were used. Some issues to explore include methods of co-developing scenarios for use in analyses for sectors versus systems versus regional units; combining top-down and bottom-up methods; scenario needs to support national and regional adaptation plans; future evolution of reference scenarios (SSPs) to serve IAV needs; regional scenarios for framing co-development of coherent regional mitigation and adaptation (and other) policies. The last part of the session allows for discussion on knowledge advancements.

**Presenters:**

**Session 26A (14:30-16:00)**

**Chair:** Kasper Kok, Wageningen University

**Presenters:**

**Simona Pedde**, Wageningen University and Research

Oral presentation: Applying global socio-economic scenarios for regional climate change impact and adaptation analysis

**Abiy S. Kebede**, Brunel University London

*Oral presentation:* Integrating multi-scale and participatory scenario methods for assessing climate change impacts and adaptation in coastal deltas: Lessons and outlook

**Antje Katzschner**, Ludwig-Maximilians-Universitaet Munich

*Oral presentation:* Challenges and advantages in the process of downscaling scenarios

**Timothy Carter**, Finnish Environment Institute (SYKE)

*Oral presentation:* Co-production of SSP-based integrated scenarios to support provincial climate change adaptation planning in Finland

**Leiwen Jiang**, Hunter College, CUNY

*Oral presentation:* Local urban extensions of the Shared Socioeconomic Pathways (SSPs) for city-scale risk and adaptation assessments – state of research and ways forward

**Coffee break (16:00-16:30)**

**Session 26B (16:30-18:00)**

**Chair: Timothy Carter**, Finnish Environment Institute (SYKE)

**Presenters:**

**Hermine Mitter**, University of Natural Resources and Life Sciences, Vienna; Department of Economics and Social Sciences; Institute for Sustainable Economic Development

*Oral presentation:* Downscaling Global Shared Socioeconomic Pathways for European and National Agriculture and Food Systems: The Eur-Agri-SSPs and the AT-Agri-SSPs

**Anita Lazurko**, School of Environment, Resources, and Sustainability, University of Waterloo

*Oral presentation:* Projecting local climate resilient futures under the SSPs: Participatory cross-impact balances modelling in the Red River Basin

**Athanasios Vafeidis**, Institute of Geography, Christian-Albrechts University Kiel

*Oral presentation:* Harmonizing the development of local socioeconomic scenarios: A participatory downscaling approach applied in five European case studies

**Kari Hyytiäinen**, University of Helsinki

*Oral presentation:* Extending the Shared Socioeconomic Pathways for adaptation planning of blue tourism

**Kasper Kok**, Wageningen University

*Oral presentation:* Beyond climate, narratives, and models: Novel methods to develop and use the SSPs in the Netherlands

**Poster session (Monday 20 June, 18:00-19:30)**

**Jamie Jenkins**, University of Helsinki

*Poster presentation:* Regionally Extended Shared Socioeconomic Pathways for the Offshore Wind Industry in Finland



## Session ID # 24: Scenario development and modeling that bridges scales and communities: the rich diversity of global transport futures

06/20/2022, 14:30 - 16:00

Laxenburg Conference Center – Kaminzimmer

**Lead organizer(s):** David McCollum<sup>1</sup>, Sonia Yeh<sup>2</sup>, Paul Kishimoto<sup>3</sup>, Bas van Ruijven<sup>3</sup>, Roberto Schaeffer<sup>4</sup>, Ioannis Tsiropoulos<sup>5</sup>

**Institutional Affiliation(s):** Oak Ridge National Laboratory<sup>1</sup>, Chalmers University<sup>2</sup>, International Institute for Applied Systems Analysis<sup>3</sup>, Alberto Luiz Coimbra Institute for Graduate Studies and Research in Engineering (COPPE)<sup>4</sup>, and E3 Modelling<sup>5</sup>

**Session Type:** Workshop Session

### Session Description:

Global transport comprises many identifiable systems and subsystems. These range in scope from ‘micro’ (individuals, neighborhoods, cities) to ‘macro’ (countries and world regions). Analysis of and scenarios for these systems often focus on specific geographic areas or transport modes—or, conversely, sacrifice resolution to span the global system. A similar type of partitioning tends to be seen in the study of alternative fuel pathways (biofuels, electricity, hydrogen, and e-fuels). These choices on scale and scope lead to research communities that can be fragmented.

A future low-carbon transport system could be comprised of a more diverse mix of fuels and technologies than we see today and is expected to interact more and more with the broader energy system. But how might the fuel/technology mix look within countries, and how will it compare between them? And how can scenarios and modeling account for heterogeneity across multiple scales and multiple strategies, particularly with work being conducted across disparate communities?

Scenarios provide one potential answer to these questions, if they, and the tools used to quantify them, could be developed jointly by researchers in different disciplines. Such collaborative activities would strengthen connections, promote dialogue, and harmonize efforts that would otherwise remain disconnected. Scenarios can serve as a common language for discussing phenomena across subsystems, thereby facilitating integration of disparate modeling paradigms and outcomes. Currently, nothing resembling a common scenarios process exists for the study of transport worldwide. While much of the global (macro) modeling community frames their narratives in terms of the Shared Socioeconomic Pathways (SSPs), local/national scenarios tend to be crafted with more micro-scale considerations (technology, policy, socio-economics) in mind. Reconciling these different perspectives presents a challenge, but also an opportunity, in the analysis of transport futures.

This session will bring together diverse viewpoints with the aim of advancing scenario-based transport research that serves the knowledge needs of equally diverse researchers and stakeholders. Toward that end, the session welcomes abstract submissions on:

- What is the current state of the science with respect to transport technology potentials and costs and the modeling of transport alongside other sectors, in global/national and city/regional settings?

- Can standard ‘handshakes’ be organized by researchers from different communities, in order to bridge qualitative trends and their modeling quantifications across scales and fuels/technologies?
- What are critical features for a common transport scenarios process that would ease multi-scale and multi-strategy analysis?

**Presenters:**

**Roberto Schaeffer**, Universidade Federal do Rio de Janeiro

*Oral presentation:* Scenarios for the simultaneous decarbonization of both aviation and shipping: An integrated perspective for the case of Brazil

**Guineng Chen**, ITF\OECD

*Oral presentation:* Integrate Transport Models for Assessing Cross-scale Common Scenarios: The ITF Approach

**Matteo Muratori**, National Renewable Energy Laboratory

*Oral presentation:* Scenarios of US transportation decarbonization

**Ramya Natarajan**, Center for Study of Science, Technology and Policy (CSTEP)

*Oral presentation:* Transport Sector Dynamics in India: Scenario Development and Analysis

**Rafael Garaffa**, European Commission - Joint Research Centre (JRC-Seville)

*Oral presentation:* Building baselines for air and land transport

## Session ID # 47: Modelling integrated scenarios for reaching climate and sustainable development goals

06/20/2022, 14:30 - 16:00

Laxenburg Conference Center - Franz Josef

**Lead organizer(s):** Bjoern Soergel<sup>1</sup>, Elmar Kriegler<sup>1</sup>, Sebastian Rauner<sup>1</sup>, Detlef van Vuuren<sup>2,3</sup>, Geanderson Ambrósio<sup>2</sup>, and Bas van Ruijven<sup>4</sup>

**Institutional Affiliation(s):** Potsdam Institute for Climate Impact Research<sup>1</sup>, Utrecht University<sup>2</sup>, Netherlands Environmental Assessment Agency<sup>3</sup>, and International Institute for Applied Systems Analysis<sup>4</sup>

**Session Type:** Research Session

### Session Description:

The Sustainable Development Goals (SDGs) and the Paris Agreement set an ambitious agenda for human well-being within planetary boundaries. Given the narrow time horizon for delivering on climate action and progress towards the SDGs, there is an urgent need for pathways exploring how to advance these goals jointly. Requirements for modelling such sustainable development pathways (SDPs) are a fairly comprehensive coverage of the SDG target space, including interactions between targets [1,2,3].

Following the recent publication of a first model-based SDP scenario [4], this session aims to provide a forum for discussing the development of the next generation of SDP scenarios. By broadening and connecting the modelling communities developing such pathways, it also extends the existing SSP-RCP scenario framework with SDP scenarios.

The invited presentations will present i) first results from a multi-model comparison of a set of several SDP scenarios [5], reflecting different societal perspectives on how to pursue sustainable development, and ii) discuss recent methodological advances in integrated SDG modelling, as well as the need for future model development [6].

Submissions for presentations or posters can focus e.g. on the following topics: i) advancing integrated assessment models for SDG analyses, ii) model-based analysis of interactions between multiple sustainable development goals, or iii) target-seeking scenarios integrating climate and sustainable development targets.

Based on these inputs, the session aims to discuss how to arrive at robust insights about the interventions required to advance sustainable development, about synergies and trade-offs, and how such modelling work can inform policy processes.

[1] The World in 2050 report,

[http://pure.iiasa.ac.at/id/eprint/15347/1/TWI2050\\_Report081118-web-new.pdf](http://pure.iiasa.ac.at/id/eprint/15347/1/TWI2050_Report081118-web-new.pdf)

[2] van Vuuren *et al.* 2021, <https://eartharxiv.org/repository/view/2386/>

[3] van Soest *et al.* 2019,

<https://www.sciencedirect.com/science/article/pii/S2589791819300179>

[4] Soergel *et al.* 2021, <https://www.nature.com/articles/s41558-021-01098-3>

[5] <http://shape-project.org/>

[6] <http://www.sdg-futures.eu/>

**Presenters:**

**Detlef Van Vuuren**, Utrecht University

*Oral presentation:* Sustainable development pathways – the current state and future prospects (first insights from the PICASSO project)

**Bjoern Soergel**, Potsdam Institute for Climate Impact Research (PIK)

*Oral presentation:* Sustainable Development Pathways reflecting different societal perspectives: First results from the SHAPE project

**Enayat A. Moallemi**, Deakin University

*Oral presentation:* Diversifying models for analysing global change scenarios and sustainability pathways

**Poornima Kumar**, CSTEP India

*Oral presentation:* Using the Sustainable Alternative Futures for India (SAFARI) model to explore integrated scenarios for reaching climate and sustainable development goals

**Alize le Roux**, Institute for Security Studies, African Futures and Innovation

*Oral presentation:* Forecasting Africa's Future

**Jihoon Min**, International Institute for Applied Systems Analysis (IIASA)

*Poster presentation:* Modelling integrated scenarios for reaching climate and sustainable development goals

**Thomas Wiedmann**, UNSW Sydney, Australia

*Poster presentation:* Modelling Sustainable Development Pathways at National Level

## **Session ID # 83: Representative Agricultural Pathways – Cross-scale and trans-disciplinary storylines for agricultural development and decision-making**

**06/20/2022, 14:30 - 16:00**

**The International Institute for Applied Systems Analysis (IIASA) – Gvishiani**

**Lead organizer(s):** Alex Ruane<sup>1</sup> and Roberto Valdivia<sup>2</sup>

**Institutional Affiliation(s):** NASA Goddard Institute for Space Studies<sup>1</sup> and Oregon State University<sup>2</sup>

**Session Type:** Workshop Session

### **Session Description:**

Countries are in the process of developing their National Adaptation Plans and Nationally Determined Contributions as part of their commitment to the Paris Agreement while at the same time, policy makers are developing strategies and interventions for agricultural development that could lead to achieving the Sustainable Development Goals. The next generation of development scenarios will benefit from an enhanced representation of the dynamic nature of agricultural production and food systems. The future of agricultural systems further influences (and is influenced by) economic growth, competition for land and water resources, rural/urban contrasts, producer/consumer divides and dietary demands across heterogeneous populations. The Agricultural Model Intercomparison and Improvement Project (AgMIP) is an international community of 1200+ climate, crop, livestock, economics and health experts working to assess and address current and future agricultural development and food security challenges. AgMIP assessments augment the SSP-RCP framework with additional agricultural sector development pathways called Representative Agricultural Pathways (RAPs), which are designed to be compatible across different scales of application (from local to national and international). Examples of RAP information include illustrative pathways for food prices, agricultural fees and subsidies, risk management instruments, farm technology, and costs for equipment, labor and transportation. Conditions of agricultural systems at sub-national level are typically inadequately addressed by agricultural and climate change related action plans that would enable the implementation of the countries' Vision 2030. Recent work in the AgMIP Climate Change Adaptation and Resilience (CLARE) project indicates that national and sub-national detail is particularly important to evaluate specific systems transitions building, sustainable, climate resilient and just agricultural systems. This session welcomes contribution on how scenarios for the agricultural sector can be linked into broader scenario efforts, the use of RAPs in the AgMIP project and (discussion on) how RAPs and additional agricultural information may be connected to the next generation of scenarios.

### **Presenters:**

**Jonas Jägermeyr**, Columbia University and NASA GISS

*Oral presentation:* Climate change implications for global agriculture under current practices and future management pathways

**Sabine Homann-Kee Tui**, International Crops Research Institute for the Semi-Arid Tropics  
*Oral presentation:* Future scenarios to support national policy decision making: the AgMIP Representative Agricultural Pathways applications

**Subash Nataraja Pillai**, ICAR-Indian Institute of Farming Systems Research  
*Oral presentation:* Sustainable Agricultural Pathways for India under projected climate change scenario 2050s – Need for corrections under Pandemic situation

**Kaveri Ashok**, Center for Study of Science, Technology and Policy (CSTEP)  
*Oral presentation:* Sustainable alternative pathways for agriculture in India

**Mario Herrero**, Cornell University  
*Oral presentation:* The transition of the livestock sector under environmental, diet and health constraints.

**Alexander Popp**, Potsdam Institute for Climate Impact Research (PIK)  
*Oral presentation:* From Shared Socioeconomic to Sustainable Development Pathways – the next step for global agricultural economic models

**Keith Wiebe**, International Food Policy Research Institute (IFPRI)  
*Oral presentation:* Enhanced foresight and engagement with decision makers to accelerate food, land, and water systems transformation in developing countries

**Willem Verhagen**, Frederick S Pardee Center for International Futures  
*Oral presentation:* The future of food security along pathways of food supply, food access and inequality in food access

**Davit Stepanyan**, Johann Heinrich von Thünen-Institut  
*Poster presentation:* Climate mitigation measures in European agriculture under uncertainty

## Session ID # 69: Exploring and expanding the cross-border dimensions of the SSPs

06/20/2022, 14:30 - 16:00

The International Institute for Applied Systems Analysis (IIASA) – Wodak

**Lead organizer(s):** Stefan Fronzek<sup>1</sup>, Magnus Benzie<sup>2</sup>, Henrik Carlsen<sup>2</sup>, Timothy Carter<sup>1</sup>, Christopher Reyer<sup>3</sup>

**Institutional Affiliation(s):** Finnish Environment Institute<sup>1</sup>, Stockholm Environment Institute<sup>2</sup>, Potsdam Institute for Climate Impact Research<sup>3</sup>

**Session Type:** Research Session

### Session Description:

Climate change impacts, adaptation and vulnerability studies tend to confine their attention to impacts and responses within the same geographical region. However, this approach ignores cross-border climate change impacts that occur remotely from the location of their initial impact and that may severely disrupt societies and livelihoods, e.g. through international trade, financial markets and issues related to migration and security.

For example, the 2011 flood in Thailand destroyed industrial parks of the electronics sector with wide-ranging consequences for the economy globally through disruptions of supply chains. The potential impacts of a recurrence of a similar event in the future depend on the vulnerability of the region directly affected, but also on what kind of ties and connections with other parts of the world are in place – both aspects can vary greatly under alternative scenarios of the future. This session attempts to explore how current scenario frameworks such as the Shared Socio-economic Pathways (SSPs) can be used and extended to explore the cross-border dimensions of climate change impacts. How may the connections between countries and regions evolve into the future, how might these affect the propagation of climate change risks across borders, and what are possible responses to these changing risks?

We welcome contributions on the following topics:

- Studies advancing scenario assumptions that determine the level of inter-regional connectivity and cooperation
- Quantitative and qualitative assessments of the effects of cross-border climate change impacts under different scenarios using indicator, model-based (e.g. trade, integrated assessment, migration models) or stakeholder-driven approaches
- Development and discussion of response options of actors at various scales to address cross-border impacts of climate change under a range of different scenarios

The session is organized by the EU-funded CASCADES project (CAScading Climate risks: towards ADaptive and resilient European Societies – [www.cascades.eu](http://www.cascades.eu)).

