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POLICY RELEVANT SCIENTIFIC TECHNICAL TOPICS TO BE ADDRESSED IN IPCC AR5

Compilation of submissions from Governments and Organizations

(Prepared by the IPCC Secretariat)

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Policy relevant scientific technical topics to be addressed in IPCC AR5

Barbados

submitted 29 May 09

The following responds to your correspondence of April 29, 2009 on the above referenced topic.

The Climate Change Convention (UNFCCC) and all of the prior reports of the IPCC have identified Small Island Developing States (SIDS) such as those in the Caribbean to be amongst the most vulnerable groups to the projected impacts of climate change. Indeed this statement is substantially valid when considered against the majority of environmental issues presently being addressed by the major Multilateral Environmental Agreements (MEAs). When all of these are considered together the full suite of projected impacts are both additive and synergistic and, at least intuitively, offers up a gloomy forecast for the long term viability of may SIDS as nation states.

With the seeming inability of the developed world to come to consensus on the scale of an emissions reduction response, the immediate issue and challenge to SIDS remains in adaptation to the climate change impacts that will materialize. Accordingly, the following topic is proposed for consideration as part of the AR5 report – " SIDS – the challenge of climate change adaptation and maintaining sustained economies". Questions that should be addressed and answered through this examination include:

- Given their environmental and economic vulnerability, a SIDS specific discourse on the additive and/or synergistic contributions of climate change to the environmental issues being addressed by other MEAs (e.g: biodiversity, desertification and drought, land degradation ….etc).
- An examination of existing economic models and assessment of their long term viability in the face of Climate Change. (e.g Can a country like Barbados anticipate having a tourism industry in the future, if so at what cost, if not, what transitional requirements should be contemplated now?)
- The challenge and capacity of SIDS to adapt to climate change.
- The challenge of the world community to either (a) sustain the existing economic models in SIDS, and/or (b) facilitate and support the development of alternative viable economic models.

This would be most beneficial if real data is used and based on a variety of economic models engaged by SIDS, rather than being generalist.

The risks and vulnerability of SIDS to climate change must move to the centre of the debate rather than being treated at the margins.

Belgium

30 May 09

We first would like to express our support for the issues that have been raised in the submissions to the IPCC Plenary 30 by Germany, United Kingdom and the European Community.
In addition we would like to draw attention on a few of issues that may see new developments or that we would like to see thoroughly analysed in the 5th Assessment Report in view of a better support to policy developments.

Part1 concerns general issues; part 2 contains more specifically a series of policy relevant questions from the Belgian climate-policymakers, in reply to requests by SBSTA and the IPCC chair. And finally part 3 is a copy of the letter, submitted during the Antalya Plenary, which focuses on issues raised by the Federal Council for Sustainable Development which is mainly made up by stakeholders.

In addition, II would like to inform you that our experts are currently preparing a document on the treatment of the regional aspects and the associated division of the report to feed the discussion in the AR5 scoping meeting in Venice. I hope this document will be completed before mid June.

Part 1: general issues

- **Assessment of regional climate change, impacts, adaptation and mitigation with an improved regional division**
    - As extensively discussed at the session XXX of the IPCC in Antalya, there is a broad support for improving the regional division used in the AR5. We fully agree that this report should include a new set of regions to be defined so that important features are homogeneous within each area, both climatically and socio-economically. The main features of climate vulnerability could then be described in a consistent way. For example, the formerly used “Asia” region is too large and to diverse, and consequently statements may become too generalised, with insufficient detail, so that a finer division would be more appropriate. The move may not imply a large increase in the total number of regions, as some changes could merely consist in a different grouping, such as for example the creation of a Mediterranean region.

    - More detailed suggestions will be provided in a document made available before the scoping meeting in Venice in view of helping discussions on this issue.

- **More attention to the climate projections in the structure of the WGI report**
    - Consideration of climate projections in WG1 report should be given more page space as compared to AR4, with a division of this issue in chapters that provides easy access to the content and improves readability.

- **Analysis of scenarios and associated storylines**
    - Assessment of climate change, impacts and mitigation on the basis of a consistent set of scenarios with associated storylines. Analyse the new scenarios in detail (including the new storylines), considering e.g. social and development aspects and the consistency with non-climate issues such as the Millennium Development Goals, sustainability, co-benefits of low emission scenarios, etc.

    - Investigation of the links between these storylines (population, society, development, economy, etc.) and costs (mitigation and adaptation with the associated non-climate effects, and damages) with a view to provide policy relevant information on how to these costs could be minimised.

    - Analysis of the research on how transition(s) towards societies that better deal with climate change issues (e.g. low carbon society,...) could be achieved, including consideration of institutional changes, equity issues, the design of multilateral agreements, etc.

    - Assessment of mitigation and adaptation policy measures in a policy relevant manner, with a comprehensive treatment of costs including climate and non-climate impacts as well as social and environmental issues and trade-offs (such as between bioenergy and food production). Analysis of the non-economic barriers to implementation and how these could be dealt with.

