

FIFTH ASSESSMENT REPORT

Concept notes on Cross-Cutting issues¹

Consistent Evaluation of Uncertainties and Risks (CCM)

Background and scope

The quality of the uncertainty guidance notes for AR4 was recognized, but it was noted that their application has been uneven across and within Working Groups. Aspects of risks have not been treated consistently among Working Groups.

Further, the increased awareness and concern of policy makers regarding low-probability, high-consequence events, and the increased interest in risk assessment and risk management was recognized, even though these concepts are understood differently in different disciplines and Working Groups.

The overarching goal of refining and conveying consistent information on uncertainty and risk is to serve as a useful input for decision making on climate change.

Working Group involvement

All three Working Groups are and should continue to be involved, with the Co-Chairs of the Working Groups taking the lead.

Suggested approach

- The Working Group Co-Chairs to discuss their needs for guidance in the area of risk and uncertainty, and engage a process for updating and extending the existing guidance prior to the first LA meeting of each Working Group;
- The distinction between likelihood and confidence and the use of the confidence scale needs to be further clarified;
- The guidance paper to include a discussion of the meaning and significance of risk, specifically to address the treatment of low-probability, high-consequence events;
- Concerning risk assessment and risk management, to use a common language among Working Groups and Special Reports, without being prescriptive regarding its application;
- Once authors have been designated, for each Working Group to designate a small group of authors in order to ensure communication, coordination, and consistency of this issue across Working Groups and throughout the assessment process;
- Early on in the guidance development process, to use concrete case studies to test the approach recommended to deal with uncertainty and risk.

¹ Cross-Cutting Methodology (CCM)
Cross-Cutting Theme (CCT)

Costing and Economic Analysis (CCM)

Background

Economic analysis has been widely applied across the climate change domain – analyses of the economic cost of climate-related damages, the costs and benefits of mitigation options, the costs and benefits of adaptation options, the economic implications of policy design and instrument choice, the economic consequences of alternative architectures for international treaties on climate policy, and the economics of decision-making under uncertainty are primary examples. Past IPCC Reports have assessed these analyses, and this tradition will continue in the AR5.

Scope

The application of common economic fundamentals and measurement processes to analyses of adaptation and mitigation depends on the constraints that define their context. Even though these analyses accommodate enormous diversity in context, common fundamentals suggest that common criteria can be applied in the assessment of the resulting disparate literature. The point is not to decide whether the underlying analytical approach of any specific study is right or wrong; it is, instead, to judge the degree to which its specific application recognizes, to the extent practicable, elements that have played critical roles in driving results in one direction or another. The scope of this CCM would also comprise matters related to finance and investment.

Working Group Involvement Coverage

Costing and economic analysis will permeate the work of Working Groups II and III. Exploiting common language and common fundamentals should help in making the confidence assessments of economic conclusions that will be offered in both Reports more comparable and more transparent than in the past.

Suggested Approach

An Expert Meeting is proposed to assist authors in conducting their upcoming work. The expert meeting will not conduct a comprehensive assessment of literatures involved. It will, instead, work to incorporate a diverse set of views and to suggest how assessment frameworks can be created so that confidence levels drawn from economic analyses of all types can be more comparable. If the Meeting were scheduled after the author teams had been assembled but before the writing had begun, Lead Authors who will be responsible for the economic and valuation parts of the various chapters in both Working Groups could attend, participate, and begin the collaborative relationships that will, themselves, facilitate integration. The Expert Meeting should produce a volume that contains invited papers, discussant comments, and summaries of subsequent audience discussions. A Guidance Paper could then be created based on the content of the Meeting Report and other documents. This Paper would be designed to promote quality in the assessment of economic literature included across the various chapters of Working Groups II and III as well as consistency in judgments of quality across multiple chapters and both Working Groups. Elements of the guidance paper might even be incorporated into the both Working Group contributions to the AR5.