### Presenters:

**Stefan Fronzek**, Finnish Environment Institute

*Oral presentation:* Characterizing international connectivity in the SSPs for assessing future cross-border climate change impacts and responses

**Nina Knittel**, Wegener Center for Climate and Global Change, University of Graz

*Oral presentation:* The transmission of global climate change via international trade – Insights from a cross-sectoral impact assessment for Austria

**Irene Monasterolo**, EDHEC Business School, EDHEC-Risk Institute

*Oral presentation:* Assessing Financial Risks from Physical Climate Shocks: A Framework for Scenario Generation

**Adrien Detges**, adelphi

*Oral presentation:* A SSP perspective on cascading climate impacts on security and European foreign relations

**Fanny Groundstroem**, University of Helsinki

*Oral presentation:* Implications of different global development pathways for adaptation to cross-border impacts of climate change in national low-carbon transitions

**Ousseyni Kalilou**, Gum Arabic Institute of Poverty Alleviation

*Poster presentation:* Shared Socio-economic Pathways to the Future of the Food System in the Sahel: Sustainable Food-Related Solutions for Climate-Related Insecurity



## Session ID # 50: New and on-going work on scenarios for biodiversity & nature contributions to people

06/20/2022, 16:30 - 18:30

Laxenburg Conference Center – Theatersaal

**Lead organizer(s):** David Leclère<sup>1</sup>, Rob Alkemade<sup>2</sup>, and Detlef van Vuuren<sup>3,4</sup>

**Institutional Affiliation(s):** International Institute for Applied Systems Analysis<sup>1</sup> and Wageningen University<sup>2</sup>, Utrecht University<sup>3</sup>, and Netherlands Environmental Assessment Agency<sup>4</sup>

**Session Type:** Research Session

### Session Description:

Models and scenarios are increasingly used in research and policy support contexts for biodiversity and nature contributions to people (NCP). While the SSP/RCP scenario framework was developed in the context of climate change, it is widely used to provide storylines and/or quantification to biodiversity & NCP-relevant scenarios as it provides the largest exploration of environmental change drivers to date, many being directly or indirectly relevant for biodiversity & NCP. At the same time, new scenario frameworks are developing to specifically foster biodiversity & NCP-relevant knowledge generation and decision-making support, such as the Nature Futures Framework (NFF), spurred by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). These scenario frameworks are applied for biodiversity & NCP in various contexts: scales, geographies, knowledge vs decision-making support, knowledge generation and decision-making practices, etc.

This research session aims to feature new and on-going scenario work that contributes to biodiversity & NCP knowledge generation and decision-making support. It welcomes submissions on biodiversity & NCP scenario development and application in a variety of contexts (scales, geographies, knowledge vs decision-making support, knowledge generation and decision-making practices). The session will feature 7 presentations. It links to a workshop session (session 59, Marschallzimmer 1, June 22, 2022 11:00 AM - 12:30 PM CEST) discussing the cross-fertilization and linking across scenario frameworks.

### Presenters:

**Kazuaki Tsuchiya**, National Institute for Environmental Studies

*Oral presentation:* Towards the development of integrated scenarios for biodiversity and climate change: exploring uncertainties in global protected area expansion and land use change

**Patrick José von Jeetze**, Potsdam Institute for Climate Impact Research (PIK)

*Oral presentation:* Taking the landscape perspective for safeguarding nature's contributions to people in the global land system

**Sarah Jones**, Alliance of Bioversity International & CIAT

*Oral presentation:* Pathways for food and land systems to contribute to global biodiversity targets

**Zuzana Harmackova**, CzechGlobe & Stockholm Resilience Centre

*Oral presentation:* Linking multiple values of nature with future impacts: Value-based participatory scenario development for sustainable landscape governance

**Maria Gasalla**, University of Sao Paulo

*Oral presentation:* Scenarios of the sustainable use of wild species

**Olivier Maury**, Institut de Recherche pour le Développement (IRD)

*Oral presentation:* Ocean System Pathways (OSP) for driving marine ecosystems & fisheries models.

**Bernd Lenzner**, Bioinvasions, Global Change, Macroecology Group, University of Vienna

*Oral presentation:* Biological invasion scenarios – the neglected driver in biodiversity scenarios

**Justin Johnson**, Department of Applied Economics, University of Minnesota

*Oral presentation:* The missing middle: Meso level interactions from Integrated Assessment Models linking the global and local scales of the GTAP-InVEST model

**Martin Schönhart**, University of Natural Resources and Life Sciences, Vienna

*Poster presentation:* Participatory scenario design for ecosystem services and biodiversity assessments in four European case study landscapes

**Tana Qian**, National Institute for Environmental Studies

*Poster presentation:* Estimating the potential of waste residual woody biomass for regional woody bioelectricity generation in Aizu region, Japan

## Session ID # 63: Scenarios in IPCC assessments: lessons from AR6 and recommendations for AR7

06/20/2022, 16:30 - 18:00

Laxenburg Conference Center - Marschallzimmer 1

**Lead organizer(s):** Jan Fuglestedt<sup>1</sup> and Anna Pirani<sup>2</sup>

**Institutional Affiliation(s):** CICERO Center for International Climate Research<sup>1</sup> and The Abdus Salam International Centre for Theoretical Physics, Trieste<sup>2</sup>

**Session Type:** Workshop Session

### **Session Description:**

The use of scenarios has been an integrating and cross-cutting element across the Working Groups (WGs) in the 6th cycle of the IPCC (AR6), with three Special Reports overseen by the three Working Groups (WGs), as well as the three WG reports and the coming Synthesis Report. Stronger collaboration and linkages across communities were developed thanks to the cross-cutting nature of the three Special Reports, and this was followed up in the writing of the three WG reports. IPCC WGI considered a core set of scenarios from the SSP framework from CMIP6, supplemented by RCPs from CMIP5. WGII used both SSPs and RCPs, and WGIII used scenarios from a database containing more than 2000 scenarios, complemented by bottom-up approaches.

The session will address the role of scenarios for the development of key findings from the WG reports and discuss knowledge gaps and challenges in the context of new and emerging research. Topics will include emissions, climate responses, risks and development pathways, on both near-term and long-term time scales, regional climate changes and impacts and costs and benefits of mitigation and adaptation in the context of sustainable development. Lessons learned that are useful for the AR7 cycle and beyond will be considered. The workshop will end with a discussion between the panel and all session participants of ideas and recommendations for strengthened coordination across the IPCC and its underlying scientific and technical communities and will address how the use of scenarios can support addressing important climate research questions and the coming assessments from the IPCC.

This session will not be open to submissions of abstracts for oral presentations, but invites submissions for posters. The workshop will include approximately 4 invited speakers/panelists from various backgrounds and communities representing different perspectives and the breadth of the scenario assessment within the AR6. Each panelist will give a short presentation on successes and challenges in how scenarios facilitated and/or integrated the assessment in AR6, as well as key recommendations for AR7 based on that experience.

### **Presenters:**

**Anna Pirani**, The Abdus Salam International Centre for Theoretical Physics, Trieste

*Oral presentation:* intro about AR6 (i.e., SRs and WG reports)

**Jochem Marotzke**, Max Planck Institute for Meteorology, **June-Yi Lee**, Pusan National University  
*Oral presentation: WGI, SyR*

**Steven Rose**, Electric Power Research Institute (EPRI)  
*Oral presentation: WGII*

**Keywan Riahi**, IIASA, **Roberto Schaeffer**, COPPE, **Edward Byers**, IIASA  
*Oral presentation: WGIII*

**Claudia Tebaldi**, Lawrence Berkeley National Laboratory  
*Oral presentation*

**Edward Byers**, International Institute for Applied Systems Analysis (IIASA), **Roberto Schaeffer**, COPPE  
*Poster presentation: Systematic scenario process to support analysis of long-term emissions scenarios and transformation pathways for the IPCC WG3 6th Assessment Report*

## Session ID # 93/94: Addressing the gender dimension in socioeconomic scenarios: policy and climate change impacts on gender equality & gender equality as a driver of change

06/20/2022, 16:30 - 18:30

Laxenburg Conference Center – Kaminzimmer

**Lead organizer(s):** [Caroline Zimm](#)<sup>1</sup> and [Jonathan Moyer](#)<sup>2</sup>

**Institutional Affiliation(s):** International Institute for Applied Systems Analysis<sup>1</sup>; University of Denver; Pardee Center<sup>2</sup>

**Session Type:** Workshop Session

### **Session Description:**

While it is recognized that gender matters in climate change mitigation and adaptation efforts and human development, to date it has been challenging to empirically address the gender dimension in socioeconomic scenarios – both regarding impacts of climate change and related policies on gender (in)equality, as well as the impact of gender (in)equality as a driver of change.

Accounting for gender differentials in policy is essential because women generally have reduced access to socioeconomic resources, services and social protection. A growing body of gender-focused analysis highlights both the disproportionate vulnerability faced by women during shocks (i.e., induced by climate change or COVID-19), and the disproportionate impact that investments can have on their development prospects. Meanwhile, risk perceptions and climate-related attitudes and behavior vary by gender.

Explicitly accounting for gender differentials in future socioeconomic scenarios requires both baseline empirical evidence and a scenario design that is gender-responsive. Gender- and sex-disaggregated data are becoming available from various sources. Nevertheless, there has been limited attention to sex-specific outcomes in long-range projections and scenario frameworks (e.g., SSPs). Much of our analysis may partially misrepresents outcomes related to half the global population and potentially sustainable human development policies. Accounting for gender heterogeneity enables more realistic representation of current and future socioeconomic development relevant to sustainable development.

This workshop explores progress, challenges, and opportunities associated with gender- or sex-disaggregate indicators in long-range projection and scenario analysis. The workshop session is split into two:

- The first half will focus on the impacts of climate change and policy on gender inequality. We aim to explore current empirical and modelling work which explicitly addresses the gender dimension in climate-related development issues (e.g., gender sensitive scenarios).
- The second half will focus on gender inequality as a driver of change., e.g., how improvements in gender equality may impact climate mitigation and adaptation, or human, social, and economic development more broadly.

### **Presenters:**

**Raya Muttarak**, University of Bologna/International Institute for Applied Systems Analysis (IIASA)  
*Oral presentation:* Why sex/gender-disaggregated data and analysis matter for scenarios building and how do we get there?

**Daniele Malerba**, German Development Institute (DIE)

*Oral presentation:* Inequality and gender disparities in India – the impact of climate policies and revenue recycling schemes

**Wolfgang Lutz, Anne Goujon**, International Institute for Applied Systems Analysis (IIASA)

*Oral presentation:* Differentiation by gender in demographic drivers and well-being outcomes

**Mathilde Rainard**, University of Leeds

*Oral presentation:* How does gender equality relate to environmental performances of countries?

**Osprey Orielle Lake**, University of California at Davis

*Oral presentation:* Gender diversity in leadership reduces emissions. What does this mean for our models, and for climate communications in general?

**Marina Andrijevic**, International Institute for Applied Systems Analysis (IIASA)

*Oral presentation:* All brains in action: Gender equality, education, and mitigation ambition

**Felix Creutzig**, MCC Berlin and TU Berlin

*Oral presentation:* Quality of governance, gender equality, and just outcomes: a virtuous cycle

**Marina Andrijevic**, International Institute for Applied Systems Analysis (IIASA)

*Poster presentation:* Overcoming gender inequality for climate resilient development

**Camille Belmin**, Potsdam Institute for Climate Impact research

*Poster presentation:* Scaling-up girls' education through the carbon market? A case study on rural Zambia

## Session ID # 56: Assessing the impacts of the Global Energy Transition in the global south

06/20/2022, 16:30 - 18:00

Laxenburg Conference Center - Franz Josef

**Lead organizer(s):** Jude Kurniawan<sup>1</sup>, Andreas Goldthau<sup>2</sup>, and Maria Apergi<sup>1</sup>

**Institutional Affiliation(s):** Institute for Advanced Sustainability Studies, Potsdam<sup>1</sup>, Willy Brandt School of Public Policy, University of Erfurt<sup>2</sup>

**Session Type:** Research Session

### Session Description:

To achieve the Paris climate target of “well below 2 degrees” of global warming, the global energy system needs to decarbonize. This means switching from a fossil fuel-based system to one that relies on renewables and low carbon technologies. While the push in the global energy transition is ongoing delivering numerous benefits, it is also creating new inequalities. The risks posed by this transformation will impact especially countries of the Global South, in part due to the lack of access to technologies and capital. What, then, can be done to ensure that these countries can also make the transition to a low-carbon economy? Although energy transition scenario studies may adopt a global perspective, the focus will be on countries of the Global South. This session invites oral and *Poster presentations* on methodological insights for analyzing the social dimensions of the global energy transitions, touching on various issues including the politics of climate change mitigation; questions related to distributional justice; the political economy of national decarbonization; and the opportunities and barriers in the present of the systemic change. In this session we will discuss pertinent aspects including financial flows, the economics of going low carbon, and the role of technology and policy.

### Presenters:

**Hsing-Hsuan Chen**, Copernicus Institute of Sustainable Development, Faculty of Geosciences, Utrecht University

*Oral presentation:* Using decomposition analysis to identify major contributors to carbon neutrality across sectors in OECD and non-OECD regions

**Esther Schuch**, Institute for Advanced Sustainability Studies (IASS)

*Oral presentation:* Breaking the Carbon Lock-In: A scenario analysis of the Malaysian energy transition

**Giacomo Falchetta**, International Institute for Applied Systems Analysis (IIASA)

*Oral presentation:* Scenarios of solar irrigation uptake in Africa and their development potential

**Hui Yang**, The Pennsylvania State University

*Oral presentation:* The critical role of socio-demographic factors in determining the future health burden from ambient particulate matter

**Adam Suski**, Technical University of Denmark

*Poster presentation:* Power system expansion planning in the presence of uncertainty and climate change: The case study of Ecuador

**Dorothee Flaig**, Universität Hohenheim

*Poster presentation:* Impact of EU CBAM on the oil market and related socio-economic implications for the Global South



## Session ID # 30: Interpreting and debiasing uncertainties in SSP-based model ensembles

06/20/2022, 16:30 - 17:15

The International Institute for Applied Systems Analysis (IIASA) - Gvishiani

**Lead organizer(s):** Massimo Tavoni<sup>1</sup>, Celine Guivarch<sup>2</sup>, and Ben Sanderson<sup>3</sup>

**Institutional Affiliation(s):** RFF-CMCC European Institute on Economics and the Environment<sup>1</sup>, International Research Center on Environment and Development (CIRED)<sup>2</sup>, and CICERO Center for International Climate Research<sup>3</sup>

**Session Type:** Research Session

### Session Description:

The increasing relevance of modelled pathways for climate policy making is evident from the rapidly rising number of scenarios reviewed by the IPCC. The SSP framework is one of the cornerstones of community exercises involving multiple models. SSPs provide coordinated guidelines for running model comparisons and for spanning future socio-technical uncertainties. Despite their importance, the SSPs span a relatively small set of uncertainties, and many driving factors are limited to the current century. Furthermore, model comparisons based on SSPs do not directly address model uncertainty. Models do not constitute independent estimates and uncertainty is influenced by both choices made in the model comparison project construction and in the design of scenario intercomparison exercises. The difficulty of separating effects of SSP, target and model structure poses a challenge for the statistical interpretation of scenario ensembles, and for their use to inform climate policy via illustrative pathways. This session discusses ways to explore a wider range of uncertainties and to improve the statistical understanding of scenarios ensembles. The session welcomes contributions from the climate, impact and mitigation modelling community on independence weighting, and use of clustering methods on output and input to classify model family trees and methods based on assessment of common heritage and SSP. It also encourages discussion of use of machine learning approaches for scenario classification, uncertainty quantification and reduction. Finally, methodological contributions of uncertainty analysis and proposed revised experimental designs to improve the predictive power and robustness of ensembles in the short term while retaining the capacity to explore a vast space of outcomes in the longer period are welcome.

### Presenters:

**Thomas Le Gallic**, CIRED, CNRS

*Oral presentation:* What can we learn from the way milestones are sequenced on the road to net-zero?