- **Climate forcing agents that are not covered by the Kyoto Protocol**
  - Identification of climate agents that are not yet included into the Kyoto Protocol but that have or may have a significant impact on climate (including related uncertainties).
  - Reduction of the uncertainties regarding agents with poorly known quantitative impacts on climate, in particular ozone precursors, sulphate aerosols and black carbon, with their regional effects and including cloudiness and rainfall changes.
  - Investigation of the sources and mitigation potentials for climate agents whose emissions have increased or may increase in the future, such as in particular NF3.
  - Discussion of mitigation options of these climate agents, including metrics required for trading schemes, as well as tradeoffs and co-benefits in connection with e.g. air quality and health.
- **Measuring the full climate impacts of aviation transport**
  - Reporting on the magnitude of future effects of aviation transport, including non-CO_2 climate agents (NO_x, contrails, induced cloudiness), and considering scenarios consistent with the other sectors.
  - Detailing possible metrics that could be used for reporting, emission reduction commitments and trading. For these metrics, provide values (per relevant unit of causal agent) that are very likely to be exceeded, and when possible, "best guesses". Consider in particular "multipliers" based on CO_2 emissions and computations of GWPs to link with existing trading schemes.
- **Treatment of uncertainties in models**
  - Improvement of the evaluation of model uncertainties (e.g. through broad consideration of sensitivity experiments). Evaluation of model quality with comprehensive metrics, so that higher weights can be associated to model variants that perform better. Further improvement of the assessment of model uncertainties, not only for physical climate models, but also for energy, economy and other types of models.
- **Climate change, climate variability and drylands**
  - Analysis of the vulnerability of arid and semi-arid regions, taking into account the interactions between climate change and variability, environmental vulnerability and human activities, and considering in particular the desertification processes. This is a very important issue, which was previously presented to the Panel for consideration as the topic of a Special Report (document IPCC-XXVII/INF. 3). Taking into account the number of issues for SR already proposed, we support an in-depth assessment of drylands issues as a specific theme in AR5.Improved quantification of risks.
- **Improved quantification of risks**
  - Whilst the more accurate quantification of probability is a strong feature of AR4, a better quantification of risk (i.e. probability * magnitude of impact) would improve policy relevance, as higher-impact lower-probability outcomes are just as important as lower-impact higher-probability outcomes.

Make sure that the research outcome provided by the international programmes (including ESSP, IGBP, WCRP, IHDP, FP7 (energy, environment, ...) in the coming years enters the IPCC assessment processs.

- **Climate change and the mesosphere**
    - What can we learn from observations with regard to the mesosphere / lower thermosphere? Could noctilucent clouds and polar mesospheric clouds be regarded as indicators of global climate change? Could the high atmosphere cooling have consequences in the troposphere?

- **Biogenic volatile organic compounds (BVOCs)**
    - Could emissions of BVOCs increase due to increased photosynthesis and growth rates following higher temperature and CO_2 concentrations, ultimately resulting in a cooling contribution from resulting aerosols?

Part 2: Specific policy questions and crosscutting issues provided by the Belgian Climate - Policymakers in reply of the request by SBSTA and the IPCC Chair

Given the magnitude of the mitigation and adaptation challenges, there is a perceived need for coherent and integrated scientific and policy (governance) thinking, frameworks and instruments. This need is translated into the following overarching policy questions:

What can scientific analyses contribute to what constitutes dangerous interference with the climate system"?

How can a "safe level" be defined?

- What are the risks for extreme events and abrupt/non-linear/irreversible/large scale events and feedback effects (in particular on carbon cycle) implied with a range of emissions scenarios, including ambitious mitigation scenarios?

- Is Ocean carbon uptake decreasing? What will the effects of ocean acidification be?

- Which scientific approaches, frameworks and integrated sets of instruments for mitigation policy (governance) are adequate to maximally enable Annex I countries to effectively, efficiently, timely, coherently, sustainably and equitably achieve the combination of mitigation objectives to maximally prevent the global community from:
    - o exceeding a global average atmospheric temperature rise of 2°C?
    - o causing irreversible climate change and ensuing / related impacts?
- Are the present strategies and policies regarding mitigation and adaptation delivering the intended results?
- How will fossil fuel production likely change over the next century? What effect will that have on climate change?
- Would any of the current proposed geoengineering strategies effectively and safely combat climate change? What potential consequences would they have (risk assessment)?
- How much adaptation do we need between now and around 2020, 2050 and 2100 in order to cope with 'inevitable' climate change?
- How to enhance employment and sustainable consumption and production patterns as well as the sustainable development in general while reducing GHG emissions?
- What are the costs implied with different scenarios and strategies/options for mitigation and adaptation?
- Could the IPPC work on scientific information on the transition pathways to low carbon economy and socio-economic aspects of climate change?
- What are the co-benefits of mitigation and adaptation measures?

Part 3: Issues raised by the (Belgian) Federal Council For Sustainable Development.

