

**Integrated research on climate risk and sustainable solutions across  
IPCC working groups:  
lessons learnt from AR5 to support AR6  
29-31 August 2016, Stockholm, Sweden**

*Draft published 12 August 2016. "Task group" text subject to revision as workshop planning develops.*

The Paris Agreement in December 2015 demands an urgent response from the research community. An immediate priority is greater international coordination of climate research in support of the Intergovernmental Panel on Climate Change's Sixth Assessment Report (IPCC AR6) to help inform future development pathways. This is why Future Earth and PROVIA (The Global Programme of Research on Climate Change Vulnerability, Impacts and Adaptation) and IPCC have convened a scientific workshop to identify research gaps relating to integrated research on risk and solutions in support of IPCC AR6 and development pathways for a resilient future.

The AR6 cycle, including three special reports, three working group assessments and the synthesis report, will focus on: understanding the magnitude and pattern of risks today and in the future; the extent to which adaptation and mitigation solutions could reduce the risks; risks associated with response strategies; and on the trade-offs and barriers to implementing sustainable solutions.

The workshop is designed to further support the research and coordination needed for AR6, and to inform the assessment development, by bringing together experts from research and society across the areas of planetary and regional climate risks (WGI), societal and ecological risks (WGII) and abatement of risks (WGIII) to discuss the major scientific issues associated with integrative risk management and sustainable solutions to the climate challenge. It will explore the lessons learnt from AR5 (see links below), for example, it will identify major gaps in understanding related to the climate system, adaptation, mitigation and vulnerability and examine the strategic research approaches to addressing these issues in the next 3-5 years. It will also explore how the IPCC process can improve the assessment process in support of these aims.

The workshop will complement the 2014 IPCC-World Climate Research Programme workshop (Final Report published 29 January 2015 [http://www.wcrp-climate.org/images/documents/reports\\_flyers/Bern%20workshop%20report.final.29.01.15.pdf](http://www.wcrp-climate.org/images/documents/reports_flyers/Bern%20workshop%20report.final.29.01.15.pdf)) focusing on lessons learnt relating to AR5 with a particular emphasis on Working Group I, the physical basis of climate change.

Finally, the workshop should also complement the efforts of three IPCC scoping meetings that are also providing input to IPCC on AR6 development:

- An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, scheduled for 2018 (scoping meeting 15-18 August 2016)
- An IPCC special report on climate change and oceans and the cryosphere, scheduled for 2019 (scoping meeting 6–9 December 2016)
- An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems, scheduled for 2019 (scoping meeting 13-17 February 2017)

### **Workshop task groups:**

1. GAPS - knowledge gaps on climate-resilient and sustainable solutions to support AR6;
2. SOLUTIONS - catalyzing research, tools, methods, and learning mechanisms to inform development and deployment of sustainable solutions;
3. REGIONAL - sharing information on risks and solution strategies across local to global scales;
4. SCENARIOS - facilitating consistent use of climate and development scenarios across the IPCC WGs.
5. RISKS - consistent and effective characterization and visualization of risks and sustainable solutions across IPCC Working Groups.

### **IPCC AR5 knowledge and data gaps**

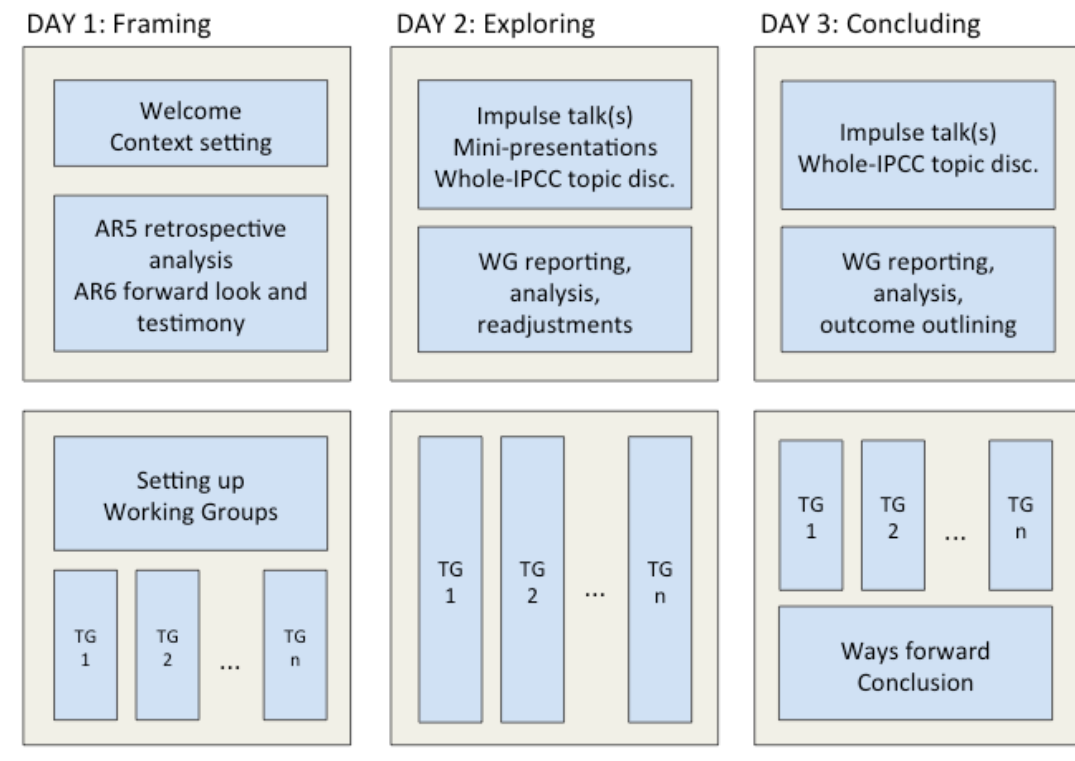
The IPCC Fifth Assessment Report outlined a number of research and data gaps and outstanding issues in climate research.