**Jennifer Morris**, MIT

*Oral presentation:* Combining Probabilistic Uncertainty Quantification and Scenario Discovery Techniques

**Chris Smith**, University of Leeds / International Institute for Applied Systems Analysis (IIASA)  
*Oral presentation: A framework for downweighting similar scenarios in integrated assessment model ensembles*

**Carl Schleussner**, Climate Analytics  
*Poster presentation: Emission pathways reflecting the Paris Agreement climate objectives*

## Session ID # 20: Improving the representations of Carbon Dioxide Removal (CDR) options in the SSPs

06/21/2022, 11:00 - 12:30

The International Institute for Applied Systems Analysis (IIASA) – Wodak

**Lead organizer(s):** Keywan Riahi<sup>1</sup>, Haewon McJeon<sup>2</sup>, and Frances Wang<sup>3</sup>

**Institutional Affiliations:** International Institute for Applied Systems Analysis<sup>1</sup>, Pacific Northwest National Laboratory<sup>2,1</sup>, and ClimateWorks Foundation<sup>3</sup>

**Session Type:** Workshop Session

### Session Description:

This workshop sessions discusses the role of carbon dioxide removal (CDR) options in reaching stringent climate targets and how to improve the representation of CDR in the SSPs and the underlying emissions models. Limiting global warming to 1.5 °C will require large-scale carbon dioxide removal (CDR) to aid in deep decarbonization towards net zero CO<sub>2</sub> emissions, and to reverse accumulated emissions in the longer term. Most integrated assessment modeling scenarios to date have emphasized afforestation or bioenergy with carbon capture and afforestation. As the negative side-effects of relying on large-scale land-intensive strategies (tens of Gt-CO<sub>2</sub>/year) have become clear, several recent studies have suggested alternative approaches for carbon removal including direct air capture, direct ocean capture, accelerated weathering, and increasing soil carbon density. This session aims to provide a forum for modeling teams, technology experts, and stakeholders to exchange ideas and improve representation of CDR in the SSPs and other integrated modeling scenarios. We welcome abstract submissions featuring new scenario analysis on carbon removal technologies and their potential side-effects and co-benefits that could influence their deployment at global and regional scales. Additionally, we welcome submissions with a social science, policy or technology focus that may help to understand the pace of deployment, public perception and other conditions under which CDR options may deploy into the market.

CDR might be needed to limit warming to well below 2C. Many CDR options are however not well represented in the SSPs or most of the related climate change pathways and models. This session tries to identify community activities to improve our understanding of CDR and how to include them better into the SSP framework.

The session will include four complementary presentations (12 + 3 min) on key dimensions of future CDR deployment, followed by a discussion about possible community activities to improve their representation in the SSPs and related models.

### Presenters:

**Jay Fuhrman**, Pacific Northwest National Laboratory

*Oral presentation:* Integrated Assessment Modeling of a Comprehensive Suite of CO<sub>2</sub> Removal Technologies towards a 1.5 degree Future

**Joni Jupesta**, Research Institute of Innovative Technology for the Earth (RITE)

*Oral presentation:* Carbon Dioxide Removals (CDR) from technology diffusion, innovation, and life-cycle assessments perspectives

**Oliver Geden**, German Institute for International and Security Affairs (SWP)

*Oral presentation:* How to prepare for an increasing normalization and politicization of CDR (and its modelling) in climate policy debates?

**Jan C. Minx**, Mercator Research Institute on Global Commons and Climate Change

*Oral presentation:* The State of Carbon Dioxide Removal: A Global Status Report & Data Platform that can benefit the scenarios process

**Benjamin K. Sovacool**, Aarhus University

*Poster presentation:* Determining our climate future: Expert predictions about negative emissions and solar geoengineering pathways

**Garrett Guard**, American University, Institute for Carbon Removal Law and Policy

*Poster presentation:* Assessing a wider range of CDR technological portfolios across differing energy demand futures

**Gaurav Ganti**, Climate Analytics / Humboldt Universität zu Berlin

*Poster presentation:* Equitable carbon dioxide removal scenarios

**Nadine Mengis**, GEOMAR, Helmholtz Centre for Ocean Research Kiel

*Poster presentation:* Multi-dimensional, comparative assessment of CDR options for Germany

## Session ID # 32: Beyond illustrative scenarios - novel approaches to assess future climate risks

06/20/2022, 17:15 - 18:00

The International Institute for Applied Systems Analysis (IIASA) - Gvishiani

**Lead organizer(s):** Carl-Friedrich Schleussner<sup>1</sup> and Joeri Rogelj<sup>2, 3</sup>

**Institutional Affiliation(s):** Climate Analytics<sup>1</sup>, International Institute for Applied Systems Analysis<sup>2</sup>, and Imperial College London<sup>3</sup>

**Session Type:** Workshop Session

### **Session Description:**

Climate science often uses static illustrative scenarios to understand the impacts of a wide range of emission trajectories and associated warming outcomes. These scenarios are useful to align assumptions across research communities, but there is a risk that they become outdated and constrain the scope of research endeavors. With 90% of global emissions covered by net zero pledges, the policy discourse has shifted away from questions that pitch mitigation versus no-mitigation, to questions of how much mitigation, by whom, how fast and with which technologies. In this context, also the separate consideration of climate change adaptation and mitigation questions is increasingly left behind in favor of exploring questions of low-carbon climate resilient development. This new focus and dynamism in climate policy requires climate science to respond. Novel, versatile scenario approaches that can explore the implications of various portfolios of mitigation and adaptation measures are necessary, with a key component being a dynamic representation of the climate system that links them. Ultimately, such approaches will improve the integration of climate impacts into integrated assessment models, thereby paving the way for a true cross-working group integration in scenario development. In this session, we want to explore the latest advancements in integrating mitigation and adaptation questions in scenario development, as well as key research questions that would benefit from such an advance. This includes approaches towards improved climate impact integration in scenario development, how specific scenario components - such as land-based CO<sub>2</sub> removal - can impact adaptation and mitigation, climate emulator development and integration, assessments of climate impacts for warming rates or temperature overshoots, and key questions this research can contribute to, such as those related to loss and damage or financial risk assessment.

### **Presenters:**

**Benjamin Sanderson**, CICERO

*Oral presentation:* Reversing the scenario logic: mapping impacts back to compatible scenarios

**Jeremy Fyke**, Environment and Climate Change Canada

*Oral presentation:* Addressing the “Which scenario should I use?” question: a demonstration of probabilistic emission projections for real-world risk-based adaptation decision making

**Wim Thiery**, VUB

*Oral presentation:* The kids aren't alright

## Session ID # 85: Multiscale and multidimensional demographic projections for the extended global scenario frameworks

06/21/2022, 11:00 - 12:30

Laxenburg Conference Center - Theatersaal

**Lead organizer(s):** Leiwen Jiang<sup>1</sup>, Samir KC<sup>2</sup>, and Bryan Jones<sup>3</sup>

**Institutional Affiliation(s):** Shanghai University<sup>1</sup>, International Institute for Applied Systems Analysis<sup>2</sup>, and City University of New York<sup>3</sup>

**Session Type:** Research Session

### **Session Description:**

Population dynamics has been a key element in developing socioeconomic and environmental scenarios, including the Shared Socioeconomic Pathways (SSPs) for addressing climate change mitigation and adaptation challenges. Over the past years, many efforts have been invested in updating and extending demographic projections of the global basic SSP scenarios, acknowledging the importance of changing population size, characteristics, spatial distributions and their associated production and consumption behavior. This session seeks to extend and improve the existing population scenarios that explicitly assess demographic and spatial heterogeneity. They are projections of changes in not only population sizes, compositions by age, sex, education, rural-urban residence, household structure, and income, but also their distributions across national, subnational, and spatial scales. By examining the available methods and data for producing the multiscale and multi-dimensional projections and discussing the methodological differences, it helps understand the challenges and implications associated with demographic scenarios over small areas and long time-horizons. The session also aims to update and explore new development in the research community to consider the feedback of external forces such as climate change, conflict, and COVID-19 pandemic on population dynamics. This is in line with the new initiatives in the integrated assessment modeling community to better account for interactions and causal mechanisms between different sectors and systems. Thirdly, the session invites novel, interdisciplinary, and evidence-based research submissions that develop localized sociodemographic scenarios tailored to specific communities and apply them to supporting community-based policies for building resilience through an equity and well-being enhancement lens.

### **Presenters:**

**Iulia Marginean**, Center for International Climate Research (CICERO)

*Oral presentation:* Quantifying future vulnerability to climate change: The importance of high-resolution population projections.

**Samir KC**, International Institute for Applied Systems Analysis (IIASA) and ADRI/SHU

*Oral presentation:* Population heterogeneity under SSPs at the sub-national level in India and China

**Lena Reimann**, Institute for Environmental Studies (IVM), Vrije Universiteit Amsterdam

*Oral presentation:* Developing high-resolution SSP-based population projections accounting for internal migration and spatial development patterns

**Leiwen Jiang**, Population Council and ADRI/SHU

*Oral presentation:* Multiscale demographic projections for climate change scenarios framework

**Camille Belmin**, Potsdam Institute for Climate Impact research

*Oral presentation:* Integrating energy access as a determinant of fertility in population projections: can universal access to energy lead to long-term energy savings?

**Mehdi Mikou**, CIRED

*Poster presentation:* Projecting high resolution gridded datasets for income and population disaggregated by age and gender in Europe

**Laurence Hawker**, University of Bristol

*Poster presentation:* Introducing FuturePop - Global Gridded Population Projections at 90m resolution

## Session ID # 25: Poverty, inequality, distributional impacts of climate change mitigation and impacts

06/21/2022, 11:00 - 12:30

Laxenburg Conference Center - Marschallzimmer 1

**Lead organizer(s):** Shinichiro Fujimori<sup>1</sup>, Bjoern Soergel<sup>2</sup>, Jihoon Min<sup>3</sup>

**Institutional Affiliation(s):** Kyoto University<sup>1</sup>, Potsdam Institute for Climate Impact Research<sup>2</sup>, and International Institute for Applied Systems Analysis<sup>3</sup>

**Session Type:** Research Session

### Session Description:

A number of scenario based studies dealing with interactions between climate change mitigation and poverty (inequality) with numerical models have recently emerged<sup>1, 2, 3</sup>. While energy and land-use system transformation is required to reduce GHG emissions, identification of the poverty implications of such transformation as well as countermeasures to eradicate poverty or to reduce inequality should be considered alongside the climate policies, for example through national and international redistribution of carbon pricing revenues. Given that the goals of poverty, inequality and climate are separately emphasized by the SDG, this is an even more important task for the research community.

In this session, we, first, exchange information regarding latest scenarios and the modelling on poverty and inequality. Then, we discuss the required research directions for future scenarios of poverty and income inequality. To do this, we begin with the climate change mitigation and poverty interaction, but work towards a quantification of climate change impacts (and those avoided through mitigation). We also consider the link to multi-dimensional poverty, including aspects such as hunger, energy access, or health. We discuss advantages and disadvantages of using the current SSP-RCP scenario framework. In parallel, the modeling techniques and required data for the further improvement of representation of poverty and inequality would be also discussed.

We finally anticipate the following items and insights.

- Recommendation of poverty and inequality assessment research in terms of the future scenarios.
- cover the full SSP-RCP matrix? Or deviate from the original SSP-RCP?
- How we should handle the baseline, climate mitigation and impacts concept within poverty and inequality research?
- Potential improvement of representation poverty and equality and its required data.

### Presenters:

**Bramka Arga Jafino**, Deltares

*Oral presentation:* Climate change impacts on global poverty and shared prosperity in 2050 and how better development can mitigate them

**Johannes Emmerling**, RFF-CMCC European Institute on Economics and the Environment



*Oral presentation:* The impact of climate change, policies, and redistribution on within-country inequality

**Nicolas Taconet**, PIK

*Oral presentation:* Managing within-region inequalities on the way to low carbon economies

**Kanishka Narayan**, Pacific Northwest National Lab (PNNL), Joint Global Change Research Institute (JGCRI)

*Oral presentation:* A PCA driven approach to representing and projecting net income deciles

**Jarmo Kikstra**, International Institute for Applied Systems Analysis (IIASA) / Imperial College London

*Oral presentation:* Multidimensional deprivations using Decent Living Standards with a focus on energy needs

**Shiya Zhao**, Kyoto University

*Oral presentation:* Poverty and equity implications of national climate change mitigation policies in line with the Paris Agreement

**Shonali Pachauri**, International Institute for Applied Systems Analysis (IIASA)

*Poster presentation:* Income growth and spread needed to make the universal modern energy access goal affordable for all

## Session ID # 22: Integrated scenarios of impacts, mitigation and adaptation

06/21/2022, 11:00 - 12:30

Laxenburg Conference Center - Marschallzimmer 2

**Lead organizer(s):** Franziska Piontek<sup>1</sup>, Celine Guivarch<sup>2</sup>, Jun'ya Takakura<sup>3</sup>, Detlef van Vuuren<sup>4</sup>, Massimo Tavoni<sup>5</sup>, Kiyoshi Takahashi<sup>3</sup>

**Institutional Affiliation(s):** Potsdam Institute for Climate Impact Research<sup>1</sup>, International Center for Development and Environment<sup>2</sup>, National Institute for Environmental Studies Japan<sup>3</sup>, Netherlands Environmental Assessment Agency<sup>4</sup>, and RFF-CMCC European Institute on Economics and the Environment<sup>5</sup>

**Session Type:** Research Session

### Session Description:

The SSP framework separates the exploration of mitigation pathways and the assessment of climate change impacts. However, there is an increasing demand to quantify avoided impacts as benefits of mitigation in a consistent, integrated framework. Furthermore, impacts from climate change affect energy demand patterns, demographic and economic development prospects, costs and potentials of mitigation options such as biomass-energy and more. Finally, adaptation is a dimension rarely explicitly considered in existing integrated approaches. While there has been substantial progress in IAM-based impact assessment, there are many remaining challenges. Therefore, there is a need to foster further integration of impacts, adaptation and mitigation in scenarios and models with the goal to quantify scenarios that consistently represent mitigation and adaptation possibilities together with the impacts of a warming world, as well as synergies and trade-offs with development goals. This session will feature presentations of recent advances for joint climate impact-mitigation-adaptation modelling and assessment focusing mainly on detailed process-based IAMs but other forms of IAMs are also within the scope. It will facilitate the discussion of questions like

- how to approach the large uncertainty from climate and associated impact assessments and its implications for projections of socio-economic development;
- how to reconcile top-down and bottom-up impact estimates;
- how to improve the uptake of impact research into IAMs and economic modelling, in particular consistency between scenarios and data sets and integration of high resolution spatio-temporal data;
- how to include risks (esp. from extremes and compound events);
- how to include adaptation, both autonomous for more realistic baselines and specific adaptation as part of the SPA framework.

This research session is complemented by a workshop session focusing on practical aspects of linking impact and IAM modeling.

### Presenters:

**Alexandre Koberle**, Grantham Institute, Imperial College London

*Oral presentation:* Temperature-clustered scenarios for integrated assessment of mitigation and adaptation policy options

**Francesco Pietro Colelli**, Ca' Foscari University and CMCC

*Oral presentation:* Energy needs for adaptation significantly impact mitigation pathways

**Adriano Vinca**, International Institute for Applied Systems Analysis (IIASA)

*Oral presentation:* Including water, energy and land climate impacts and adaptation strategies in IAM scenarios

**OI Perkins**, King's College London

*Oral presentation:* Capturing land system dynamics in the SSPs through geospatial behavioural models

**Felix Jaeger**, School of Economics and Management, China University of Geosciences (Wuhan),  
Laboratoire des Sciences du Climat et de l'Environnement (LSCE), IPSL, CEA/CNRS/UVSQ,  
Université Paris-Saclay

*Poster presentation:* Comparing Forest to Fire Weather Projections

## Session ID # 51: Physical climate storylines: applications and perspectives

06/20/2022, 16:30 - 18:00

Laxenburg Conference Center – Wodak

**Lead organizer(s):** Marina Baldissera Pacchetti<sup>1</sup> and Suraje Dessai<sup>1</sup>

**Institutional Affiliation(s):** University of Leeds<sup>1</sup>

**Session Type:** Research Session

### **Session Description:**

This session aims at collecting perspectives on physical climate storylines, a recently developed approach to address climate risk amongst other issues related to the interpretation and use of model projections and the related uncertainty. Physical climate storylines are physically self-consistent unfolding of past events, or plausible future events.