In view of gathering information from the stakeholders in support of development of the Fifth IPCC assessment report, the Minister for Science Policy, Mrs Sabine Laruelle, consulted the Belgian Federal Council for Sustainable Development (FCSD).
This is an advisory body that advises the federal authorities about sustainable development policies, at the federal government's and parliament's request, as well as on its own initiative.

In addition to its advisory duties the FCSD acts as a forum to encourage the sustainable development debate, for instance by means of organizing symposia. Experts in the area, representatives of government and civil society, and a wider public have the opportunity to explain their point of view and to dialogue. The Council makes use of the results when formulating advices. The Council was also given the task of sensitizing organizations and citizens on the subject of sustainable development.

The members of the FCSD represent various social organizations: environmental organizations, development organizations, consumers' unions, trade unions, employers' federations, energy producers and the world of science. Federal and regional government representatives and delegates of environmental and socio-economic advisory bodies only have an advisory voice in the meetings.

More on the FCSD (FRDO-CFDD) can be found on www.frdo-cfdd.be.
The FCSD was asked to give an opinion on:

1. Lessons from the previous IPCC assessments in view of enhancing processes and procedures to better meet the needs of the policymakers and the public at large.

2. Topics and policy relevant questions as guidance for the scoping meeting of the AR 5 and for the SYR.

3. Suggestions for the enhancement of the participation of developing countries in the assessment process.

Annexed you find the advice of the FCSD. This advice does not represent the official views of the Belgian government. However it includes a number of very useful and pertinent remarks and suggestions to be taken into account on one hand by policy makers in the different sectors and on the other hand in the next assessment cycle.
In this submission, we provide our interpretation of the advice of the FCSD in view of the AR5 assessment cycle.
We would regard as specifically valuable for the AR5 to consider:

- the risks resulting from climate change, with specific attention to “tipping points” past which the climate system may shift into potentially irreversible states with serious consequences for social, economic and natural systems;

- how societies can engage in a transition that addresses not only the environmental challenge of climate change, but also the resulting – among others – political, social and economic challenges in supporting a “Sustainable New Deal”. This implies a thorough assessment by IPCC of, among others:

    - institutional changes and their processes, such as for example the implications of the broad introduction of sustainable development objectives, including the transition to a low carbon society and adaptation to the unavoidable part of the change, into the agendas of international agencies like the WTO, World Bank and IMF

    - financial mechanisms

    - how to ensure the shift to a more sustainable economy and coordinate its funding

- the full range of global change scenarios with an in-depth analysis of the human, social, and economic context that is coherent with each of these scenarios, i.e. the “storylines” that describe the drivers of emissions and vulnerability to climate change. This would include, as appropriate, specific attention to
    - the economic impacts, including the effect of transition measures and consideration for the speed of change
    - the social ramifications of the changes, especially in terms of jobs and education policy
    - the social acceptability of the changes, in particular regarding the technological options and the potential for “backlash” effects if new policies are not well accepted
    - examples of changes in daily life that are consistent with a given scenario
    - how each scenario can (or cannot) be consistent with objectives not directly related to climate, such as the Millennium Development Goals
    - studies involving stakeholders. Local people and policy makers for example have valuable knowledge that must be captured. To facilitate integration of this knowledge, the IPCC may assess research gaps, and organize workshops on relevant issues, helping to structure the research community and build connections between researchers and stakeholders. This is particularly relevant for scenarios involving a transition towards a low carbon and sustainable economy/society/energy/agriculture
    - the different policy approaches (fore- versus backcasting, policy scenarios and packages, deterministic policy making versus reflexive governance, etc.) and different policy instruments for climate change mitigation (market mechanisms, taxation, investment incentives, regulation, information and education, etc.), taking into account, as appropriate, inputs from the Secretariat of the UN Framework Convention on Climate Change (UNFCCC), the World Bank and/or any other relevant specialized agency.
- possible ways to improve the international climate change negotiation process, considering how cooperation and collaboration in collective action could be favoured. This would, in particular, assess the research results international environmental negotiations, networking and game theory, as well as theories that analyze transition management and societal system innovations.

Outreach
More efforts could be done in order to provide stakeholders, including the general public, with easy access to summaries of IPCC work. In particular, we encourage the IPCC to look for ways it could help developing a booklet explaining tangible ways in which climate change can already be seen happening and highlighting what can be done in daily practice (possibly involving other UN agencies such as UNESCO).

Organisation of IPCC work
Recognizing the symbolic value of taking climate change into consideration in its own activities, we suggest that the IPCC makes efforts to reduce its own emissions, such as by greater use of teleconferencing, and offsetting.
We hope this information from the Belgian stakeholders is helpful for the fifth assessment cycle.