Regional Aspects (CCM)

Background and Scope

At its 30th Session held in Antalya, Turkey, in April 2009, the IPCC decided that much greater attention was required to improve the treatment of regional issues in AR5. The scoping meeting was also tasked to consider options for a more detailed regional division. The Scoping meeting took note of the following documents: the guidance paper on regional issues prepared for AR4, the report of the Task Group on the Future of IPCC (IPCC-XXX/Doc. 10), the draft report of the 30th session of the IPCC, the compromise proposal on the improved treatment of regional information in AR5 (AR5-SCOP/INF.3), and a document titled "Consideration of regional division for the IPCC AR5" prepared by the IPCC Secretariat for this meeting.

Reflection of Regional Information in the AR5 Working Groups

In order to improve the treatment of regional information in AR5, for the benefit of all users of the AR5 reports, it is suggested that the WGII contribution is split in two parts, completed at the same time and subject to a single review and SPM/TS approval process (There would be only one SPM and one TS, both included in each part, so that the overall context is present in each part.):

General title: *Vulnerability, Impacts, and Adaptation*

- Part A scope and subtitle: *"Global and sectoral aspects"*
- Part B scope and subtitle: *"Regional aspects"*. The cover for this Part would also mention: *"Contribution of IPCC WGII, incorporating inputs from IPCC Working Group I "The Physical Science Basis" and Working Group III "Mitigation of Climate Change"*

For further details see outline of the Working Group II report contained in IPCC-WG-II:9th /Doc.2.

To make this regional Part possible, a number of suggestions were made:

- Ensure consistency in the presentation and transfer of regional information on observed and projected climate changes (including changes in extreme events), future scenarios, and mitigation and adaptation issues between Working Groups I, II and III;
- Holding an IPCC Workshop or an Expert Meeting on Regional Aspects of Climate Change jointly between Working Groups I, II and III at an appropriate stage of the development of the AR5 would be very useful to help achieving this consistency, increase the knowledge base from region specific literature and promote mutual understanding around the regional aspects. One possibility is to organize it in conjunction with a TGICA meeting;
- As in AR4, make use of detailed case studies in specific regions ("hot spots") that focus on different aspects of the climate issue, often spanning different Working Groups;
- Offer mechanisms for making the most efficient use of regional expertise on chapters in different Working Groups requiring the transfer and presentation of regional information, e.g.: WGI and WGIII nominate authors who would be willing to review, from the outset, draft regional chapters in WGII; A small number of Lead Authors from one Working Group accustomed to working in an interdisciplinary perspective be nominated as "Attending" Contributing Authors for another Working Groups. At the invitation of the Co-Chairs they can attend relevant parts of LA meetings (they would be LA in one WG and CA in another WG);
- Make the draft texts of Part A of WGII available in a timely manner to WGIII so that WGIII can take into account the latest information available for integrated assessment. Similarly, timely exchanges of relevant draft texts between WGI and WGII will be useful.
- Promote the use of Geographical Information Systems (GIS) and Internet tools to present and communicate regional information both during AR5 preparation (for technical exchange) and after its completion (for outreach), and could possibly be aided by TGICA and DDC.

- Consider scheduling the WGII final plenary after both WGI and WGIII have completed their volumes. This would allow the WGI and WGIII material to be available in an approved form, and allow the WGI and WGIII author teams and TSUs to be able to contribute effectively with their material to the regional Part B of the WGII report. This would facilitate the effective contribution of WGIII to the regional WGII Part B, and the approval process of this Part B, so that WGIII-related material in WGII Part B can be founded on already approved WGIII material. This is particularly important given the number of WGII chapters.

Suggested approach for the division of the world into regions

For the division of the world into regions to be used in AR5 a number of different criteria, depending of the kind of analysis intended or the discipline concerned need to be considered, while noting that there is no regional division which can satisfy perfectly all needs. A number of principles were suggested, including: no area should be left out of the division, and the sum of the parts should cover the entire globe; a geographical approach is suggested to divide the world into regions, with additional sub-regional information as feasible.