Physical climate storylines are described as tools for different purposes: for example, the IPCC AR6 WG1 suggests that they can be used for the exploration of low likelihood, high impact events (IPCC, WG1, §4.8), of cross-scale interactions for the purpose of informing adaptation (§10.3.4.2), as pseudo-global warming studies (§10.3.2.2), as information distillation exercises for stakeholders (§10.5.3) where sometimes climate information is integrated with socio-economic information and delivered the form of narratives delivered through climate services (Cross-Chapter Box 12.2), or as an alternative approach to attribution studies (§11.2.4).

In the context of climate related risk, storylines intend to inform stakeholders about the possible impacts of climate hazards by either complementing or replacing probabilistic approaches to represent uncertainty about future climate. Storylines focus on plausibility rather than probability and can offer an alternative way of dealing with deep uncertainty that is more accessible to local decision makers.

Many physical climate storylines are developed with the aim of incorporating stakeholder perspectives either by addressing questions identified by stakeholders or by co-producing storylines with stakeholders themselves. Storylines can combine climate and socio-economic information relevant to stakeholders to facilitate decision-making, thereby overlapping with scenario approaches.

For this session, we encourage submissions that develop one of the following: (i) physical climate storylines to address information needs of stakeholders for climate risk assessment and management, (ii) critical/evaluative perspectives on existing physical climate storylines (iii) comparative evaluations of physical climate storylines and scenarios, (iv) perspectives on the physical climate storyline approach in general.

### **Presenters:**

**Henrique M. D. Goulart**, Deltares

*Oral presentation:* Storylines of weather-induced shocks to the soybean supply chain under climate change and different socioeconomic policies

**Taro Kunimitsu**, CICERO Center for International Climate Research

*Oral presentation:* The use of Bayesian networks in physical climate storylines

**Nina Pirttioja**, Finnish Environment Institute (SYKE)

*Oral presentation:* Exploring methods of co-creating climate and impact storylines to complement SSP-based scenarios for informing regional adaptation planning

**Theodore Shepherd**, University of Reading

*Oral presentation:* Physical climate storylines: not 'Just So Stories'

**Taro Kunimitsu**, CICERO Center for International Climate Research

*Poster presentation:* The use of Bayesian networks in physical climate storylines

## Session ID # 82: Qualitative and quantitative approaches to represent regional capacity for mitigation and adaptation in the Shared Socioeconomic Pathways (SSPs)

06/21/2022, 11:00 - 12:30

Laxenburg Conference Center - Franz Josef

**Lead organizer(s):** Elina Brutschin<sup>1</sup>, Silvia Pianta<sup>2</sup>, and Felix Schenuit<sup>3</sup>

**Institutional Affiliation(s):** International Institute for Applied Systems Analysis<sup>1</sup>, RFF-CMCC European Institute on Economics and the Environment<sup>2</sup>, and Hamburg University<sup>3</sup>

**Session Type:** Research Session

### **Session Description:**

Integrated Assessment Models (IAM) are the primary tool for developing global and regional emission trajectories and carbon budgets that limit global warming in line with the Paris Agreement. However, these trajectories rely mostly on assumptions about technological and economic constraints/capacities and do not take into account possible constraints that might be imposed by regional variation in institutional and societal capacities that determine the political conditions for the implementation of more stringent climate action, effective climate adaptation, and alignment with achieving key SDGs.

Currently, institutions and governance are embedded in the narratives associated with the Shared Socioeconomic Pathways (SSP); however, this information is qualitative and can only be incorporated indirectly, for example, techno-economic assumptions can be adjusted from variation in institutional and social narratives. At the same time, there are newer approaches that are leveraging political and social sciences to improve the conceptualization and quantification of institutions and other societal constraints. For this research session we are inviting proposals that are looking into one of the following areas: (a) theoretical work pertaining to the conceptualization of state capacity, governance and institutions as it relates to climate action, (b) empirical work that proposes innovative operationalization of state capacity related concepts and historically analyzes key drivers and (c) qualitative and quantitative work incorporating institutions into projections and scenarios.

### **Presenters:**

**Lola Nacke**, Chalmers University of Technology

*Oral presentation:* Using coal compensation schemes to understand national capacity for coal phase-out

**Ines Dombrowsky**, German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE)

*Oral presentation:* Policy mixes for the implementation of the Paris Agreement and the 2030 Agenda

**Felix Schenuit**, German Institute for International and Security Affairs

*Oral presentation:* Towards politically robust mitigation pathways: Assessing ‘mitigation capacity’ in the context of carbon dioxide removal

**Marina Andrijevic**, International Institute for Applied Systems Analysis (IIASA)

*Oral presentation:* Future cooling gap in shared socioeconomic pathways

**Florian Humpeñöder**, Potsdam Institute for Climate Impact Research (PIK)

*Oral presentation:* Overcoming global inequality is critical for land-based mitigation in line with the Paris Agreement

**Silvia Pianta**, RFF-CMCC European Institute on Economics and the Environment

*Oral presentation:* Emissions lock-in, capacity, and public opinion: How social and political science can inform climate modeling efforts

**Jonathan Moyer**, University of Denver / Pardee Center

*Oral presentation:* Geopolitical implications of future patterns of socioeconomic development

**Session ID # 12: Reflexivity for sustainable and equitable futures:  
broadening scenario inputs for linkages across methods, scales, and levels  
06/21/2022, 11:00 - 12:30**

**The International Institute for Applied Systems Analysis (IIASA) – Kaminzimmer**

**Lead organizer(s):** Anita Lazurko<sup>1</sup> and Vanessa Schweizer<sup>1</sup>

**Institutional Affiliation(s):** University of Waterloo, Canada<sup>1</sup>

**Session Type:** Workshop Session

**Session Description:**

Scenarios are an important tool to anticipate trajectories of socio-environmental systems and to navigate transformations to sustainability. Amid such complex, uncertain, and potentially contested processes of change, scenario development requires reflexive processes that are open to a wide range of inputs. This drive toward more reflexive and inclusive scenario practice is reflected in emerging scenario research, which focuses on reconciling alternative forms of knowledge (e.g., qualitative and quantitative), linking global to sub-global scales, and combining bottom-up with top-down drivers of change. For example, emerging semi-quantitative methods like Cross-Impact Balances help systematically link drivers of change at different scales that are represented by both qualitative and quantitative data.

The opportunities and challenges associated with “opening up” scenario practice can be framed as a form of reflexive boundary selection, where the up-front choice of scenario framework and method creates a sweeping limit around the scope of future conditions and values considered in the detailed processes that follow. This delimitation may constrain the consideration of extreme scenarios that are increasingly plausible under 21st century conditions and to exclude ambitious or pluralistic visions of a sustainable future.

This session aims to 1) explore the need for more reflexive scenario research and practice and 2) highlight methods and case studies that address this need. Organizers invite abstracts that have successfully applied greater reflexivity in scenario development by widening the range of methods, inputs, or drivers of change included in the process, such as by using semi-quantitative or linked qualitative-quantitative methods and/or by connecting drivers of change across scales or levels. After introducing an emerging framework for reflexive scenario practice in sustainability science, 4 to 5 panelists will present their work. Through a Q&A and breakout groups, participants will interact with the panelists to discuss: what opportunities and challenges exist for more reflexive and inclusive scenarios, particularly when linking across knowledge types, scales, and levels?

**Presenters:**

**Anita Lazurko**, School of Environment, Resources, and Sustainability, University of Waterloo  
*Oral presentation:* Boundaries of the future: A framework for reflexive scenario practice in sustainability research

**Piotr Magnuszewski**, Centre for Systems Solutions  
*Oral presentation:* Social Simulations for Exploring Sustainable Futures



**Sean Low**, Aarhus University

*Oral presentation:* Models of Anticipation: Challenging modes of global environmental assessment by expert networks in climate intervention technologies

**Geronimo Gussmann**, Global Climate Forum e.V.

*Oral presentation:* Co-developing sea-level rise adaptation scenarios for the Maldives

**Patrick Keys**, School of Global Environmental Sustainability, Colorado State University

*Oral presentation:* Challenges and Opportunities for Futures Research in the Anthropocene

**Naomi Rubenstein**, International Institute for Applied Systems Analysis (IIASA)

*Poster presentation:* Exploratory scenarios for transformational intervention planning in the Flood Resilience Measurement for Communities program

## Session ID # 203: Blue scenarios: ocean and fisheries in Earth System models

06/21/2022, 11:00 - 12:30

The International Institute for Applied Systems Analysis (IIASA) - Gvishiani

**Lead organizer(s):** Mary Gasalla<sup>1</sup>, Jessica Strefler<sup>2</sup> and David Keller<sup>3</sup>

**Institutional Affiliation(s):** University of Sao Paolo<sup>1</sup>, Potsdam Institute for Climate Impact Research<sup>2</sup> and GEOMAR, Helmholtz Centre for Ocean Research Kiel<sup>3</sup>

**Session Type:** Workshop Session

### **Session Description:**

Oceans cover most of the surface of our planet and are home to a wide variety of current and future human activities and environmental concerns. Yet, there are important gaps in the incorporation of scenarios, especially the SSPs, in ocean and fisheries research. This workshop will address the use of scenarios in ocean and fisheries research and their incorporation in Integrated Assessment Models and Earth System Models. The session will explore the scenarios covering the sustainable use of blue resources, the role of ocean-based carbon dioxide removal, and how to make progress on the use of scenarios. This session invites contributions and examples of the use of scenarios, particularly SSPs for the “blue sector”, including methodological progress, co-benefits, research gaps, ocean-based carbon dioxide removal. While addressing methodological options in climate, biodiversity and socioeconomic development scenarios, the workshop also welcomes examples of scenarios based on both qualitative narratives and earth system modeling approaches.

### **Presenters:**

**Mary Gasalla**, University of Sao Paolo

*Introduction:* Introduction to the Blue Scenarios Workshop

**Jessica Strefler**, Potsdam Institute for Climate Impact Research

*Introduction:* Integrating oceans in Integrated Assessment Models

**David Keller**, GEOMAR, Helmholtz Centre for Ocean Research Kiel

*Oral presentation:* Ocean-based CO<sub>2</sub> removal in the Carbon Dioxide Removal Model Intercomparison Project

**Nadine Mengis**, GEOMAR, Helmholtz Centre for Ocean Research Kiel

*Oral presentation:* Representing marine Carbon Dioxide Removal options in future scenario designs - why, when and how?

**Miranda Boettcher**, German Institute for International and Security Affairs (SWP)

*Oral presentation:* Broadening blue (carbon) futures: how qualitative foresight can complement quantitative scenarios on the “blue” frontier of carbon-dioxide removal

**Derek P. Tittensor**, Dalhousie University

*Oral presentation:* The Fisheries and Marine Ecosystem Model Intercomparison Project (FishMIP): past, present, and future

**William Cheung**, Institute for the Oceans and Fisheries, The University of British Columbia

*Oral presentation:* Exploring future seafood sustainability under scenarios of climate change and socio-economic development

**Guillermo Ortuño Crespo**, Stockholm Resilience Centre

*Poster presentation:* Envisioning futures for transformed human-nature relationships on the high seas

**Shujuan Xia**, National Institute for Environmental Studies, Japan

*Poster presentation:* Benefits of moving to diets with more fish

## Session ID # 48: Feasibility of scenarios

06/21/2022, 14:30 - 16:00, 16:30 - 18:00

Laxenburg Conference Center – Theatersaal

**Lead organizer(s):** Aleh Cherp<sup>1</sup> and Jessica Jewell<sup>2</sup>

**Institutional Affiliation(s):** Central European University<sup>1</sup> and Chalmers University of Technology<sup>2</sup>

**Session Type:** Research Session

### Session Description:

The policy impact and relevance of transition scenarios depends, in large part, on whether they are viewed as 'feasible', i.e. likely to unfold in the real world rather than only in the world of models. Yet, the science of assessing feasibility of scenarios is just emerging and at the moment struggling with a number of conceptual and methodological challenges. This session will discuss these challenges with reference to specific cases of assessing feasibility of national or global scenarios (pathways, roadmaps, etc.) as well as sectoral transitions relevant for addressing global long-term sustainability challenges. The session will not be able to accommodate narrow discussions of technical, economic or geophysical feasibility of specific technologies. The presentators are encouraged to focus on the following questions: "how is feasibility defined?", "how is feasibility assessed?", "how are the results of feasibility assessment used?". More theoretical presentations on conceptualising feasibility and exploring the principles of sound feasibility assessment are also invited.

### Presenters:

**Jessica Jewell**, Chalmers University of Technology

*Oral presentation:* Feasibility spaces for climate actions: A bridge between the inside and outside view

**Shinichiro Asayama**, National Institute for Environmental Studies

*Oral presentation:* The politics of crafting and assessing feasible scenarios: muddled between 'plausibility' and 'desirability' of projected futures

**Elina Brutschin**, International Institute for Applied Systems Analysis (IIASA)

*Oral presentation:* Lessons learned from systematic evaluations of IAM scenarios

**Roger Pielke**, University of Colorado Boulder

*Oral presentation:* Plausible 2005-2050 emissions scenarios project between 2 and 3 degrees C of warming by 2100

**Theresa Scavenius**, Aalborg University

*Oral presentation:* Feasibility, policy-guidance, and machine-learning analysis of the IPCC approach

**Gregor Semieniuk**, University of Massachusetts Amherst

*Oral presentation:* Plausible energy demand patterns in a growing global economy with climate policy

**Oliver Geden**, German Institute for International and Security Affairs (SWP)

*Oral presentation:* Assessing political feasibility frontiers: the case of CDR in the European Union

**Vadim Vinichenko**, Chalmers University of Technology

*Oral presentation:* Nuclear and renewables: comparison of historical growth and climate stabilisation scenarios

**Vivien Fisch-Romito**, Renewable Energy Systems, Institute for Environmental Sciences (ISE), Section of Earth and Environmental Sciences, University of Geneva

*Oral presentation:* Insights from hindcasting on modeling socio-technical feasibility of EU climate objectives in the power sector

**Adrian Odenweller**, Potsdam Institute for Climate Impact Research

*Oral presentation:* Probabilistic feasibility spaces for analysing the upscaling of energy technologies: the case of green hydrogen

**Masahiro Suzuki**, Central European University

*Poster presentation:* Speed of energy transitions: Comparing the historical and required speed of energy transitions and analysing the feasibility of G7 achieving their climate targets

**Rachel Freeman**, University College London

*Poster presentation:* Reflections from a socio-politically driven model on the feasibility of energy transition pathways

## Session ID # 17: Updating the population and economic projections in the SSPs

06/21/2022, 14:30 - 16:00

Laxenburg Conference Center - Marschallzimmer 1

**Lead organizer(s):** Rob Dellink<sup>1</sup> and Samir KC<sup>2</sup>

**Institutional Affiliation(s):** OECD<sup>1</sup> and International Institute for Applied Systems Analysis<sup>2</sup>

**Session Type:** Workshop Session

### **Session Description:**

The Shared Socioeconomic Pathways (SSPs) are underpinned by projections of population by age, sex, and educational attainment, as well as by projections of economic activity. Since the original projections were published, there have been significant developments that imply new population and economics projections would be quantitatively and qualitatively different. This session presents an analysis of how updated tools, newer data, and state-of-the-art assumptions affect the long-term projections of the socioeconomic drivers in each of the SSP scenarios, using the original storylines.

This session aims first to explore advancements made in the past decade and new approaches in population forecasting, including projections of demographic heterogeneity. Updated population dynamics scenario projections will be presented building on the assessment of future fertility, mortality, and migration. This session seeks to identify state of the art assumptions and scenarios for fertility, mortality, and migration, including new developments in the demographic community that can feed into the SSP scenarios.

Next, updated economic projections will be presented, exploring how recent economic trends and updated short-term economic forecasts affect the long-term GDP scenarios. The session will highlight the role of key assumptions on income convergence, trade openness, and the role of natural resource rents in making long-term economic scenarios.

Third, a dedicated part of the discussion will center on the long-term projections on the recovery from COVID-19 and the effects of uncertainty surrounding this on the long-term socioeconomic drivers.