- IPCC AR5 WGI: Key Uncertainties (p114)  
[http://www.climatechange2013.org/images/report/WG1AR5\\_ALL\\_FINAL.pdf](http://www.climatechange2013.org/images/report/WG1AR5_ALL_FINAL.pdf)
- IPCC AR5 WGII Part A: Research and Data Gaps (p258)  
[http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIAR5-PartA\\_FINAL.pdf](http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIAR5-PartA_FINAL.pdf)
- IPCC AR5 WGII Part B: Research and Data Gaps (p1183 and 1184)  
[http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIAR5-PartB\\_FINAL.pdf](http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIAR5-PartB_FINAL.pdf)
- IPCC AR5 WGIII: Gaps in Knowledge and Data (detailed at end of each chapter)  
[http://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc\\_wg3\\_ar5\\_full.pdf](http://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_full.pdf)

### **Outcomes**

Workshop participants will produce a report for IPCC and a peer-reviewed paper to describe the research challenges, and opportunities related to integrated risks to fill high-priority knowledge gaps for climate-resilient and sustainable solutions. The report and paper will outline how Future Earth and PROVIA can help support research coordination internationally to address these gaps. Furthermore the workshop aims to provide recommendations for the preparation and production of future IPCC assessments.

## Workshop structure



## Task Groups

This workshop brings together participants with diverse backgrounds and career stages. The meeting is designed to hear the voices of all participants and to develop integrated outcomes both within the task group and between task groups. All participants have been asked to bring a 3-minute presentation to help articulate their input to the Task Groups at the appropriate time. Task Group outputs should include a draft outline (ca. 3 pages) of a section of the report/paper and identify a first drafting team of authors willing to work on text following the meeting.

## Task Group 1 GAPS

**What key knowledge gaps on climate-resilient and sustainable solutions can be filled for the AR6?**

**SC conveners:** Kristie Ebi, Corinne Le Quere

**Co-chairs:** Purnamita Dasgupta

**Co-rapporteurs:** Maria Carmen Lemos (TBC) and TBC

Increasingly, research demonstrates that climate-resilient solutions can deliver multiple benefits related to human health, food security, water security, energy security, reduced pollution and enhanced biodiversity. Framing climate-resilient adaptation and mitigation options in terms of multiple cross-sectorial benefits and risks would increase the saliency of the assessment and would focus the key findings on current understanding of effective and efficient approaches to moving towards sustainable pathways.

#### **Questions relating to research gaps:**

1. Are existing risk-benefit frameworks related to climate-resilient solutions effective? Do they capture the complex interactions across scales and sectors? How can they be improved? What are the needs of policymakers in terms of risk-benefit knowledge
2. What is a typology of key decisions that will need to be taken over the next decade to promote climate-resilient and sustainable solutions? Examples include infrastructure decisions, planning decisions, surveillance and monitoring programs, others.
3. What knowledge gaps need to be filled to assess the costs, effectiveness, and barriers to implementation of these solutions?

#### **Questions relating to assessing knowledge:**

1. How can case-based and place-based analyses be assessed to inform regional and national decision-making?

## **Task Group 2 SOLUTIONS**

**How can the AR6 catalyze research and assessment to inform the solution space?**

**SC conveners:** Debra Roberts, Claire Weill

**Co-chairs:** Joyashree Roy, Benjamin Preston

**Co-rapporteurs:** Penny Urquhart

Poorly designed mitigation policies could impact development pathways in a way that reduces the adaptive capacity of ecosystems, economies and societies by, for example slowing poverty alleviation or energy access increasing the negative impact of climate (Hallegatte *et al Nature Climate Change* 2016). Growing investments in adaptation and mitigation policies and programs allow researchers to measure the effectiveness of possible solutions, and quantify the costs, benefits, trade-offs, and residual damages to inform implementation of the Paris Agreement. Using the risk-based framing agreed in task group 1, this task group will identify key knowledge gaps that can be filled for the AR6 to catalyse research and better inform assessment of solution options.