Some of the advantages of such an approach are that it is easy to communicate and widely recognized, and that geography does not change fast. Users can easily know where they can find the information immediately relevant to them. Any other disaggregation (for example socio-economic) could be incorporated in those regions. This is also consistent with AR4.

A regional division and an indicative regional subdivision has been proposed for the regional Part B, but it is suggested that the regional subdivision be finalized by the chapter authors after the Workshop/Expert meeting suggested in section 7.2. For further details see outline of the Working Group II report contained in Section C.

Water and the Earth system: changes, impacts and responses (CCT)

Background

The title was changed from “*Hydrological cycle*” to “*Water and Earth system: changes, impacts and responses*” to better reflect the main interests of stakeholders. There needs to be more consistency among Working Groups and more involvement of WGIII on this topic.

Scope

The following outlines the main variables and activities that should be covered. These are broken into areas relevant to the three IPCC Working Groups. It is recommended that all three Working Groups undertake a synthesis of their components of this CCT.

Working Group involvement

WG I – There should be a comprehensive assessment of information available on variables related to the water cycle including observations, modeling capabilities, attribution of the changes to causes, predictions from daily to decadal time scales, projections of the longer term future, and an assessment of all of these for use by decision makers. Variables of particular interest include the following: precipitation; temperature; water vapor; extremes; runoff, river flow, discharge into the oceans; water storage, soil moisture, lakes, ground water; drought, evaporation; sea level; cryosphere changes; and air pollution. There is a need to use observations to evaluate models and factor these results into model projections, because there are still limitations in simulating precipitation. Simulation needs to be improved of the diurnal cycle, tropical storms, ENSO, and other phenomena. Down-scaling uncertainties need to be properly accounted. Issues include observational networks that are becoming degraded, especially for *in situ* observations, and the science on the attribution of changes to variables beyond temperature should be advanced.

WG II – Stakeholder needs should be addressed by:

- *defining the main drivers of change.* In addition to changes in climatic variables, non-climatic drivers include increasing population and water demand, economic development, urbanization; changing diet and lifestyle; and governance on water.
- *addressing fresh water issues on regional scales through observations, attribution, predictions and projections of impacts on the following:* resources; agriculture, food security, fisheries; human well-being, security; desertification, erosion; built environment; infrastructure; ecosystems; sea level; lake storage, ground water, frozen ground; snow cover, glaciers and ice caps, river and lake ice; rivers; trans-boundary aquifers (relationships between ground and surface water, aquifer recharge); extreme frequency and intensity; water quality; virtual water.
- *identifying vulnerabilities of fresh water systems.*
- *addressing coping strategies and responses* including short and long term adaptation.
- *addressing sustainable development.*

WG III - Water and climate change mitigation issues include:

- low carbon energy: bioenergy, biofuels (use of water, added pollution); nuclear power (cooling); hydro power; co-benefits and tradeoffs; side effects of solar, wind, etc.
- land use change: sequestration of carbon; fires.
- infrastructure: energy/water efficiency, energy recovery; technology;
- potential changes in precipitation and water quality with some geoengineering options
- questions exist on whether CCS would have side effects
- non-conventional water: (desalination, etc.).

Suggested approach

Working Group II should have the lead in addressing this CCT, but all three Working Groups need to be included. All Working Groups should recognize the need for a water cycle theme and provide appropriate insights, including on regions and extremes. There is a need to ensure exchange of information and coordination of information among the three Working Groups and accomplish the coordination among Working Groups. The most appropriate and effective way of doing this would be developed by the Co-Chairs (e.g. designated contributing authors). Links should be established with other activities including the special report on extreme events, the CCT on regions, and the planned "*Human Settlement and Infrastructure*" expert meeting; and water related extreme events should be taken into account at the proper level in each chapter. It is not expected that a new Technical Paper would come from this activity.