This session will highlight how state-of-the-art future projections of environmental pressure, not least of greenhouse gas emissions, may benefit from a new generation of population and economic projections for the SSPs. It will also show how a full set of updated population and economic scenario assessments can improve on more ad-hoc updates of population and economic projections using only a recalibration to the latest economic data.

### **Presenters:**

**Wolfgang Lutz**, International Institute for Applied Systems Analysis (IIASA)

*Oral presentation:* Alternative approaches to population forecasting and dealing with demographic heterogeneity

**Samir KC**, International Institute for Applied Systems Analysis (IIASA), Wittgenstein Center and Shanghai University

*Oral presentation:* Updating SSPs' population and human capital projections

**Rob Dellink**, OECD

*Oral presentation:* Updating the economic drivers in the SSPs

**Johannes Koch**, Potsdam Institute for Climate Impact Research

*Oral presentation:* Update of Ssp GDP Projections: Capturing Recent Changes in National Accounting, PPP Conversion and Covid 19 Impacts

## Session ID # 42: Advances in human-Earth System interactions in scenario development

06/21/2022, 14:30 - 16:00

Laxenburg Conference Center - Marschallzimmer 2

**Lead organizer(s):** Tokuta Yokohata<sup>1</sup>, Chris Smith<sup>2</sup>, Hannah Liddy<sup>3,4</sup>, Kaoru Tachiiri<sup>5</sup>, and Jarmo Kikstra<sup>2,6</sup>

**Institutional Affiliation(s):** National Institute for Environmental Studies Japan<sup>1</sup>, International Institute for Applied Systems Analysis<sup>2</sup>, Columbia University<sup>3</sup>, NASA Goddard Institute for Space Studies<sup>4</sup>, Japan Agency for Marine-Earth Science and Technology<sup>5</sup>, and Imperial College London<sup>6</sup>

**Session Type:** Research Session

### Session Description:

In the scenario development of IPCC AR6, socio-economic scenarios (Shared Socio-economic Pathways (SSPs)) were developed by the integrated assessment modelling (IAM) community. Subsequently, in a coordinated effort emissions and concentrations pathways from SSP-RCP scenarios were used by Earth System Models, providing a link between socioeconomic scenarios and detailed climate research. At present this linkage is mostly one-directional. For instance, the SSP design explicitly excluded any climate impacts, and thus potential feedbacks from climatic characteristics to socioeconomic development are not taken into account. At present, the inclusion of more human-Earth system interactions is being actively discussed in multiple communities.

Implications where climate feedbacks may be important include energy supply/demand, food security and wider land use changes, water availability, air quality, climate damages, and population dynamics. Climate change, if included in the design of future scenarios, would therefore affect basic components of IAM scenarios like population and GDP pathways that normally serve as input data. One emerging way to study such complex interactions is to develop coupled models that consider the interaction and feedback between the human-earth system. In this session, presentations on the linking of models for human activities and the natural environment with various complexities and different strategies are welcomed. Additionally, we would like to solicit from scenario developers and users where climate modelling efforts could be more focused and useful and call for greater collaboration between IAM and Earth System Model groups in scenario development.

### Presenters:

**Kaoru Tachiiri**, Japan Agency for Marine-Earth Science and Technology

*Oral presentation:* Evaluating the interaction between Earth and socio-economic system by using a loosely coupled model

**Sibel Eker**, Radboud University & International Institute for Applied Systems Analysis (IIASA)

*Oral presentation:* Using simple integrated assessment models to explore human and earth system feedbacks



**Thomas Gasser**, International Institute for Applied Systems Analysis (IIASA)

*Oral presentation:* Mitigation pathways robust to Earth system uncertainty under cost-benefit and cost-effective paradigms

**Peter Alexander**, University of Edinburgh

*Oral presentation:* Land-use change drivers, interactions, and impacts: The Land System Modular Model (LandSyMM)

**Alan Di Vittorio**, Lawrence Berkeley National Laboratory

*Oral presentation:* The role of coupled human-environment modeling in scenario development

**OI Perkins**, King's College London

*Poster presentation:* Capturing human-Earth system interactions through behavioural land system model coupling: the case of landscape fire

**Yangyang Xu**, University of California San Diego

*Poster presentation:* Modelling human–natural systems interactions with implications for twenty-first-century warming

## Session ID # 202: Improving the scenario development process

06/21/2022, 14:30 - 16:00

Laxenburg Conference Center - Kaminzimmer

**Lead organizer(s):** Detlef van Vuuren<sup>1</sup>, Bas van Ruijven<sup>2</sup>, Brian O'Neill<sup>3</sup>

**Institutional Affiliation(s):** Netherlands Environmental Assessment Agency<sup>1</sup>, International Institute for Applied Systems Analysis<sup>2</sup>, and Pacific Northwest National Laboratory<sup>3</sup>

**Session Type:** Workshop Session

### **Session Description:**

An important recommendation of the 2020 paper on the “Achievements and needs for the climate change scenario framework,” which synthesized the insights from the first Scenarios Forum, was to improve the scenario development process. This recommendation included a range of topics, such as connecting the SSP-RCP framework to other scenario activities, define and promote the use of Shared Policy Assumptions (SPAs) for both mitigation and adaptation, make the scenario development process as inclusive as possible, and establishing a process for regular updates of the scenario framework. While some of these topics are partly discussed in other sessions throughout the Scenarios Forum, this session aims at a dedicated discussion on how the scenario framework and development process can be improved. The goal of this workshop session is to assess examples of progress on these topics, consider weaknesses in the framework, and identify concrete proposals on how the scenario process can be improved on these dimensions while relying on voluntary efforts from the scenarios community.

This session welcomes contributions that show examples of improvements of the scenario process or propose how the scenario framework or development process can be improved on these dimensions. This includes, for example, proposals on the development of adaptation SPAs, proposals on making the SSP/RCP framework more suitable for applications beyond climate, examples of perspectives/scenarios that currently are not contained in the Scenarios Framework, and considerations for establishing a regular update process for the scenarios framework.

### **Presenters:**

**Nicolas Siorak**, Em-Lyon, Gsda, SAE institute

*Oral presentation:* Towards devil scenarios?

**Claudia Tebaldi**, Lawrence Berkeley National Laboratory

*Oral presentation:* Climate impacts in baseline scenarios: Why? Which? How?

**Jennifer Morris**, MIT

*Oral presentation:* In search of a scenario reflecting current and future pressures and trends

**Carole Green**, University of Washington

*Oral presentation:* Guiding Future Research and Scenario Development: The Continued Shared Socioeconomic Pathway (SSP) Literature Database

**Vanessa Schweizer**, University of Waterloo

*Oral presentation:* Using limits to adaptation and Reasons for Concern to contextualize guidance on baseline scenarios for IAV use

**Siir Kilkis**, The Scientific and Technological Research Council of Turkey

*Poster presentation:* Urban Emissions Scenarios for Urban Systems: Advances and Ways Forward within the SSP-RCP Framework

## Session ID # 43: Scenarios of material stocks, flows, services, and practices: exploring nexus approaches to address climate change, air pollution and sustainability

06/21/2022, 14:30 - 16:00

Laxenburg Conference Center - Franz Josef

**Lead organizer(s):** Adriana Gómez Sanabria<sup>1</sup>, Helmut Haberl<sup>2</sup>, Edgar Hertwich<sup>3</sup>, Oreane Edelenbosch<sup>4</sup>, Gamze Ümlü<sup>1</sup>, Jihoon Min<sup>1</sup>, and Dominik Widenhofer<sup>2</sup>

**Institutional Affiliation(s):** International Institute for Applied Systems Analysis<sup>1</sup>, University of Natural Resources and Life Sciences, Austria (BOKU)<sup>2</sup>, Norwegian University of Science and Technology<sup>3</sup>, Copernicus Institute of Sustainable Development, Utrecht University<sup>4</sup>

**Session Type:** Research Session

### Session Description:

This session will focus on exploring approaches to analyse society-nature interactions and their implications for material cycles, GHG, air pollution, waste and sustainable development. The 'stocks-flows-services/ practices' approach connects biophysical stocks (e.g., buildings, infrastructure and machinery) and flows involved in social metabolism to the delivery of services. It can help to analyse relationships between resource use and the practices of everyday life. It is well known that material extraction and processing is a significant cause of environmental impacts and resource inputs ultimately translate into wastes and emissions i.e., pollution. Furthermore, current research of consumption practices focuses on structure-agency issues at the heart of socio-metabolic research. However, in current climate and sustainability scenarios, material demand is often directly related to economic indicators and as such cross-sectoral interactions between material stock and flows are not account for. Moreover, consistent representations of circular strategies (extraction, production, manufacturing, use, end of life, waste management) and consumer practices are still at a very early stage in scenario narratives. Better understanding these systemic interrelations is particularly important when aiming to forge demand-side solutions that address critical social goals such as eradicating poverty and hunger while at the same time reducing resource use in absolute terms, as required e.g., for meeting the Paris climate goals. This session aims to bring together different research communities to build and discuss consistent scenarios that might enable societies to satisfy human needs without compromising the climate and sustainability.

### Presenters:

**Stefan Pauliuk**, Industrial Ecology Group, Faculty of Environment and Natural Resources, University of Freiburg

*Oral presentation:* Cutting down or letting grow? Scenarios for future use of timber in long-lived construction materials

**Ankita Gaur**, University College Cork

*Oral presentation:* Analysing and predicting the impact of spatial settlement pattern and interdependencies on energy service demands to aid deep mitigation pathway development

**Adriana Gómez Sanabria**, International Institute for Applied Systems Analysis (IIASA)

*Oral presentation:* Potential for future reductions of global GHG and air pollutants from circular waste management systems

**Veronika Gaube**, Institute of Social Ecology, BOKU Vienna

*Oral presentation:* Understanding linkages between stocks, flows, services and practices using agent-based and system-dynamic models

**Edgar Hertwich**, NTNU (Norwegian University of Science and Technology)

*Oral presentation:* Material efficiency as part of the Sustainable Development Pathways

**Antoine Teixeira**, ADEME – CIRED

*Oral presentation:* The future carbon footprint of materials as a bottleneck for the transition to Net-Zero Emissions – case study on France

**Kimon Keramidas**, University of Grenoble-Alpes

*Poster presentation:* Estimation approaches for materials demand, recycling and substitution using the POLES model

## Session ID # 6: The role of non-CO2 greenhouse gas emissions in mitigation scenarios and climate change

06/21/2022, 14:30 - 16:00

The International Institute for Applied Systems Analysis (IIASA) – Wodak

**Lead organizer(s):** Lena Höglund-Isaksson<sup>1</sup>

**Institutional Affiliation(s):** International Institute for Applied Systems Analysis<sup>1</sup>

**Session Type:** Research Session

### **Session Description:**

The urgency of mitigating non-CO2 greenhouse gas emissions methane, nitrous oxide and fluorinated gases (HFCs, PFCs and SF6) in addition to deep decarbonization of energy systems, is becoming increasingly evident if the world is to stay below 1.5 degrees warming both in the short- and long- terms. The idea of this session is to bring together researchers from the three communities (a) non-CO2 emission and mitigation scenarios, (b) earth system models and climate change impacts, and (c) technical opportunities for direct atmospheric removal of methane, with a purpose to improve the understanding of how different opportunities to limit warming from short-lived climate forcers can enable safe warming levels in the next few decades, while not forgetting the necessity of energy transformations and CO2 emission reductions to ensure safe warming levels in the mid- to long terms. This session therefore welcomes contributions on global and regional projections of non-CO2 emissions, mitigation potentials and costs, assessments of potentials for atmospheric removal of non-CO2 GHGs, and the timing and treatment of non-CO2 emissions in climate change mitigation scenarios, and their impacts on climate change in (reduced form) climate models. We also welcome contributions on the identification of policies and regulatory instruments in support of a continuous maintenance of safe levels of warming in both the short- and long terms, e.g., studies investigating implications of using single policy instruments to jointly address short- and long-lived gases.

### **Presenters:**

**Chair: Lena Höglund-Isaksson**, International Institute for Applied Systems Analysis (IIASA)  
*Introduction*

**Yang Ou**, Joint Global Change Research Institute, Pacific Northwest National Laboratory, USA  
*Oral presentation: Beyond Decarbonization: Deep Mitigation of All Greenhouse Gases towards 1.5°C and 2°C future*

**Jared Creason**, RTI International  
*Oral presentation: Projections of Global Baseline Emissions and Mitigation Potential for Non-CO2 Greenhouse Gases under Alternative Socioeconomic Scenarios*

**Mathijs Harmsen**, PBL Netherlands Environmental Assessment Agency  
*Oral presentation: Uncertainty in non-CO2 greenhouse gas mitigation: Make-or-break for global climate policy feasibility*

**Laura Wilcox**, University of Reading

*Oral presentation:* Rapidly evolving anthropogenic aerosol emissions induce strong and regionally heterogeneous climate impacts on the way to a net-zero world

**Daniel Johansson**, Chalmers

*Oral presentation:* The social cost of methane in a scenario context

**Stefan Frank**, International Institute for Applied Systems Analysis (IIASA)

*Poster presentation:* Land-based emission reduction potentials and their role for the transition towards climate neutrality

## Session ID # 10: Building better climate scenarios for supervisors, private sector financial institutions, and development institutions

06/21/2022, 14:30 - 16:00, 16:30 - 18:00

The International Institute for Applied Systems Analysis (IIASA) - Gvishiani

**Lead organizer(s):** James Edmonds<sup>1</sup>, David Carlin<sup>2</sup>, Bas van Ruijven<sup>3</sup>, Seth Monteith<sup>4</sup>, Leon Clarke<sup>5</sup>, Yu Sha<sup>1</sup>, Christoph Bertram<sup>6</sup>

**Institutional Affiliation(s):** Pacific Northwest National Laboratory<sup>1</sup>, UN Environment Programme-Finance Initiative (UNEP FI)<sup>2</sup>, International Institute for Applied Systems Analysis<sup>3</sup>, ClimateWorks Foundation<sup>4</sup>, University of Maryland<sup>5</sup>, and Potsdam Institute for Climate Impact Research<sup>6</sup>

**Session Type:** Research/Workshop Session

### Session Description:

This workshop session seeks to bring together producers and users of climate scenarios for a constructive dialogue about how these scenarios are being used in the financial sector and the role of finance within the scenarios themselves. The workshop will explore the needs of scenario users including financial supervisors, private sector financial institutions and development banks. The workshop session will also explore the abilities and challenges of scenario creators in addressing these needs. Finally, the workshop will cover the role of finance in climate scenarios: both how it is modeled and where the greatest needs for capital exist within the transition. This session aims to begin a continuing dialogue between scenario producers and users that will generate recommendations for future climate scenario development and application.

### Presenters:

**Xianfu Lu**, Climate Investment Funds (CIF)

*Oral presentation:* Enabling Climate-Resilient Investment Decision-Making in MDBs: the role of scenario information

**Nicola Ranger**, Smith School of Enterprise and Environment, University of Oxford (and World Bank)

*Oral presentation:* Bank Stress Testing of Physical Risks under Climate Change Macro Scenarios: Application within the Philippines FSAP

**Stefano Battiston**, Univ. of Zurich

*Oral presentation:* Accounting for finance is key for climate mitigation pathways

**Theresa Lober**, Bank of England/NGFS

*Oral presentation:* Setting the scene: why financial supervisors are using scenarios and how the NGFS scenarios are being applied

**Christoph Bertram**, PIK



*Oral presentation:* The development of the NGFS IAM models for financial supervisors and institutions

**Edo Schets**, Bank of England/NGFS

*Oral presentation.*

**Adele Morris**, Federal Reserve Board of Governors

*Oral presentation.*

**Laura Parisi**, European Central Bank/NGFS

*Oral presentation.*

## Session ID # 16: Scenarios in CMIP6 and CMIP7: lessons learned and new design considerations

06/21/2022, 16:30 - 18:00

Laxenburg Conference Center - Marschallzimmer 1

**Lead organizer(s):** Claudia Tebaldi<sup>1</sup>, Bjørn H. Samset<sup>2</sup>, Brian O'Neill<sup>3</sup>, Jean-Francois Lamarque<sup>4</sup>, Detlef van Vuuren<sup>5</sup>, and Laura Wilcox<sup>7</sup>

**Institutional Affiliation(s):** Lawrence Berkeley National Laboratory<sup>1</sup>, CICERO Center for International Climate Research<sup>2</sup>, Pacific Northwest National Laboratory<sup>3</sup>, Climate & Global Dynamics (CGD-NCAR)<sup>4</sup> Netherlands Environmental Assessment Agency<sup>5</sup>, University of Reading<sup>7</sup>

**Session Type:** Workshop Session

### Session Description:

Scenarios have played a central role in CMIP6 activities, with the ScenarioMIP design built around the SSP-RCP framework and several other MIPs using SSP-based scenarios and variants to explore a range of scientific questions about future climate changes. The results have underpinned future projections assessed by the IPCC AR6 WG1 report, and many papers are being written about future climate change and its impacts based on the results from ScenarioMIP.