### **Questions relating to research gaps:**

1. What are the key knowledge gaps and needs for assessing local and regional solution options related to changes in weather and climate (mean and extreme)?
2. How to consider the geographic and temporal trade-offs between adaptation and mitigation?
3. How to increase the coherence and consistency of research on risks and solutions, particularly for low- and middle-income countries?

### **Questions relating to assessing knowledge:**

1. What are helpful approaches to synthesizing and assessing case-based and place-based analyses to reach general conclusions?

## **Task Group 3 REGIONAL**

**Sharing and integrating knowledge on risks and solution strategies across local to global scales;**

**SC conveners:** Shobhakar Dhakal, Carolina Vera

**Co-chairs:** Mark Stafford-Smith, Mercedes Bustamante

**Co-rapporteurs:** Sabine Fuss and TBC

All regions have now begun to initiate climate adaptation strategies to manage risk. Adaptation experience is accumulating across regions and in the public and private sector and there is a new emphasis on sharing knowledge and practice. Local government and the private sector are increasingly recognized as critical to progress in adaptation and risk reduction, given their roles in scaling up adaptation of communities, households and civil society and in managing risk information and financing (IPCC AR5). However, adaptation options to date emphasize incremental adjustments rather than transformative approaches to enhancing resilience (IPCC AR5). Most assessments of adaptation have been restricted to impacts, vulnerability and adaptation planning. However, very few assessments have analysed the processes of implementation or the effects of adaptation actions.

On the mitigation side, there has been a considerable increase in national and subnational climate mitigation plans and strategies in the last decade. In 2012, 67% of global GHG emissions were subject to national legislation or strategies versus 45% in 2007. Sector-specific policies have been more widely used than economy-wide policies (AR5) with important implications for implementation of mitigation solutions. However, gaps remain in sharing and integrating mitigation knowledge and solutions.

### **Questions relating to research gaps:**

1. How are adaptation and mitigation solutions scaling and how are they assessed?  
Which solutions scale rapidly and why?
2. What are the opportunities to spread national and regional risk across global financial markets?
3. An integrated response to urbanization provides substantial opportunities for enhanced resilience, reduced emissions and sustainable development (IPCC AR5).  
What are the research gaps to support regional strategies and pathways for sustainable urbanization?

### **Questions relating to assessing knowledge:**

1. How can AR6 improve accommodation of regional, national and sub-national risks?
2. How can IPCC assess the process of implementation of adaptation and mitigation solutions against resilience criteria?
3. How can IPCC assess key regional cross-cutting issues, such as mountains, urban areas (including mega-cities), coastal zones, least developed countries, amongst others?
4. How can IPCC share, harmonize and integrate such regionally cross-cutting issues consistently across WGs for better addressing climate risks?

## **Task Group 4 SCENARIOS**

### **Developing consistent climate and development scenarios across the IPCC WGs**

**SC conveners:** Jean-Francois Soussana, Ramon Pichs Madruga, Kristie Ebi

**Chair:** Jiahua Pan, Tom Kram

**Rapporteur:** Piers Forster and TBC

Informing risk adaptation requires a detailed understanding of regional and local consequences of climate change scenarios in the context of contrasted socio-economic pathways (SSPs). An important achievement could be new approaches to the assessment of risks within integrated assessment models. For instance, how to test extreme climate event impacts and assess how SSP mitigation scenarios would modify risks levels in a number of different sectors. We also need to pay attention to risks, adaptation and vulnerability in climate stabilization scenario assessments, e.g. for the 1.5°C global warming target. This group will be charged of discussing how aggregated risk values & vulnerability assessments can be considered when framing scenarios.

### **Questions relating to research gaps:**

1. How to improve methodologies on data treatment and analysis to boost scientific progress (e.g. how different scenarios modify risk assessments)
2. How to develop synergies with other global scenarios studies (IPBES, GEO-UNEP, and others)
3. How to address the lack of capacity in many developing countries for climate & development scenarios building.
4. How do scenarios treat uncertainties and negative emissions solutions?
5. Do scenarios inform policy and how can they be used as more effective tools for informing policy?