Carbon Cycle including ocean acidification (CCT)

Background

The carbon cycle is a central component of the Earth system. It integrates multiple forcings, responses and feedbacks related to climate change over a range of different time-scales, concerns additional biogeochemical cycles and is therefore a theme of paramount importance for all Working Groups of the AR5, as well as for the Synthesis Report. Since the completion of the IPCC-TAR, ocean acidification has been identified as a further critical and direct consequence of increasing atmospheric GHG concentrations – a full assessment of it will have to be presented by AR5. Multiple types of active management of the carbon cycle are now envisaged by many governments. Given the emergence of substantial new scientific literature on these themes, it is recommended that all the issues described in this document are reviewed and updated by all AR5 WGs, and that a mechanism is put in place to ensure this coverage, as well as ensuring the avoidance of inconsistencies between different sections of the assessment.

Scope

- Major *issues* concerning CO₂, CH₄ and N₂O including ocean acidification, feedback mechanisms between biogeochemical cycles and climate, and aspects of land use and land management including competition between bioenergy and food production, etc;
- *process* knowledge including direct CO₂ effects ('fertilization') on physiology and functioning of land ecosystems, variability of carbon pools, ocean acidification, the marine biological pump, nutrient interactions with terrestrial and marine carbon dynamics, interactions among CO₂ effects, climate, and other stressors, carbon feedbacks from land/ocean ecosystems to climate;
- *knowledge of past dynamics* of biogeochemical cycles, ocean pH, anthropogenic GHG emissions, including budgets of CO₂, CH₄, N₂O, DIC and other quantities;
- *present day budgets* with improved attribution to different sources and sinks;
- *projections* of atmospheric CO₂, other GHGs and ocean pH including of relevant feedbacks, the longer-term (beyond 2100) scope, and reversibility;
- sensitivity of major carbon pools to changes in climate, land use etc. including stratification by climate zones (land and ocean) and major regional case studies (coral reefs, Amazon forest, polar oceans);
- impacts of changing biogeochemistry on biological productivity, food web structure, biological resources, fisheries, crops, fibre, bioenergy;
- carbon management for mitigation, changes in energy systems with implications for biogeochemistry and climate, urban carbon metabolism, impacts from agroindustrial system development to GHG emissions from transport, packaging and distribution.
- It is likely that further issues related to global biogeochemistry and climate arise during the coming few years – these will have to be considered as well by the AR5 assessment.

Working Group involvement

An important role will likely be played by the WGI chapter on carbon cycle and other biogeochemical cycles: it should assess the full range of Earth system wide implications for climate change of changing biogeochemistry. WGII and WGIII should implement suitable sections to summarize this, as well as accounting for any outstanding issues as they are relevant for the respective WG.

Suggested approach

Coordination meetings (e.g., after completion of the zero-order draft from all WGs) may be held to ensure implementation of the goals stated above. No specific "product" is being envisaged, rather adequate coverage of biogeochemistry and ocean acidification issues across the AR5 are of high importance.

Ice Sheets and Sea-Level Rise (CCT)

Background

The potential significant contribution of the ice sheets to future sea-level rise has raised concern about the implications for adaptation and mitigation policy options. To build on the experience gained in the AR4, there is strong interest in ensuring good communication between all three Working Groups (WGs).

Scope

The focus of the cross-cutting theme was on sea-level rise and its implication for coastal zone and island adaptation and vulnerability. A particularly important focus was the heavily populated megadeltas. For understanding the adaptation issues, there is a need for scenarios of sea-level rise, including the upper and lower end of the range and not just the central estimates. The regional distribution of sea-level rise and trends in extreme events and surface waves (both amplitude and direction) were recognized as important issues. There are also potential implications for mitigation policy.

Working Group involvement

WGI and WG II (and potentially WG III) have strong interest in this cross-cutting theme. Leadership would depend on the appointment of lead authors but would naturally lie in either or both of WGI and WG II. A range of issues will be addressed in the appropriate WGI and WGII chapters.

Suggested approach

Mechanisms for ongoing communication across the Working Groups proposed were:

- exchange of outlines between WGI and WG II;
- video conferences between relevant lead authors. The IPCC budget may need to consider providing financial support to ensure adequate regional representation;
- explore the ability to use the IPCC Data Distribution Centre as a resource to facilitate inter-WG data exchange.