At this time, we can start to take stock of what worked, and what made the process more difficult. We can address questions about number and type of scenarios prescribed, the process that furnished forcing input to ESMs, and the utility of the set of scenarios for both Earth system and impacts research. For instance, some of the trajectories chosen for CMIP6 are distinct mainly in terms of total radiative forcing, not because of pathway shape or composition of individual forcing agents. It may be useful to consider how to better explore the shape of forcing pathways (e.g., more overshoots, regional heterogeneity), and their nature (e.g., the role of aerosols, whose changes on decadal timescales can dominate the climate response to anthropogenic emissions; the effects of different land-use change patterns).

The session will include invited speakers addressing lessons learned in the preparation, use and analysis of experiments from ScenarioMIP (and possibly paired MIPs). A panel discussion will then look towards the next iteration of ScenarioMIP addressing fundamental questions about usefulness, number, range, shape and mix of forcing agents in scenarios for CMIP7. Opinions will be elicited in the discussion process from the three research communities involved: scenario modelers (IAM community), Earth system modelers and VIA researchers.

### Presenters:

**Claudia Tebaldi**, LBNL

*Oral presentation:* Introduction to session

**Jean-Francois Lamarque**, NCAR

*Oral presentation:* Planning for the next phases of CMIP

**Benjamin Sanderson**, CICERO

*Oral presentation:* Scenario design considerations in CMIP7 to better inform robust net-zero strategy

**Matthew Gidden**, International Institute for Applied Systems Analysis (IIASA)

*Oral presentation:* The economic-climate model interface: modeller perspectives on CMIP6 looking towards CMIP7

**Goran Georgievski**, Max Planck Institute for Meteorology

*Poster presentation:* Adaptive emission scenario simulations with the MPI Earth System Model

## Session ID # 8: Challenges and opportunities in constructing national scale scenarios from the SSPs/RCPs

06/21/2022, 16:30 - 18:00

Laxenburg Conference Center - Marschallzimmer 2

**Lead organizer(s):** Mark Rounsevell<sup>1,2</sup>, Paula Harrison<sup>3</sup>, and Rob Dunford-Brown<sup>3</sup>

**Institutional Affiliation(s):** Karlsruhe Institute of Technology<sup>1</sup>, the University of Edinburgh<sup>2</sup>, and UK Centre for Ecology and Hydrology<sup>3</sup>

**Session Type:** Research Session

### Session Description:

The SSP/RCP framework, whilst originally developed at the global scale (O'Neil *et al.*, 2020), has been interpreted extensively at the national scale (e.g. Pedde *et al.*, 2021), often to inform both research and policy in support of climate change adaptation and mitigation actions. These interpretations involve a range of different methods in the development of both qualitative and quantitative interpretations of key socio-economic and climate change variables, often embedded within participatory processes that engage with key stakeholders (Kok *et al.*, 2019). National scale RCP/SSP-based scenarios are critical in engaging with national governments since it is these governments who ultimately have the capacity to implement policy in response to the climate change crisis. Scenario analyses provide the basis for exploring alternative socio-economic development trajectories and the consequences of these trajectories for national economies.

This session will explore examples of the construction of both qualitative and quantitative scenarios from the SSPs/RCPs in different national contexts. This includes studies focused on interpreting the drivers of socio-economic change, quantitative modelling of future socio-economic indicators, and participatory approaches to storyline development. In particular, the session will address the questions:

1. How can the regional applicability of the SSPs/RCPs be improved?
2. Should we be aiming for consistency or diversity in methods for downscaling SSPs/RCPs to improve comparability across scales and studies?

We invite abstract submissions on how SSP/RCP scenarios have been constructed at the national scale for different countries. The session will comprise a mix of 2 invited, and 2-3 selected presentations as well as a panel discussion of the session speakers.

References: Kok, *et al.* (2019). *Reg Env Chang* 19, 643–654; O'Neil *et al.* (2020). *Nat Clim Chang*, 10, 1074-1084; Pedde *et al.* (2021). *Sci Tot Env*, 756, 143172. 12

### Presenters:

**Paula Harrison**, UK Centre for Ecology & Hydrology

*Oral presentation:* Qualitative and quantitative methods in the development of national scale SSPs for the UK

**Anna Lipsanen**, Finnish Environment Institute (SYKE)

*Oral presentation:* Downscaling global SSP narratives for the Finnish health and social welfare sector to inform climate change adaptation

**Andy Challinor**, Institute for Climate and Atmospheric Science, School of Earth and Environment, University of Leeds, United Kingdom

*Oral presentation:* Stakeholder-driven scenarios for national scale climate-smart nutrition security

**Lena Gubler**, Swiss Federal Institute for Forest, Snow and Landscape Research WSL

*Poster presentation:* Developing SSP-Narratives for Switzerland

**Lara Welder**, Climate Analytics gGmbH

*Poster presentation:* Downscaling 1.5°C Paris-Agreement Compatible Pathways to inform National Decarbonisation Strategies

**Fabio Sferra**, International Institute for Applied Systems Analysis (IIASA)

*Poster presentation:* Downscaling IAMs results to the country level – a new algorithm

## Session ID # 21: What do non-state actors (e.g., corporations, NGOs, financial institutions, etc.) need from climate change scenarios?

06/21/2022, 16:30 - 18:00

Laxenburg Conference Center – Kaminzimmer

**Lead organizer(s):** Katie Mulvaney<sup>1</sup> and Nemi Vora<sup>2</sup>

**Institutional Affiliation(s):** RMI<sup>1</sup> and Amazon<sup>2</sup>

**Session Type:** Workshop Session

### **Session Description:**

Non-state actors (corporations, NGOs, investors, financial institutions, civil society, sub-national governments, and philanthropies) are increasingly using SSP narratives and scenarios to make critical decisions on climate change risk as well as mitigation and adaptation actions. Improving the relevance of climate change scenario applications for users was an important recommendation coming out of the 2019 Scenarios Forum (as highlighted in O'Neill *et al.* 2020, Nature Climate Change). Equipped with the right information these non-state actors, in collaboration with national governments and through coalition-building, could help set off tipping points that accelerate policy and technological transitions to limit warming to 1.5°C. The objective of this workshop session is to begin a conversation on what will help make SSP-RCP scenarios more relevant by highlighting the perspectives of non-state actors on how scenarios are already being used in decision making processes and identifying bottlenecks. Potential outcomes from this workshop could include a compilation of needs, details on salient output metrics for non-state actors, initiation of guidelines for downscaling results of global scenarios, or identification of scenario co-production opportunities. Therefore, we seek proposals on a range of topics across climate change adaptation and mitigation. Examples include: how corporations are using scenarios to quantify and adapt to future shocks as they pertain to private sector supply chains; how scenarios can be used by sectoral change initiatives in the energy system transition; the use of scenarios in the financial sector; etc.

### **Presenters:**

**Andres Chang**, Science Based Targets initiative / CDP

*Oral presentation:* Business Net Zero: How Scenarios Are Informing The Next Generation of Science-Based Targets

**Francesca Desmarais**, Falck

*Oral presentation:* The power of design — engaging decision makers by merging the SSP narratives with design practices

**Derek Pankratz**, Deloitte

*Oral presentation.*

**Madeleine McPherson**, University of Victoria

*Poster presentation:* Modelling the energy system transition

## Session ID # 66: Digitalization scenarios and implications for climate change

06/21/2022, 16:30 - 18:00

Laxenburg Conference Center - Franz Josef

**Lead organizer(s):** Charlie Wilson<sup>1</sup>, Laurent Drouet<sup>2</sup>, Felix Creutzig<sup>3</sup>, Zoi Vrontisi<sup>4</sup>, and Elena Verdolini<sup>2</sup>

**Institutional Affiliation(s):** University of Oxford<sup>1</sup>, RFF-CMCC European Institute on Economics and the Environment<sup>2</sup>, TU Berlin<sup>3</sup>, and E3 Modelling<sup>4</sup>

**Session Type:** Research Session

### Session Description:

Digitalisation is a powerful and pervasive ‘megatrend’ shaping social and economic activity across the world. Digital devices, hardware, infrastructure, and general-purpose applications like the internet and artificial intelligence continue to transform how we work, live, interact, organise, participate, shop, and relax, and how goods and services are provided and consumed.

The net impacts of digitalisation on mitigation and adaptation of climate change remain highly uncertain. For example, digitalisation can help reduce energy demand by enabling shared and reduced mobility, smart metering, and data analytics. Conversely, digitalisation can increase electricity demand in growing IT sectors: data centres, network connections, cryptocurrencies are just a few of the examples. Digitalisation also has system wide impacts through changing patterns of consumption, political agency, and social organisation. Through these different forms of impact, digitalisation may have dramatically divergent consequences, steering us towards a digital utopia of efficient service provision in optimised systems ... or a digital dystopia of corporate exploitation and runaway energy demand. This bifurcation in future trajectories is shaped by institutions and governance of data, privacy, market power, democratic participation, skills, and sovereign rights in a digital age. A systematic exploration of scenario narratives for digitalisation in the Anthropocene is a necessary precursor to robust quantitative modelling of emission impacts. This session will explore how the development of digitalisation narratives can support the modelling and assessment of digital transformation in a decarbonizing energy sector and the economy-wide low carbon transition.

### Presenters:

**Felix Creutzig**, MCC Berlin and TU Berlin, **Charlie Wilson**, University of Oxford

*Oral presentation:* Digitalization and the Anthropocene

**Tim Foxon**, SPRU, University of Sussex

*Oral presentation:* Socially- and individually-oriented pathways for the impacts of digitalisation on energy demand

**Doris Fuchs**, Westfälische Wilhelms-Universität Münster

*Oral presentation:* AI – Narratives and governance of AI and sustainability

## Session ID # 64: Future lifestyle changes at different geographical scales and in response to societal shocks (e.g., Covid-19)

06/21/2022, 16:30 - 18:00

Laxenburg Conference Center - Franz Josef

**Lead organizer(s):** Nicole van den Berg<sup>1</sup>, Johannes Morfeldt<sup>2</sup>, Oreane Edelenbosch<sup>1</sup>, Daniel Johansson<sup>2</sup>, Charlie Wilson<sup>3</sup>, and Jörgen Larsson<sup>2</sup>

**Institutional Affiliation(s):** Utrecht University<sup>1</sup>, Chalmers University of Technology<sup>2</sup>, and Oxford University<sup>3</sup>

**Session Type:** Research Session

### Session Description:

Lifestyle changes and demand-side transformations are critical enablers of stringent mitigation pathways in line with Paris Agreement targets. IAMs are traditionally stronger on supply-side measures and technological development than modelling diverse demand-side transformations. Potentials for transformations differ across countries and regions and can be affected by societal trends, policies, and norms. Nevertheless, they can significantly reduce emissions by decreasing product and service demand and enabling more energy-efficient services. It is critical to explore how demand-side transformations can be stronger represented within IAMs and how hybrid approaches, i.e. combined scenario and model approaches where IAM-outputs are used to describe the development in the “rest of the world” and where national scale scenarios and models are used for capturing the local specific context and the fine-scale nature of demand-side transformations.

Pandemics and other societal shocks have dramatic effects on social and economic activity. The policy responses triggered by Covid-19 forcibly changed lifestyles. However, change in the material and social fabric of life is strongly path-dependent. Long-lived infrastructures endure, and institutions provide stability. Daily practices are habitual, as are organisational modes of thinking and planning. Following a shock, the response of locked-in systems is to seek a return to stability - the ‘old normal.’ But humans’ capacity to adapt allows for new lifestyle practices to emerge and embed, such as homeworking, e-retail, localised movement, e-health, and food preparation. Societal shocks can shape lifestyles over the medium-to-long term with related impacts on energy, materials and carbon emissions.

This session aims to explore the geographical and contextual detail needed for modelling lifestyle changes and demand-side transformations. We encourage presentations and posters on:

1. Scaling up demand-side transformations from national to regional and global levels and hybrid modelling using rest-of-world pathways to assess local developments.
2. Incorporating societal shocks, such as impacts of Covid-19, in modelling over decadal timescales.
3. Interlinking input-output analysis with IAMs to better understand rebound effects when assessing demand reductions.

### Presenters:

**Johannes Morfeldt**, Chalmers University of Technology

*Oral presentation:* A hybrid method for developing Swedish consumption-based emission scenarios

**Hayley Steele**, University of California at Davis

*Oral presentation:* Should future scenarios factor in the impact of racism upon emissions?



**Nicole van den Berg**, Utrecht University

*Oral presentation:* (Path)ways to a lower carbon footprint? the impact of sustainable lifestyle scenarios in reaching climate targets

**Isabela Schmidt Tagomori**, PBL Netherlands Environmental Assessment Agency

*Poster presentation:* Contribution of lifestyle changes to climate change mitigation

**Charlie Wilson**, Utrecht University

*Poster presentation:* Lifestyle changes in post-Covid-19 futures

## Session ID # 29: Learnings from stakeholder participation for the development and implementation of scenarios and long-term pathways towards sustainable systems

06/21/2022, 16:30 - 18:00

The International Institute for Applied Systems Analysis (IIASA) - Wodak

**Lead organizer(s):** Jeffrey M. Bielicki<sup>1</sup>, Maria Diaz<sup>2</sup>, Jan Steinhauser<sup>3</sup>, and Douglas Jackson-Smith<sup>1</sup>

**Institutional Affiliation(s):** Ohio State University<sup>1</sup>, Sustainable Development Solutions Network<sup>2</sup>, International Institute for Applied Systems Analysis<sup>3</sup>

**Session Type:** Workshop Session

### **Session Description:**

Modelers and the integrated assessment models they create and use have fundamental roles at the interface where science and policy influence each other. Effective scenarios for these efforts contain reasonably plausible combinations of factors that reflect different perspectives on past, present, and future developments; they can help provide context for decision-making and intervention strategies for complex political, social, economic, and environmental uncertainty over various spatial and temporal scales. Scenarios—especially model-based scenarios like the popular RCP-SSP framework—set a pathway on a trajectory that can help guide policy for mitigating undesirable long-term outcomes.

In this workshop, we seek to elevate discussion and analysis of the scenario development process. Scenarios are often constructed by input from stakeholders with diverse perspectives and backgrounds, including using participatory methods. Yet subjective assessments underly scenario construction. Plausibility depends on perspective, and views on what is needed for decision-making as well as potential intervention strategies are also human constructs. As a result, the scenario development process is often a social process that occurs through the exchange between experts, academics, and others. The perspectives and dynamics of those ‘in the room’ matter, and the methods, open-access tools, and inputs from various stakeholders are as essential as selecting for and cultivating productively critical and flexible dialog, decision-making, transparency, and constructive group processes.

Participants are invited to: i) share experiences where pathways were used as a framework for engaging stakeholders in the design of scenarios, in particular for climate and land-use systems; ii) discuss challenges and how they were addressed (e.g., working with stakeholders to address limited understanding of complex models, misalignment between short-term national pledges and long-term global objectives (i.e., SDGs, Paris Agreement)); iii) showcase how participatory modeling influenced the ambition of national policies and strategies.

### **Presenters:**

**Torres Gunfaus Marta**, IDB

*Oral presentation:* Long-Term Climate Strategies in Latin America: What can we learn from the voice of the actors who have participated in their formulation?