Canada
29 May 09

Working Group I lead

Question: What is the potential for slowing the rate of climate change, and reducing its impacts, through reductions in emissions of short-lived climate forcers (black carbon, methane, ozone)? (with WGIII)
Rationale: There is increasing interest in evaluating mitigation options for short-lived climate forcers such as black carbon aerosols and methane even though there is still considerable scientific uncertainty about the radiative forcing from these substances, and about how regional climates (e.g. the Arctic) may respond to reductions in their emissions. The net impact of reductions in aerosol emissions is of particular concern given that many sources emit both black carbon (a warming agent) and aerosols with climate cooling properties. Assessment of multi-gas mitigation scenarios that specifically address the extent to which including measures to reduce short-lived forcers are critical to meeting lower atmospheric temperature stabilization targets is needed.

Question: What are the upper limits on emissions of the various anthropogenic gases that impact on the climate system that would, with acceptable likelihood, allow global temperatures to stabilize below a fixed threshold such as 2C, 3C, or 4C above pre-industrial levels? (with WGIII)
Rationale: For the AR5, it would be useful if increased attention were given to mitigation scenarios aimed at stabilizing global temperature. Greater understanding is required of the cumulative emission limits that would, with high probability, restrict global temperature increases to specific thresholds, as is an assessment of the uncertainty around those emission limits. New information on carbon cycle feedbacks on the climate system, and on the persistence of CO_2 in the atmosphere will constrain these cumulative emission limits and may impact on the flexibility in the timing of emission reductions. Probability assessment of the likelihood of keeping below different temperature targets at different cumulative emission amounts would be informative for policy decisions. Finally, an assessment of the political and technological implications of having to attain a state of near zero anthropogenic emissions at some point in the future (once the allowable cumulative emissions amount has been used up) is required.

Question: Is climate change reversible on human timescales?
Rationale: There is some new evidence in the scientific literature which suggests that global average temperature, once elevated, could remain elevated for many human generations, even as atmospheric GHG concentrations decline. An assessment of how other aspects of the climate system respond to sustained elevated global temperature is critical to an understanding of what constitutes dangerous climate change. Among the issues worth exploring would be the persistence of changes in precipitation patterns, the likelihood of triggering irreversible melting of the polar ice sheets and the commitment to long term sea level rise, the loss of Arctic summer sea ice and the conversion of terrestrial carbon sinks to sources.

Question: Can tipping points or response thresholds in critical components of the climate system be identified?
Rationale: Examples of critical components of the climate system changes that have potentially strong positive feedbacks include permafrost regions with their large reservoirs of stored carbon (including methane hydrates), the Amazon rainforest, polar ice, both on sea and on land and the Atlantic meridional overturning circulation. A key question is whether or not we can avoid triggering irreversible changes in these systems by limiting global warming. Assessment of the sensitivity of such systems to changes in regional climate and the likelihood of such regional changes occurring under different global warming scenarios is needed. Also very useful would be identification of early warning indicators that might signal the approach of critical thresholds.

Question: What are the probabilities of sea-level changes of varying magnitude? Is it possible to reduce the uncertainty in projections of regional sea level rise?
Rationale: The AR4 assessment has come under repeated criticism for underestimating the potential for future sea-level rise. The most important aspect not adequately addressed in the AR4 is the potential for sea-level rise due to the ablation of glacial ice. Several other aspects also deserve enhanced treatment in the AR5, including the possible role of the heating of abyssal waters. The need for better regional projections of SLR is also paramount.

Question: How has our understanding of oceanic responses to increasing atmospheric concentrations of GHGs evolved since the last Assessment Report?
Rationale: Little literature was available at the time of the AR4 to support an assessment of the effects of ocean acidification but assessment of the growing literature base on this subject should be a priority for the AR5. It would also be useful to have further information on trends, mechanisms and underlying drivers of ocean circulation changes to generate improved predictions of future climate change impacts, both on land and in the oceans.

Question: What are the projected long-term changes in carbon stocks under various future warming scenarios? (with WGII and WGIII)
Rationale: The biosphere holds vast reserves of carbon in biomass and soils. A large fraction of this carbon was lost to the air by past land use change, but efforts are underway to reverse that trend. However, ongoing climate change and some adaptation and mitigation efforts (e.g. increasing use of biofuels) could jeopardize such efforts, creating a potential positive feedback on future climate change. To plan for such changes, and devise appropriate mitigative practices, it would be very useful to assess scenarios or projections of global carbon stocks over a 50 or 100 year period.

Working Group II lead

Question: How has understanding of the process of adaptation improved?
Rationale: WGII assessment reports to date have focused predominantly on issues of "what" - what are the projected impacts of climate change, what are key vulnerabilities, what is adaptation, and what are possible adaptation options? From a policy perspective, it is essential that the AR5 place stronger focus on issues of "how". There is now sufficient literature, based on the wide range of adaptation initiatives that have been undertaken, to focus on the process of adaptation. This involves understanding what constitutes enabling environments for adaptation, including consideration of social and institutional barriers. Discussion should address the relationship with development initiatives, the roles of international organizations, national and local governments, NGOs, and businesses / private sector, and implementation and absorptive capacity for financing. The issue should be addressed from both global and regional perspectives.