The Co-Chairs of WGI will propose to the Panel at its 31st Session an IPCC Workshop on Sea Level Rise and Ice Sheet Instability to be held in June 2010.

Joint lead authors or joint lead author meetings were not seen as essential. No need for a guidance paper or Technical Paper was identified.

There is a need to ensure optimum use is made of authors' time and to facilitate attendance and the communication of outcomes with Working Groups. IPCC Lead Author participation in the relevant workshops should be encouraged.

Mitigation, Adaptation and Sustainable Development (CCT)

Background

This cross-cutting theme was addressed in both WGII and WGIII of the IPCC Fourth Assessment Report (AR4). It addresses the ways that processes, responses and outcomes affect for individuals, communities, social-ecological systems, etc., which are experiencing climate change within the context of multiple, interacting stresses. The theme includes not only assessments of the economic, social and environmental costs and benefits of responses to climate change, but the human security implications for present and future generations.

Scope

This CCT can be considered an overarching framework for considering climate change impacts, adaptation, and vulnerability. Within the AR5, this theme involves identifying the linkages between adaptation and mitigation; and assessing the social, economic, and ecological consequences of adaptation and mitigation responses, evaluating implications for sustainable development, while at the same time highlighting the new challenges to sustainable development raised by climate change. Attention would be paid to all relevant sectors, technologies and practices including biodiversity, land use planning and development, lifestyle and behavioral changes and geo-engineering.

Working groups involved

The theme is very relevant to both WGII and WGIII, and to the SYR. There is a need to coordinate and integrate approaches and outputs among the chapters and groups.

Suggested approach

Questions that can be considered within assessments in both WGII and WGIII:

- How do climate change responses influence a wider transition to sustainability and resilience?
- How do adaptation and mitigation policies and strategies influence vulnerability and equity? What are the implications for sustainable development (SD)?
- What types of strategies and approaches to poverty reduction and disaster risk reduction contribute to mitigation, adaptation & SD?
- How does a “sustainable” development pathway influence adaptation and mitigation?
- What is the role of transversal sectors such as energy, transport, tourism, agriculture, and fisheries
- What types of approaches and tools are being used to evaluate costs and benefits, of adaptation and mitigation measures from the perspective of SD? (i.e., what are the “co-costs” and “co-benefits”?)
- Are the metrics and values that are being used to evaluate impacts and responses explicit and transparent?

The relationship and interactions among mitigation, adaptation & SD could be framed and discussed up front in WGII, WGIII and the SYR, and assessed in the concluding chapters or sections. The empirical evidence on the consequences of adaptation and mitigation policies including synergies and conflicts and strategies for SD could also be assessed in relevant chapters. Human and societal implications and significance for SD could be included in each sectoral and thematic chapter that discusses responses to climate change. Equity dimensions of climate change responses and implications for SD could be raised in the introductory chapters of both WGs and in the SYR. Finally, individual authors that take an integrated perspective could be included in key chapters in WGII, WGIII and the SYR, and there is a need for interactions and consultations among CLAs and LAs within and among WGII, WGIII and the SYR. Inputs for dealing with this theme would also be provided from the proposed expert meeting on “*Human Settlements and Infrastructure*”.

Issues related to Article 2 of the UNFCCC

Aim

The aim of this Cross Cutting Theme is to provide comprehensive and consistent scientific information in the AR5 that is relevant to and informs the consideration of Art. 2 of the UNFCCC, including key vulnerabilities and development.

Background

The United Nations Framework Convention on Climate Change (UNFCCC)'s Article 2 states: "The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."