**Federico Frank**, INTA (Instituto Nacional de Tecnología Agropecuaria)

*Oral presentation:* A multi-model approach to explore sustainable food and land use pathways for Argentina

**Taran Faehn**, Research Department of Statistics Norway

*Oral presentation:* Plausible futures: Systemising different international contexts for Norway's climate strategies

**Ana Paula Aguiar**, Stockholm Resilience Centre, Stockholm University

*Oral presentation:* Widened co-creation processes for target-seeking climate and sustainable development scenarios

**Alison Smith**, University of Oxford

*Oral presentation:* Stakeholder engagement in the UK: developing sustainable food and land use pathways with the FABLE model

**Edward Torres Maia**, Oswaldo Cruz Foundation (Fiocruz)

*Poster presentation:* Fiocruz Method of Future Intelligence - Prospective Dialogues Methodology for 2030 Agenda and its SDGs

## Session ID # 46: Emulators: new methods and role in integrating research across climate research communities

06/22/2022, 9:00 - 10:30, 11:00 - 12:30

Laxenburg Conference Center - Theatersaal

**Lead organizer(s):** Sonia Seneviratne<sup>1</sup>, Claudia Tebaldi<sup>2</sup>

**Institutional Affiliation(s):** ETH Zurich<sup>1</sup> and Lawrence Berkeley National Laboratory<sup>2</sup>

**Session Type:** Research Session

### Session Description:

Emulators, either simpler physics-based climate models or algorithmic representation of complex models' output in a computationally efficient manner, play a central role in exploring scenarios: They are used by the Vulnerability, Impact and Adaptation (VIA) research community to determine risk of impacts and by the mitigation and Integrated Assessment Model (IAM) research community to derive the implications of alternative pathways, thus supplementing what could not be done with computationally costly Earth System Models (ESMs). In the IPCC AR6 report, emulators in the form of simple models have played a central role in assessing the likely range of future projections of global temperature by allowing the exploration of uncertainty dimensions like model structural choices, and in particular equilibrium climate sensitivity. In this role the connection between WG1, WG2, and WG3 have been facilitated, but there is potential for more integration, including through the emulation of regional climate changes.

Our session invites contributions from developers of new methods of both types, i.e., emulators in the form of simple models, and ESM emulators, including emulators representing regional climate changes, extremes and impacts, and their inclusion in IAMs. We also want to hear from users of emulators in the VIA and IAM research communities. We are particularly interested in addressing the potential of emulators of ESM output to facilitate the further connection between WG1, WG2, and WG3, ahead of the next IPCC report. We hope that the session will spur ideas and ways by which new scenarios' climate output could be more promptly available to impact and mitigation researchers, so that the same set of scenarios would be more easily and systematically explored across the whole IPCC report.

### Presenters:

**Chris Wells**, University of Leeds

*Oral presentation:* Near-term regional climate change projections using climate emulators

**Yann Quilcaille**, ETH Zurich

*Oral presentation:* Emulating spatially resolved annual maximum temperatures of Earth system models using MESMER-X

**Claudia Tebaldi**, PNNL

*Oral presentation:* STITCHES: a comprehensive option for Earth System Model emulation for impacts research, and its implications for designing future ESM scenario experiments

**Shruti Nath**, Climate Analytics

*Oral presentation:* Towards integration of LCLM feedbacks within climate models: an emulator approach

**Thomas Bossy**, Laboratoire des sciences du climat et de l'environnement (LSCE)

*Oral presentation:* Pathfinder: a model and framework to explore emission pathways limiting climate impacts

**Zeke Hausfather**, Berkeley Earth

*Oral presentation:* A probabilistic exploration of climate outcomes under current policies and commitments

**Stuart Jenkins**, University of Oxford

*Oral presentation:* An emulator of an Integrated Assessment Model's carbon price, CO<sub>2</sub> production, carbon capture and storage, and CO<sub>2</sub> emissions timeseries

**Chris Smith**, University of Leeds / International Institute for Applied Systems Analysis (IIASA)

*Oral presentation:* FaIR v2: A reduced-complexity climate model for scenario evaluation and integrated assessment

**Camilla Mathison**, UK Met Office

*Poster presentation:* Is the 1.5C climate target still alive post COP-26?

## Session ID # 38: Beyond GDP: economic dimensions of integrated assessment scenarios

06/22/2022, 9:00 - 10:30

Laxenburg Conference Center - Marschallzimmer 1

**Lead organizer(s):** Rob Dellink<sup>1</sup> and Dominique van de Mensbrugghe<sup>2</sup>

**Institutional Affiliation(s):** OECD<sup>1</sup> and Perdue University<sup>2</sup>

**Session Type:** Workshop Session

### **Session Description:**

Integrated assessment scenarios such as the Shared Socioeconomic Pathways (SSPs) are underpinned by projections of economic activity. Often, the economic dimension is limited to projections of GDP and income per capita. This session will discuss both the need and opportunities for providing broader and deeper economic projections for climate change and related integrated assessment modelling scenarios.

First, the session will look at the role of changes in the sectoral structure in the economy. Clearly, different economic activities are not projected to grow at equal speed, and as sectoral emission intensities vary widely across sectors, a sectoral approach can provide much better links with environmental pressures, including greenhouse gas and air pollutant emissions. Second, international trade matches regional consumption and production patterns. Exports of natural resources (including fossil fuels) also play a big role in macroeconomic development of resource-rich countries. Finally, the session will discuss the opportunities and pitfalls in downscaling economic projections to the local scale. The session will explicitly link these proposed economic projections to the SSPs.

The goal of the session is to highlight how deeper and broader economic projections can improve the quantification of integrated assessment scenarios more broadly. We expect the outcome to be a combination of recommendations for integrated assessment modellers on how to use more detailed insights from economic projections, and recommendations for economic modellers on how to ensure their tools and projections are useful for integration in integrated assessment models.

### **Presenters:**

**Lionel Fontagne**, Bank of France, CEPPI and Paris School of Economic

*Oral presentation:* A Dynamic Path to a Low Carbon Economy

**Steven Rose**, Electric Power Research Institute (EPRI)

*Oral presentation:* Quantifying uncertainty in global and sub-global socioeconomic and greenhouse gas emissions futures

**Rob Dellink**, OECD

*Oral presentation:* The economic drivers of environmental change: the role of baseline projections

**Marijke Kuiper**, Wageningen Economic Research, Wageningen University & Research

*Oral presentation:* Deepening the economic contribution to integrated assessments scenarios by adding more detailed labour projections as drivers of structural change

## Session ID # 7: National deep decarbonization scenarios: policy analysis and global narratives

06/22/2022, 9:00 - 10:30, 11:00 - 12:30

Laxenburg Conference Center - Marschallzimmer 2

**Lead organizer(s):** Johannes Svensson<sup>1</sup> and Daniel Buira<sup>2</sup>

**Institutional Affiliation(s):** IDDRI, France<sup>1</sup> and Tempus Analitica<sup>2</sup>

**Session Type:** Research Session

### Session Description:

This session will discuss country-driven national deep decarbonisation scenarios consistent with global carbon neutrality between 2050 and 2070, in line with IPCC estimates of required emission reductions for achieving the Paris Agreement global mitigation target (Rogelj *et al.*, 2018). The focus will be on the policy lessons that can be derived for national decision-making regarding synergies and trade-offs with country non-climate objectives, and on priority short-term policies and actions, with a focus on where shifts from current paths are most required. In addition to insights from individual country-scale analyses, the session will discuss how high-resolution national pathways defined in a bottom-up manner can inform global climate dialogues through the global enablers the national pathways depend upon (paper currently in process). This session will be an opportunity to reflect on the methodological challenges faced when developing national scenarios, capturing a broad set of key national circumstances, with the primary objectives to inform in-country and international stakeholder consultation. These objectives require adopting a pathways design framework articulating detailed national narratives and dashboards in an iterative process guided by global benchmarks with detailed accounts of sectoral transformations (Waisman *et al.*, 2019; Lefèvre *et al.*, 2020; Svensson *et al.*, 2021). The session will also discuss the methodological challenges of a bottom-up approach to the articulation between global and national scenarios, including the characteristics necessary in national pathways to be used by such an approach. The objective of this approach is to elaborate global narratives resulting from the international enablers emerging from national scenarios, and it is complementary to the widely used SSP/RCP/SPA scenario framework (Kriegler *et al.*, 2014; Riahi *et al.*, 2017; van Vuuren *et al.*, 2017; O'Neill *et al.*, 2020), using global scenarios as boundary conditions and consistency checks to national scenarios (van Vuuren *et al.*, 2017).

### Presenters:

**Johannes Svensson, IDDRI**

*Oral presentation:* What does carbon neutrality mean for transformative development and policy action in large emerging economies? Methodological insights drawn from bottom-up national analyses

**Johannes Svensson, IDDRI**

*Oral presentation:* Global Narratives: a bottom-up and policy relevant approach to bridging insights from national and global decarbonisation pathways



**Saritha Sudharmma Vishwanathan**, Indian Institute of Management, Ahmedabad  
*Oral presentation:* Indian Deep Decarbonization Scenarios informing Global Stocktake 202

**Haewon McJeon**, PNNL/UMD  
*Oral presentation:* Integrated Assessment Modeling for the U.S. Long-Term Strategy towards Net-Zero Emissions

**Gunnar Luderer**, Potsdam Institute for Climate Impact Research  
*Oral presentation:* Pathways towards reaching climate neutrality in Germany by 2045

**Matthias Weitzel**, European Commission - Joint Research Centre (JRC-Seville)  
*Oral presentation:* Taking stock of the ambition gap: implications of the Glasgow pledges for deep decarbonisation scenarios

**Femke Nijse**, University of Exeter  
*Oral presentation:* Deep decarbonisation with a solar-dominated baseline

## Session ID # 70: Narratives for scenarios and pathways to provide decent levels of energy services at low demand of energy and resources

06/22/2022, 9:00 - 10:30

Laxenburg Conference Center – Gvishiani

**Lead organizer(s):** Yamina Saheb<sup>1</sup>, Gregory Nemet<sup>2</sup>, Leila Niamir<sup>3,4</sup>, Alessio Mastrucci<sup>4</sup>, Bas van Ruijven<sup>4</sup> and Elena Verdolini<sup>5</sup>

**Institutional Affiliation(s):** Sciences Po<sup>1</sup>, Paris, University of Wisconsin, Madison<sup>2</sup>, Mercator Research Institute on Global Commons and Climate Change (MCC)-Berlin<sup>3</sup>, International Institute for Applied Systems Analysis<sup>4</sup> and RFF-CMCC European Institute on the Economics and the Environment<sup>5</sup>

**Session Type:** Workshop Session

### Session Description:

This workshop session will generate ideas for narratives and scenarios that reduce the demand for energy, materials, land, water, and resources in end use sectors, while providing decent levels of energy services. The overall goal is to gather input to develop a more robust set of pathways for how the combination of high energy service provision, and low resource demand could realistically come about over the next three decades. Specific foci include assessment of decent living standards and sufficiency; social and technological innovation including through digitalisation; as well as system change, infrastructure, and novel services; and how each play a role in facilitating low energy demand outcomes.

An important focus of the discussion will be on the importance of sufficiency, technological, and social innovations in demand reduction. Sufficiency is defined as a set of policy measures and daily practices which avoid the demand for energy, materials, land, water, and other natural resources, while delivering wellbeing for all within planetary boundaries (Saheb 2021).

As background, The French negawatt scenario (Negawatt 2003) (Negawatt 2011) (Negawatt 2017) is the first known scenario to go beyond efficiency improvement to reduce energy demand. The last update of this scenario shows high mitigation potential of consumption-based emissions and those related to the use of materials (Negawatt 2022). (ADEME 2022) and (RTE 2021) show similar results. At a global level, (Grubler *et al.* 2018) (Millward-Hopkins *et al.* 2020) (Kuhnenn *et al.* 2020) (Fishman *et al.* 2021) found large mid-century mitigation potential from the adoption of sufficiency measures, behavioural, social and technological innovations and (Mastrucci *et al.* 2021) reached similar conclusions for global heating and cooling demand while (Barrett *et al.* 2021) showed similar results from in-depth analysis of low-energy demand futures specific to the UK.

### Presenters:

**Arnulf Grubler**, International Institute for Applied Systems Analysis (IIASA)

*Oral presentation:* The 'High-with-Low' Scenario Narrative

**Gregory Nemet**, University of Wisconsin

*Oral presentation:* Social and Technological Innovation Pathways for Low Energy Demand

**Benigna Boza-Kiss**, International Institute for Applied Systems Analysis (IIASA)  
*Oral presentation:* Low energy demand and decent living scenarios in buildings

**Aimée Aguilar Jaber**, OECD  
*Oral presentation:* A mind-set shift to unlock the potential of high-well-being, low demand systems: will modelling foster or hinder?

**Barbara Nicoloso**, Virage Energie  
*Oral presentation:* Energy transition through sufficiency: a net-zero pathway emission for the Hauts-de-France region.

**Yves Marignac**, Association négaWatt  
*Oral presentation:* Energy sufficiency as the first pillar of ambitious decarbonisation and deep sustainability pathways: modelling experience from France and prospects for Europe

**Carina Zell-Ziegler**, Öko-Institut and Technische Universität Berlin  
*Poster presentation:* Sufficiency scenarios and decent living standards: comparison of key indicators

## Session ID # 52: Interacting with integrated assessment models for target-seeking under uncertainty

06/22/2022, 9:00 - 10:30

Laxenburg Conference Center - Franz Josef

**Lead organizer(s):** Sibel Eker<sup>1</sup>, Sarah Cornell<sup>2</sup>, Merle Rémy<sup>3</sup>, and Jan Kwakkel<sup>4</sup>

**Institutional Affiliation(s):** Radboud University<sup>1</sup>, Stockholm University<sup>2</sup>, Institute for Advanced Sustainability Studies, Potsdam<sup>3</sup>, and Delft University of Technology<sup>4</sup>

**Session Type:** Research Session

### Session Description:

Large integrated assessment models have been immensely useful in developing possible climate mitigation pathways, influencing political agendas and providing policy advice. But now, the 2030 Agenda highlights the urgent need to improve upon the well-established climate change scenario framework by capturing more diverse relevant perspectives, reflecting uncertainty ranges, and enhancing scenario relevance to users especially in policy analysis for coherence and implementation. There is demand for new target-seeking scenarios that achieve multiple interacting social, economic and ecological goals as well as meeting the Paris climate targets. An expanding international community of stakeholders, spanning world regions and sectors of societal action, is interested in scenario-based analysis to explore how interactions among these globally agreed goals shape future pathways to sustainable development. But large IAMs struggle to engage stakeholders actively in scenario development and to incorporate diverse uncertainties. In this session, we will explore ways to capture future uncertainties and diverse perspectives, through the use of simple IAMs to complement larger ones, combined with methods of decision-making under deep uncertainty, and through engaging stakeholders more actively in co-created scenario development processes. With invited speakers and open submissions, the session will present examples of research and science-society forums that can help improve today's scenario frameworks and interactive environments, so that they do better at reflecting the complexity and deep uncertainty of the world's often divergent societal perspectives and the necessary shifts in global governance for a sustainable future.

### Presenters:

**Georgios Xexakis**, University of Geneva; HOLISTIC S.A.

*Oral presentation:* Are interactive scenario tools an effective solution for expanding the uncertainty space and communicating the results of integrated assessment modeling?

**Damla Akoluk**, Delft University of Technology

*Oral presentation:* Exploring the distributive justice principles in integrated assessment models: a trade-off analysis on interregional justice

**David Groves, Jia Li**, World Bank

*Oral presentation:* Using IAM scenarios to guide the assessment of carbon lock-in and Paris-aligned global development

**Ben Matthews**

*Poster presentation:* A Scalable Interactive Climate IAModel for Experimenting with Diverse Pathways

## Session ID # 23: Improving the representation and usability of socio-political factors in the Shared Socioeconomic Pathways (SSPs)

06/22/2022, 9:00 - 10:30

The International Institute for Applied Systems Analysis (IIASA) - Gvishiani

**Lead organizer(s):** Ariel Macaspac Hernandez<sup>1</sup>, Ines Dombrowsky<sup>1</sup>, Elisabeth Gilmore<sup>2</sup>, Halvard Buhaug<sup>3</sup>, Håvard Hegre<sup>4</sup>, and Elmar Kriegler<sup>5</sup>

**Institutional Affiliation(s):** German Development Institute<sup>1</sup>, Carleton University<sup>2</sup>, Peace Research Institute Oslo (PRIO)<sup>3</sup>, Uppsala University<sup>4</sup>, Potsdam Institute for Climate Impact Research<sup>5</sup>

**Session Type:** Workshop Session

### Session Description:

Socio-political factors, underpinned by institutions and governance, affect the vulnerability from climate hazards as well as the capacity to implement effective responses to climate change, including mitigation, adaptation, and achievement of the SDGs.