**Questions relating to assessment of knowledge:**

1. How to improve the elaboration of integrated assessments for the full assessment reports, given that so far the three IPCC WGs work rather independently, which limits the integration of the scenarios?
2. How to improve inter-working group integration regarding scenarios assessments?
3. How to better implement the catalyzing role of the IPCC regarding emissions and socioeconomic scenarios?

## **Task Group 5 RISK**

**How to consistently characterize, quantify and visualize risk and uncertainty across IPCC WGs?**

**SC conveners: Johan Rockström, Thorsten Kiefer**

**Co-chairs: Asun St. Clair and Linda Mearns,**

**Co-rapporteurs: Sarah Cornell (TBC) and TBC**

The IPCC's characterization of risk is critically important to policy makers, economists and business leaders and warrants particular analysis and scrutiny given the high societal and economic stakes. Climate risks cut across all IPCC working groups and function as integrating dimensions of climate assessments. Moreover, in the Anthropocene, climate risks are interconnected to other risks relating for health, economic development and ecological impact. These risks cross scales from local to global. Climate risk management must also incorporate understanding of interactions and feedbacks between climate and Earth system processes, and the risks of crossing thresholds resulting in abrupt and irreversible climate change, as well as complex social-ecological risks, such as the potential interplay between geopolitical instability and climate induced volatility (e.g., on food markets). Meaningful assessment requires an integrated approach to risk analysis and assessment. Solutions to reduce risk must also be cognizant of interconnectivity and resilience approaches to managing risk.

This Task Group will take an integrated approach to climate risk assessment, addressing analytical gaps in risks assessment in the IPCC, as well as definitions of climate risk and methodologies for integrated risk assessment.

### **Questions relating to research gaps:**

IPCC AR5 states that some climate change risks and impacts are measured using aggregate economic indicators, such as gross domestic product (GDP) or aggregate income. Estimates, however, are partial and affected by important conceptual and empirical limitations. A significant priority is to explore, assess and improve conceptual and empirical limitations to addressing risk.

Many economic estimates related to climate risk do not account for the possibility of large-scale singular events and irreversibility, tipping points and other important factors, especially those that are difficult to monetize, such as loss of biodiversity. A more complete understanding of the costs related to these risks is required urgently.

Risk is closely associated with human perceptions and behavior, as well as uncertainties. How can perception change to more accurately reflect the scientific understanding of climate risks? And how can communication of risk and uncertainty, including visual tools, enhance understanding of risk.

What are the key knowledge gaps related to understanding risks related to non-linearities and tipping elements in the Earth system? How can current societies value long-term Earth-system resilience? (Discount rates affect risk perception)

What are the risks related to the resilience of existing carbon sinks?

### **Questions related to assessing knowledge:**

How can AR6 improve further the integration of climate tipping elements and the risk of irreversible climate changes?

Is there a generic risk definition that can be used across all IPCC WGs in AR6? And how can recent analysis of risk perception inform IPCC approaches to developing risk frameworks and uncertainty frameworks.

How can AR6 improve the understanding of social and economic climate risks at different resolutions, and for different economic sectors?

How can climate risk analyses be better attributed in mitigation and adaptation studies?

Should AR6 consider a new climate risk framework to improve its communication of low probability/high impact events (fat tail occurrences)?

\*\*\*



## **Scientific Committee**

Shobhakar DHAKAL, Asian Institute of Technology, Thailand  
Kristie EBI, School of Public Health, University of Washington, USA (co-chair)  
Corinne LE QUÉRÉ, Tyndall Centre, University of East Anglia, UK  
Ramon PICHS-MADRUGA, IPCC WGIII Vice-Chair, Centre for World Economy Studies,  
University of Havana, Cuba  
Debra ROBERTS, IPCC WGII Co-Chair, Environmental Planning and Climate  
Protection Department, eThekweni Municipality, Durban, South Africa  
Johan ROCKSTRÖM, Stockholm Resilience Centre, Sweden (co-chair)  
Jean-François SOUSSANA, National Institute for Agricultural Research (INRA), France  
Carolina VERA, IPCC WGI Vice-Chair, Center for Atmosphere and Ocean Sciences,  
University of Buenos Aires, Argentina

*With support from:* Thorster KIEFER and Claire WEILL, Future Earth Secretariat

## **Organising Committee**

Wendy BROADGATE, Future Earth Secretariat (chair)  
Thorsten KIEFER, Future Earth Secretariat  
Shongwe Mxolisi, IPCC Secretariat  
Rebecca OLIVER, Future Earth Secretariat  
Melinda TIGNOR, IPCC WGII Technical Support Unit  
Claire WEILL, Future Earth Secretariat

## **Financial Support**

The workshop organisers greatly acknowledge financial support from the IPCC, Stockholm Business Region and the Swedish Foundation for Strategic Environmental Research (Mistra). WCRP and self-funded participants are also acknowledged for travel support.