Document IPCC-XXXI/Doc. 4 (*Scoping of the IPCC 5th Assessment Report – Background, Cross cutting issues and AR5 Synthesis Report*) addresses the treatment of Cross Cutting Themes in the AR5. Document IPCC-XXXI/INF.3 (*Scoping of the IPCC 5th Assessment Report Cross cutting issues – Previous IPCC work related to Article 2 of the UNFCCC*) provides further background on how previous IPCC reports have addressed issues related to Article 2 of the UNFCCC. Furthermore, Document AR5-SCOP/INF. 2 (*Treatment of Cross Cutting Themes (CCTs) in TAR and AR4, and Questionnaire Result*) provides an evaluation of the treatment of the cross-cutting issues in the Third Assessment Report (TAR) and the Fourth Assessment Report (AR4). The AR4 CCT "Key vulnerabilities (including issues relating to Article 2 of the UNFCCC)" was covered by this report.

The Expert Meeting on the Science to Address UNFCCC Article 2 including Key Vulnerabilities was held in Buenos Aires, Argentina in 2004 ("IPCC Expert Meeting on The Science to Address UNFCCC Article 2 including Key Vulnerabilities" Expert Meeting – Long and Short Report). The Expert Meeting considered how this issue could be incorporated in AR4, particularly for an integrated treatment of the subject across the three Working Groups.

Scope

This cross-cutting theme is to provide comprehensive and consistent scientific information, drawing from the assessments of the working groups in the AR5 that are relevant to and inform the consideration of Art.2 of the UNFCCC. The theme is very relevant to all working groups, and to the synthesis report. There is a need to coordinate approaches and outputs among the chapters and groups. An initial consideration of relevant material in each working group and the cross cutting issues is outlined in the following indicative list:

WGI

- Anthropogenic and natural radiative forcing; detection and attribution of climate change: from global to regional
- Near-term and long-term climate change projections, including sea level change and regional aspects
- Abrupt climate change, extremes and irreversible climate change
- Scenarios/stabilisation levels, including rate of change
- Other relevant issues

WGII

Related to different magnitudes and rates of climate change under stabilization and other scenarios, including regional aspects, information on:

- Emergent risks and key vulnerabilities
 - Aggregate impacts, thresholds, irreversible changes, and reasons for concern
- Natural and managed resources and systems, and their uses
- Food production systems and food security
- Human settlements, industry, and infrastructure
- Adaptation opportunities, constraints, and limits
- Adaptation planning and implementation
- Climate-resilient pathways: adaptation, mitigation, and sustainable development
- Other relevant issues

WGIII

- Integrated risk and uncertainty assessment of climate change response policies
- Drivers, trends and mitigation
- Climate stabilization: concepts, costs and implications for the macro-economy, sectors and technology portfolios, taking into account differences across regions
- Sustainable development and transformation pathways, taking into account differences across regions
- Integrating long and short-term perspectives
- Integrating technological and societal changes
- Social, economic and ethical concepts and methods
- International cooperation: agreements & instruments
- Regional development and cooperation
- National and sub-national policies and institutions
- Cross-cutting investment and finance issues
- Other relevant issues

There are a number of cross-cutting issues including:

- Linkages and feedbacks between and among: greenhouse gas emissions, atmospheric greenhouse gas concentrations, temperature increase, precipitation, ocean acidification, sea level rise, impacts, adaptation, mitigation and sustainability
- Consistent use of scenarios and treatment of uncertainties and risks throughout the three working group reports

Working group involvement

This CCT involves WGI, WGII and WGIII. All three working groups are asked to provide comprehensive and consistent scientific information pertaining to the consideration of Article 2 of the UNFCCC and to draw from their contributions to these issues.

Suggested approach

Due to the importance of this CCT, the relationship and interactions related to this cross cutting theme between and within the three working group reports should be discussed up front and in the Lead Author meetings of the WGI, WGII, WGIII and the SYR, and assessed in concluding chapters or sections. It is proposed that the indicative list of topics above could be further developed at the scoping meeting of the SYR in 2010 based on the approved scoping documents of the AR5.

It is proposed to arrange a Cross Working Group meeting early 2010. This meeting could provide further guidance including on the arrangement of an expert meeting on this Cross Cutting Theme. This group would prepare a progress report to inform subsequent lead author meetings and for further consideration by the panel at its 32nd session. The progress report would further provide recommendations from the cross working group on the arrangement of an expert meeting on this cross cutting theme.