Topic: The role of market mechanisms, including insurance, in facilitating climate change adaptation.
Rationale: Building on analysis that will be necessary to complete the IPCC special report on Climate Extremes and Disasters, additional information is needed on innovative mechanisms to facilitate climate change adaptation at a range of spatial scales. Such assessment would also consider potential maladaptive outcomes. It would examine the cause of market failures such as the limited availability of insurance in most developing countries, and inform the development of programs and policies to stimulate greater involvement of the private sector in climate change adaptation.

Topic: Methodologies for costing and/or undertaking cost-benefit analysis of climate change adaptation.
Rationale: There is an ever increasing demand for economic information on climate change adaptation, ranging from estimates of global investments needed to meet adaptation needs to long-term cost/benefit analysis for local adaptation measures. Addressing this demand raises a number of methodological issues, including appropriate discount rates, non-market costs and dealing with low probability / high impact events. Assessment of existing methodologies,

highlighting strengths, limitations and areas of convergence, will help lead to greater comparability of cost estimates and greater acceptance of the outputs of such analysis.

Question: What are the strengths and limitations of the various indices that are available to assess relative vulnerability to climate change?
Rationale: International conventions and negotiating texts on climate change often refer (using a range of terms) to countries that are particularly vulnerable to the impacts of climate change. If priority attention is to be given to such countries, there will be a need to define them more precisely. While it should be a task of the UNFCCC to define which are priority countries, the IPCC could usefully inform that process by providing an objective assessment of existing vulnerability indices, identifying both value and limitations.

Topic: Human security, conflict and climate change
Rationale: There is a growing body of peer-reviewed literature that explores human security and conflict – climate change relationships. Policy demand for this information is evident from the efforts of a number of agencies and institutions who are interpreting findings of the AR4 through various security lenses. A chapter in AR5 WGII on Human Security and Climate Change would facilitate integration across a range of security themes (e.g. food, water, energy) and enhance understanding of how multiple stressors interact with climatic change and human security.

Question: What are the consequences of the rapid climate change observed in the Arctic for Arctic residents and ecosystems, and also for the global climate system? (with WGI)
Rationale: The rapid reduction in Arctic sea ice has had profound consequences for peoples and communities of the Arctic. The Polar Region chapter of the AR4 paid relatively little attention to the human dimension of Arctic changes. Some substantive research has been undertaken that has investigated both the impacts of this change on Arctic communities, how these communities are adapting to the changes, and what additional opportunities for adaptation exist. The Arctic is also host to critical feedback mechanisms that could lead to rapid climate change on global scales. An integrated - across WG - understanding of Arctic climate change and its implications would be extremely valuable.

<u>Working Group III lead</u>

Question: How are estimates of mitigation potential from agriculture and forestry activities affected by projected climate change and what are the relationships between adaptation and mitigation involving the land sectors? (with WGII)
Rationale: In the AR4, WGI II was able to provide some rough estimates of mitigation potential from agriculture and forests by region, indicating that an important contribution to global mitigation efforts is possible from these sectors. However, climate change will have significant impacts on land systems which in turn will impact the ability of agriculture and forestry to contribute. Understanding this is important for policy and planning around medium to long-term mitigation efforts. At the same time, there may be important synergies, trade-offs and complementarities between adaptation and mitigation activities in the land sectors that need to be identified.

Topic: Assessment of alternatives to the Global Warming Potential (GWP) metric of the potential warming effects of different greenhouse gases (with WGI and WGII)
Rationale: The IPCC recently convened an Expert Meeting (March 2009) to consider alternatives to GWP as a comparative metric of the potential warming effect of different greenhouse gases. Amongst other conclusions, the meeting determined that no single metric or time horizon for the evaluation of metrics would satisfy all policy requirements. It is therefore important that the IPCC further assess the characteristics of alternatives to the GWP, and that it considers the implications of the use of different types of metrics and/or time horizons in evaluating different mitigation options.

Topic: Comparison and evaluation of the results of Econometric/Integrated Assessment models.
Rationale: An evaluation of the results of such models was not done in the AR4 by WGIII except, briefly, in the Introduction. In the AR5, the robustness of new emission scenarios should be assessed. Alternative scenarios are required for how fossil fuel production is likely to change over the next century. Various concerns have been raised about the consequences that changes in fossil fuel availability and production might have on economic and technological development. Many of these discussions have occurred in the context of the 'peak oil' theory, though others have expressed the opinion that even global coal reserves are significantly smaller than most analyses assume. Scenarios involving a drive towards alternative liquid fuels (possibly including biofuels, coal-to-liquids, etc) and those that reflect advances in development of carbon capture and storage technology should be included among the possible emission pathways considered.

China
31 May 09

The Chinese government appreciates all the fruitful work done by IPCC since its establishment, and it thanks all scientists and staff involved in the preparation of previous assessment reports for their efforts. The Chinese government welcomes the opportunity and take it to make some comments on policy relevant scientific and technical issues regarding the IPCC Fifth Assessment Report (AR5), and China believes that the IPCC AR5 to be completed in 2014 would provide the international community with more comprehensive, in-depth and objective scientific information, which would support and promote the international community in taking policies and actions for climate change adaptation and mitigation.