Presently, in the Shared Socioeconomic Pathways (SSPs), the political dimensions of development are described in aggregate assumptions about political changes in accompanying storylines. The implication is that the challenges posed by climate change and to the achievement of the SDGs, especially those that are known to be sensitive to the political context, such as food and economic security, may be poorly characterized or - more problematically - underestimated. In this roundtable, we discuss how to improve the representation of socio-political factors in scenarios by elaborating the evidence for characteristics of political context that may be critical for the evaluation of climate impacts and the effectiveness of mitigation and adaptation actions and opportunities for approaches to integrate these factors into the SSPs. Two invited presenters will motivate these efforts that better harness the knowledge from political and social sciences. First, conceptual frameworks and theoretical models are needed to contextualize the various socio-political factors that better capture historical experiences, especially those that will most likely define variations between countries. For example, a former colony that emerged from a violent civil war and is highly vulnerable to climate change will have a distinct set of values and resource provisions that will inform its capacity for societal transformation. Second, socio-political dimensions can be better quantified along the existing SSPs to improve internal consistency and integration with modeling efforts.

The panel is relevant for modelers, social scientists and users. As socio-political trends and factors mediated by institutions are key to transformative actions, modelers can gain insight into how to include these factors in their scenarios. For social scientists, the panel can be beneficial by complementing systematic inquiry of “what it is” with “what ought to be” and “how to get there from here”. Taken together, this collaboration will enhance “goal-oriented” thinking in social science and the usability and salience of IAM efforts.

### Presenters:

**Theresa Scavenius**, Aalborg University

*Oral presentation:* The predictive capacity of the social sciences

**Ariel Macaspac Hernandez**, German Development Institute

*Oral presentation:* “Transformative” scenarios and models – Ten questions on how to improve the scientific representation of governance factors in sustainable development pathways

**Julia Leininger, Christopher Wingens**, German Development Institute

*Oral presentation:* Institutions in integrated scenarios for reaching climate and sustainable development goals

**Ian Hughes**, MaREI Centre, University College Cork

*Oral presentation:* DIIS Scenarios for Whole of Society Transformation

**Halvard Buhaug**, Peace Research Institute Oslo (PRIO)

*Oral presentation:* Accounting for political sources of vulnerability in the SSPs

**Elmar Kriegler**, PIK

*Oral presentation:* Experiences and lessons learnt from SHAPE

**Staffan I. Lindberg**, University of Gothenburg

*Oral presentation*

## Session ID # 31: Scenario-based approaches to modeling migration futures

06/22/2022, 9:00 - 10:30, 11:00 - 12:30

The International Institute for Applied Systems Analysis (IIASA) - Wodak

**Lead organizer(s):** Carsten Keßler<sup>1</sup> and Alex de Sherbinin<sup>2</sup>

**Institutional Affiliation(s):** Bochum University of Applied Sciences<sup>1</sup> and Columbia Climate School<sup>2</sup>

**Session Type:** Research Session

### Session Description:

The proliferation of scenario-based research around the climate crisis and global socio-economic development has led to an uptake of scenario-based approaches in migration studies. This includes a growing number of efforts to model internal and international migration either using the shared socioeconomic pathways (SSP) as a basis for projecting mobility or in ways that contribute to the SSPs directly (e.g., as a component of future country-level population projections). Relative to fertility and mortality, migration is the most dynamic and potentially hard to predict population dynamic to model. At the same time, new scenario frameworks are under development that focus on specific regions or social/political aspects of migration, as more disciplines are starting to utilize scenario-based research. The goal of this session is a) to provide a forum to discuss scenario-based migration research combining SSPs and RCPs from a variety of perspectives, and b) to enable a transdisciplinary exchange on migration scenarios including, but not limited to, social and political scientists, demographers, as well as experts in modelling and spatial analysis. To achieve this goal, we particularly invite submissions that go beyond a pure modeling perspective and also consider the cultural, social, and political realities of migration, including, but not limited to, aspects of educational attainment, the labor market, immigration policy, or the role of diasporas. In addition to two invited talks, the session will feature three paper presentations selected from the submissions, and a poster session for the remaining accepted papers. The session will be concluded with an open discussion to identify research gaps derived from the transdisciplinary perspectives from migration experts from different disciplines, aiming to develop best practices for the use of the SSPs across different disciplines and identify gaps that should be addressed in future scenarios.

### Presenters:

**Karolina Sobczak-Szelc**, Center for Advanced Studies of Population and Religion (CASPAR), Cracow University of Economics, Centre of Migration Studies, University of Warsaw  
*Oral presentation:* The role of qualitative research in creation of storyline of the shared socioeconomic pathways on the example of three case studies from Tunisia

**Michaël Boissonneault**, Netherlands Interdisciplinary Demographic Institute (NIDI-KNAW)  
*Oral presentation:* The use of scenario planning for exploring the future of migration: insights from an expert survey

**Lucas Kluge**, Potsdam Institute for Climate Impact Research



*Oral presentation:* A dynamic global model of bilateral migration by place of birth, age and education groups

**Roman Hoffmann**, International Institute for Applied Systems Analysis (IIASA)

*Oral presentation:* Climate Change, Desertification, and Internal Migration: Evidence from Global Census Data

**Hélène Benveniste**, Harvard University

*Oral presentation:* Tracing international migration in projections of income and inequality across the Shared Socioeconomic Pathways

**Alex de Sherbinin**, CIESIN, Columbia Climate School

*Oral presentation:* Internal climate migration scenarios using a spatial population gravity modeling approach

**Fabien Cottier**, Lamont-Doherty Earth Observatory, Columbia Climate School

*Oral presentation:* International climate migration scenarios using a gravity modeling approach

**Lars Tierolf**, Vrije Universiteit

*Oral presentation:* A global agent-based model of migration and adaptation decisions in face of sea level rise

**Gabriele Standardi**, Euro-Mediterranean Center on Climate Change (CMCC)

*Oral presentation:* A CGE model framework for the combined assessment of future migration patterns and economic effects under climate change scenarios

**Lena Reimann**, Institute for Environmental Studies (IVM), Vrije Universiteit Amsterdam

*Oral presentation:* Exploring spatial feedbacks between sea-level rise, adaptation policies, and migration – An application of the RCP-SSP-SPA scenario framework

## Session ID # 59: Catalyzing climate and biodiversity coupled scenarios for assessments and policy

06/22/2022, 11:00 - 12:30

Laxenburg Conference Center - Marschallzimmer 1

**Lead organizer(s):** HyeJin Kim<sup>1</sup>, Paula Harrison<sup>2</sup>, Laura Pereira<sup>3</sup>

**Institutional Affiliation(s):** Martin Luther University Halle-Wittenberg<sup>1</sup> and UK Centre for Ecology & Hydrology<sup>2</sup>, University of the Witwatersrand, South Africa<sup>3</sup>

**Session Type:** Workshop Session

### Session Description:

O'Neil *et al.* (2021) in "Achievements and needs for the climate change scenario framework" highlighted the need to improve relevance of climate scenarios beyond the climate research community. The SSP-RCP scenarios have been applied in biodiversity and ecosystem services models (e.g. BES-SIM), but the lack of biodiversity interventions in the SSP scenarios reduced their relevance for IPBES assessments (Rosa *et al.* 2020). IPBES is therefore developing its own scenarios and modelling framework – Natures Futures Framework (NFF) – that places nature and people at the center and facilitates the inclusion of diverse worldviews (Pereira *et al.* 2020). Similarly, communities such as TWI2050 and FABLE working on Sustainable Development Goals (SDGs) have used a mix of SSP-RCP and other scenario frameworks with different successes and challenges. In this light, this session brings together the leading experts from these communities to discuss how various scenarios and modelling frameworks and ongoing efforts could be coupled (or mapped to each other) to improve their effectiveness in informing multiple policy agendas (e.g. Paris Agreement, CBD post 2020 biodiversity framework, and SDGs). The aim of this workshop is to explore ways to cross-fertilize the SSP-RCP and NFF scenario frameworks and to catalyze collaboration in broader scenario and modelling communities going forward. The discussion will focus on the needs, challenges and opportunities for better linking scenario frameworks to IPBES/IPCC assessments and relevant policy goals. It welcomes submissions for panel members who would be willing to prompt an interactive discussion with the audience by sharing their experiences working across different scenario frameworks in a variety of contexts (scales, geographies, assessment vs decision support) and/or in linking scenarios to inform policy goals. The workshop will be preceded by the research session on new and ongoing work on scenarios for biodiversity and nature contributions to people.

References: O'Neill, B. C. *et al.* (2020). *Nat. Clim. Chang.* 10, 1074–1084, Pereira, L. M. *et al.* (2020). *People and Nature* 2, 1172–1195, Rosa, I. M. D. *et al.* (2020). *Global Ecology and Conservation* 22, e00886.

### Presenters:

**Rob Alkemade**, PBL Netherlands Environmental Assessment Agency

*Oral presentation:* Exploring the Nature Futures Framework with the IMAGE-GLOBIO models

**Mark Rounsevell**, Karlsruhe Institute of Technology

*Oral presentation:* Mapping the RCPs and SSPs onto the Nature Futures Framework at the global scale

**Simona Pedde**, Wageningen University and Research

*Oral presentation:* Participatory and extended SSPs. Can these seed a link between SSPs and NFF?

**Laura Pereira**, Global Change Institute, Wits University

*Oral presentation:* Operationalizing the Nature Futures Framework using illustrative narratives

**Alexander Popp**, Potsdam Institute for Climate Impact Research (PIK)

*Oral presentation:* Integrated strategies are key to avoid trade-offs between climate and biodiversity protection

**HyeJin Kim**, Martin Luther University Halle-Wittenberg, German Centre for Integrative Biodiversity Research (iDiv)

*Poster presentation:* Towards a better future for biodiversity and people: modelling Nature Futures

## Session ID # 37: Economic pluralism and post-growth scenarios

06/22/2022, 11:00 - 12:30

Laxenburg Conference Center – Kaminzimmer

**Lead organizer(s):** Jarmo Kikstra<sup>1,2</sup>, Jason Hicke<sup>3,4</sup>, and Bjoern Soergel<sup>5</sup>

**Institutional Affiliation(s):** International Institute for Applied Systems Analysis<sup>1</sup>, Imperial College London<sup>2</sup>, London School of Economics<sup>3</sup>, Autonomous University of Barcelona<sup>4</sup>, and Potsdam Institute for Climate Impact Research<sup>5</sup>

**Session Type:** Research Session

### Session Description:

This session aims to explore the tools for including diverse economic theories in scenarios and for developing post-growth economic futures. The session will explore the steps to build useful post-growth narratives as well as the requirements to allow for their model quantifications, and potential barriers to be overcome. It will discuss whether current integrated assessment models (IAMs) are capable of sufficiently providing such model quantifications.

The vast majority of existing climate change mitigation scenarios feature strong global growth in terms of gross domestic product (GDP). This generally includes continued growth in regions where economic capacity is already more than sufficient to meet human needs at a high standard. The growing affluence in these scenarios stimulates increases in resource use and pollution [1].

Mitigation scenarios based on SSPs subsequently generally rely on either high rates of decoupling of GDP from energy and material throughput [e.g., 2], or project a large upscaling of negative emission capabilities in the second half of the century, both of which raise potential feasibility concerns [e.g., 3]. At the same time, besides lacking detail on the decoupling of energy demand and GDP, demand-side mitigation options have long been underexplored in IAM scenarios [3].

This research session invites presentations that focus on reviewing or introducing useful datasets and modelling methods that can be used to translate narratives of alternative economic developments into quantifications of scenarios. More specifically, presentations from integrated assessment modelling, social metabolism, industrial ecology, ecological economics and related disciplines are welcome.

In particular, this session would discuss the different aspects, both social and technical, involved in developing: – Post-growth and degrowth scenarios: exploring and utilising potentials to reduce energy use and material throughput while maintaining strong social outcomes, assessing the consequences for aggregate economic output – Convergence scenarios: reducing inequalities in resource and energy use both between countries and within countries.

### References

- [1] Wiedmann, Thomas, *et al.* "Scientists' warning on affluence." *Nature communications* 11.1 (2020): 1-10.
- [2] Grubler, Arnulf, *et al.* "A low energy demand scenario for meeting the 1.5 C target and sustainable development goals without negative emission technologies." *Nature energy* 3.6 (2018): 515-527.
- [3] Brutschin, Elina, *et al.* "A multidimensional feasibility evaluation of low-carbon scenarios." *Environmental Research Letters* 16.6 (2021): 064069.

**Presenters:**

**Julien Lefèvre**, CIRED (International Environment and Development Research Center)

*Oral presentation:* Modelling post-growth mitigation scenarios with Integrated Assessment Models: capabilities and gaps

**Bjoern Soergel, David Meng-Chuen Chen**, Potsdam Institute for Climate Impact Research (PIK)

*Oral presentation:* Modelling post-growth energy and land futures

**Mengyu Li**, ISA, School of Physics, The University of Sydney, NSW 2006

*Oral presentation:* Integrated Assessment Modeling of post-growth scenarios

**Eric Kemp-Benedict**, Stockholm Environment Institute

*Oral presentation:* Withdrawing from the industrial economy: Quantifying SSP1 via labor participation

## Session ID # 104: Regional and subnational scenarios of decarbonization and sustainable development

06/22/2022, 11:00 - 12:30

Laxenburg Conference Center - Franz Josef

**Lead organizer(s):** Gokul Iyer<sup>1</sup>, Ryna Cui<sup>2</sup>, and Vaibhav Chaturvedi<sup>3</sup>

**Institutional Affiliation(s):** Pacific Northwest National Laboratory<sup>1</sup>, University of Maryland<sup>2</sup>, and CEEW India<sup>3</sup>

**Session Type:** Research Session

### **Session Description:**

As countries develop near- and long- term decarbonization strategies, decision-makers are interested in understanding the implications of national climate strategies at regional and subnational scales. Of key interest is to understand institutional and political economy issues surrounding transitions toward a low-carbon economy and the implications of those transitions for sustainable development priorities including but not limited to human health, employment, and equity at these scales. Existing scenarios literature largely focuses on global and national pathways toward deep decarbonization. Yet, a burgeoning literature is exploring regional and subnational scenarios in the U.S., China, Latin America and Caribbean, and other key emitting countries across the globe. This session will solicit presentations and posters based on recent and ongoing studies on regional and subnational scenarios focused on long-term decarbonization strategies. This session will also include presentations on implications of national decarbonization goals at subnational scales for various human and natural systems such as energy, water, land, and economy and the subsequent consequences for sustainable development priorities such as employment, human health, economic development, food security, and water scarcity at those scales. While targeted at quantitative scenarios developed by integrated assessment models, the session will also be open to studies based on other methodologies, including qualitative methodologies and combined qualitative and quantitative scenario approaches.

### **Presenters:**

**Alicia Zhao**, Center for Global Sustainability, School of Public Policy, University of Maryland

*Oral presentation:* Integrated Assessment Modeling of Federal and Subnational Climate Actions for Reducing the U.S. Emission by 50-52%

**Jonas Hörsch**, Climate Analytics

*Oral presentation:* Sub-national employment opportunities of coal-to-renewable electricity system transitions under a global model scenario

**Edmundo Molina Pérez**, Tecnológico de Monterrey

*Oral presentation:* Advancing the design of national decarbonization strategies for an uncertain future

**Olga Ivanova**, PBL Netherlands Environmental Assessment Agency

*Oral presentation:* Impact of regional energy transition on the labour market

**Wenjia Cai**, Tsinghua University

*Oral presentation:* Incorporating the health co-benefits into technology pathways to achieve China's carbon neutrality target: a modelling study

**Sha Yu**, University of Maryland

*Poster presentation:* Multi-objective environmental policies: co-benefits between air quality and climate policies