From the view of the Chinese government, the IPCC assessment should insist on objective reflection of the status and findings in scientific research and development in various fields; provision of support to addressing policy-relevant issues in response to climate change; avoidance of interventions in those issues that should be settled only through negotiations between governments. At the same time, the IPCC should pay attention to clarifying the scientific basis of important conclusions (e.g. the total number of references used for drawing the major conclusions should be clearly indicated); reflecting regional objective status in the world in a comprehensive and balanced manner; expanding the data coverage; and providing policymakers with more comprehensive information, including robust findings, uncertainties and limitations, etc.

On this occasion, the Chinese government would also like to express its views on the regional issues: In order to maintain the continuity of IPCC assessments, so that the available findings from regional research can be better reflected in the fifth assessment process, we believe that AR5 should continue with the same regional divisions as in AR4, on basis of which the regions should be refined by taking into consideration the climatic characteristics and social conditions comprehensively, rather than re-defining or re-dividing regions.

As for the policy relevant scientific and technical issues concerning the IPCC AR5, the Chinese government believes that attention should be focused on the following aspects:

1. What is the trend of future global and regional climate change? Whether or not the more refined and more focused analyses and descriptions should be made available, including uncertainties therein?

2. What is the trend of the changing intensity and frequency of the future major extreme weather and climate events, and what are their impacts on developing countries?

3. Relevant observational data shows that the global average temperature has been on decreasing trend since 1998. How accurate are the global average temperature projections in previous IPCC Assessment Reports? What is the reason behind their differences with

observational facts? What is the sensitivity of global average temperature to the concentration of carbon dioxide?

4. Whether there is sufficient evidence that demonstrates the greenhouse gas stabilization at a certain (or several) concentration level (s) is dangerous? What is the scientific foundation on which this research evidence is based? What are the uncertainties of this evidence? What are the technical and economic feasibilities in achieving this level of stabilization?

5. How are countries, especially the developing countries, able to adapt to climate change? What are the adaptation measures that can be taken in agricultural production, water resources management, coastal zone, disaster prevention and risk management, etc. What are the costs, mechanisms and obstacles?

6. What are the costs of various emission reduction measures? What are the differences for countries at different stages of development and in different environmental conditions?

7. What is the distribution pattern of the low carbon technologies? What are the accessibility, transfer approaches, costs and obstacles of the low carbon technologies for developing countries?

8. What are the impacts of the production or consumption-based GHG emission accounting system on emission accounting of various countries?

Colombia
30 May 09

Spanish (English version below)
Por instrucciones del Punto de Contacto de Colombia para el IPCC doctora Yadir Salazar, Directora de Asuntos, Económicos Sociales y Ambientales Multilaterales del Ministerio de Relaciones Exteriores, enviamos los comentarios y observaciones de nuestro país al V Informe de Evaluación del IPCC:

1. sobre las tendencias recientes

- Nueva información (con menor incertidumbre) de las tendencias observadas en la temperatura, humedad del aire y precipitación. Es muy importante conocer cómo están cambiando los ciclos anual y diario de estos eventos, (**en especial en la alta montaña parte tropical**).
- Para diferentes aplicaciones es necesario saber que está pasando con la nubosidad y el viento (dirección y velocidad).
- Estudios más precisos sobre la frecuencia de eventos extremos (tanto meteorológicos como climáticos), incluyendo los vendavales y los eventos El Niño/La Niña.

2. Sobre el clima futuro

- Mejorar la información acerca de los cambios en la frecuencia de los ciclones tropicales. (Solo conocemos las tendencias)
- Mejorar en resolución espacial de los escenarios de cambio climático incluyendo las variables y aspectos del clima como estacionalidad y ciclo diario mencionados arriba.
- Mejorar la representación de los fenómenos extremos en los modelos y plantear los posibles cambios en la frecuencia de estos.
- Difundir ampliamente y de manera sencilla cuales son los factores forzantes y otros factores relevantes para la construcción de escenarios de cambio climático.
- Presentar consideraciones relativas a los elementos del sistema climático se están incluyendo en los modelos.

- Presentar análisis relacionados con la inclusión o no de las variaciones en la radiación solar que se prevén teniendo en cuenta los ciclos solares de largo plazo.
- Incluir análisis de la probabilidad de que ocurran otras condiciones climáticas (ej: mínimo en la radiación solar de mediados de siglo; enfriamiento en el hemisferio norte por el bloqueo de la corriente del golfo, etc), diferentes a los escenarios tradicionales (2xCO2, A1, B1, A2, B2).

3. Sobre los Impactos y Análisis de Vulnerabilidad

- Investigación y generación de conocimiento (datos) en temas asociados a la biodiversidad en escenarios de cambio climático, incluyendo en las discusiones la necesidad de realizar programas de monitoreo a mediano y largo plazo, incluyendo escalas regionales (locales) y macro cuencas:
    - Cambio de rango de especies: capacidad de migración de especies
    - Fisiología, tolerancia fisiológica
    - Diversidad genética y viabilidad poblacional de poblaciones de especie
    - Interacciones CC y cambio uso de suelo
    - Desarrollo de leyendas de mapeo compatibles entre países (vegetación y uso de suelos)
    - Dinámica de límites arbóreos históricos y actuales [en realidad para todo tipo de vegetación]
    - Modelos basados en tipos de suelos
    - Relación temperatura y acumulación de carbono, variabilidad y efectos de uso de suelos
- Fortalecimiento de la investigación en cuanto a ciclo de agua
- Fortalecimiento de las metodologías para elaborar planes de adaptación, las cuales deben presentarse de manera más detalladas para los países de la zona ecuatorial, sobre todo mirando las carencias en información básica.
- Metodologías detalladas para ecosistemas únicos o endémicos (Vulnerabilidad de los bosques al cambio climático, Fortalecimiento de las capacidades institucionales para el moldeamiento del ciclo del carbono en ecosistemas tropicales)

- Metodologías para realizar estudios de Costos y Beneficios económicos relacionados con la Adaptación al Cambio Climático y relaciones más precisas relacionadas con las relaciones Mitigación - Adaptación.

4. Sobre las Emisiones de GEI

- Relaciones con el Índice de Desarrollo Humano para que involucre de alguna medida el índice de emisiones de CO_2 y su posterior análisis de estas relaciones entre sus países emisores de algún forman verán su verdadera posición.
- Metodologías de reducción de incertidumbre de los modelos de estimación de emisiones del módulo LULUCF

Esperamos estos comentarios sea de utilidad y colaboren al adecuado desarrollo del informe. Mucho le agradecería acusar recibo de este mensaje.

(English translation)
Acting on the instructions of Colombia's IPCC Focal Point, Dr. Yadir Salazar, Director for Multilateral Economic, Social and Environmental Affairs, Ministry of External Relations, we attach our country's comments and observations with regard to the Fifth IPCC Assessment Report.

1. On recent trends

- New information (with less uncertainty) on tendencies observed with regard to temperature, atmospheric humidity and precipitation. It is very important to determine how the annual

and daily cycles of these events are changing **(especially in the high tropical mountains).**

- For various applications, it is necessary to determine what is happening in terms of clouds and wind (direction and velocity).
- More accurate studies on the frequency of extreme events (both meteorological and climate), including gales and El Niño/La Niña.

2. On future climate

- Improve information on changes in the frequency of tropical storms (all we know are the trends);
- Enhance the spatial resolution of climate change scenarios, including climate-related variables and aspects such as seasonality and the above-mentioned daily cycle;
- Improve the representation of extreme phenomena in models and suggest possible changes in their frequency;
- Disseminate widely and simply information on compelling factors and other relevant elements for the construction of climate change scenarios;
- Ensure that considerations relating to elements of the climate change system are included in models;
- Present analyses relating to the inclusion or exclusion of predicted variations in solar radiation, taking into account long-term solar cycles;
- Include analyses of the probability of the occurrence of other climate conditions (e.g. minimum solar radiation in mid-century; cooling in the northern hemisphere owing to the blocking of the Gulf Stream, etc.) that are different from traditional scenarios (2xC02, A1, B1, A2, B2).

3. On vulnerability impacts and assessments

- Research and generation of knowledge (data) concerning topics relating to biodiversity in climate change scenarios, including in the discussions the need for medium- to long-term monitoring programs, including regional (local) scales and macro basins:
    - Changes in the level of species: migration capacity of species;
    - Physiology, physiological tolerance;
    - Genetic diversity and populational viability of populations of species;
    - Interactions between climate change and changes in land use;
    - Development of map headings that are compatible between countries (vegetation and land use);
    - Dynamics of historic and present treelines [in relation for all types of vegetation];
    - Models based on land type;
    - Relationship between temperature and carbon accumulation, variability and land use effects;

- Intensification of research into the water cycle;
- Strengthening of methodologies for drawing up adjustment plans, which should be more detailed for countries in the equatorial zone, above all in view of the dearth of basic information;
- Detailed methodologies for unique or endemic ecosystems (vulnerability of forests to climate change, institutional capacity-building for modeling the carbon cycle in tropical ecosystems);

- Methodologies for conducting cost-benefit studies on adjustment to climate change and more precise information on the relationship between mitigation and adjustment.

4. On greenhouse gas emissions

- Correlation with the Human Development Index to include the index of C02 emissions and subsequent analysis for emitting countries with a view to showing their true ranking;
- Methodologies for reducing uncertainty in emission estimation models of the LULUCF module.

Czech Republic
01 June 09

Ten Proposed Policy Relevant Scientific Technical Topics to be addressed in the IPCC AR5

i. What are the risks for extreme events and feedback effects implied with a range of emissions scenarios, including ambitious mitigation scenarios?
ii. Would it be possible to reduce the uncertainty level of short-term regional climate projections?
iii. What are the options to manage inevitable climate change?
iv. What are the benefits, including co-benefits of mitigation measures and adaptation options?
v. What are the experiences gained so far with climate change strategies and policies?
vi. Do mitigation and adaptation strategies and policies maintain adequate and satisfactory results?
vii. Is stabilization of GHG emissions concentration on a very low level still feasible?
viii. What are the most appropriate instruments to evaluate the key IPCC AR5 findings from an economic point of view?
ix. What are the impacts of different peaking years (2030, 2040, 2050, etc.…) on different mitigation scenarios trajectories and technical feasibility of different scenarios?
x. What are expected costs of mitigation and adaptation measures in developed and developing countries for different scenarios?

Denmark
29 May 09

With reference to your letter of 29 April 2009, I hereby provide you with a consolidated view on topics of relevance for the scoping of the Fifth Assessment Report (AR5) and its Synthesis Report (SYR). We welcome this invitation to submit Danish views on scientific and technical topics, which are considered to be highly policy relevant at the time of publication of AR5.

There are three main topics to be included or strengthened in AR5 and its Synthesis Report, which could make these documents much more relevant in a policy-context. These are:

- Irreversible and non-linear processes such as the disintegration of Polar ice masses
- Global feedbacks and severe impacts from melting sea-ice, glaciers and permafrost
- The role of the oceans (incl. currents) in uptake and release of CO_2, heat and nutrients

Our experience from AR4 tells us, that in order to maximize policy relevance of the AR5, and strengthen cross-cutting issues, which are inherently challenging, it is of great importance to begin work on the synthesis report as early as possible, as this will ensure that the necessary information is available in the underlying working group reports. We thus suggest that scoping of the synthesis

report gets high priority at a very early stage, and we consider it preferable that the two first days of the scoping meeting in Venice in July 2009 are reserved for the scoping of the synthesis report and consideration of major questions and issues to be addressed in this report. This should facilitate and ensure enhanced collaboration across working groups throughout the whole AR5-cycle.

Experience from the AR4 also shows that consistency across working groups at the regional scale is a major challenge. The scheduled sequence between the AR5 WG reports which was decided at the 28th plenary gives the opportunity to improve the flow of information from the assessment of certain regional climate scenarios through their impacts to the socio-economic consequences. This should further be enhanced through the proposed early scoping of the synthesis report and implied focus on cross-cutting issues. The link from climate change to impacts and adaptation strategies is most visible at the regional scale, emphasizing the need for coordination between working groups I and II, and probably also WG III. For future policy needs it will be important to focus not only at the identification of major vulnerabilities, but also to assess the risks, many of which are of a local to regional nature, and which are often also related to extreme events and changes in climatic variability.

In addition and linking to these major issues, there are a number of evolving policy relevant scientific and technical issues, which should receive increased attention in the AR5. Some of these are issues related to emissions from land use changes and deforestation, emissions from ships and air traffic, the economics of climate change, such as assessments of adaptation costs and costs related to risks from abrupt climate change. Last but not least there is a need for the assessment of a well-defined portfolio of mitigation scenarios, not least low stabilization scenarios with a peak and decline (and even negative) emissions profiles.

Specific WG I priority issues:

- Palaeo-climatic analogues of non-linear climatic responses – including modelling
- Coupled climate system-biosphere modelling (including carbon, nutrients and other biogeochemical interactions) to assess greenhouse gas emissions from land use changes
- Assessment of internal variability of the oceans with a focus on decadal-multidecadal variability
- A larger focus on the role of the Greenland Ice sheet in the global climate system
- Assessment of Antarctica as part of the global climate system
- Post 2100 scenarios including assessment of natural large-scale dynamics on a longer time-scale
- Assessment of positive and negative aspects of various geo-engineering schemes
- Better treatment of uncertainty aspects, including better distinction between expert judgements and other methods used to assess uncertainty
- Natural carbon sinks, including oceanic processes linked to e.g. disappearing sea-ice
- Improve networking and links to WG II and III

Specific WG II priority issues:

- Continued focus on documentation of observed impacts of climate change
- Wider focus on impacts other than those related to projected temperature increase
- Stronger focus on the fact that changes in climatic extremes have large impacts
- Provide better estimates of needs for adaptation on a more detailed regional scale
- Include impacts from, vulnerability and adaptation to ocean acidification
- Improved and more systematic assessment of applied adaptation measures
- More focus on the need for adaptation to extreme events and natural variability
- Assess resilience – in particular wrt. tipping points/elements
- Describe transitory effects (adaptation processes)
- Assess costs of impacts and adaptation as well as costs of inaction

- Better handling of uncertainties of medium to long-term impacts
- More systematic approach to assess co-benefits of adaptation and mitigation
- Focus on the effects of land use changes on climate
- More coherent assessment of net effects of a changing hydrological cycle (drought – flooding in combination with sea-level rise)
- More focus on security aspects – migration – food security
- Interaction between effects in different sectors (e.g. water and land use)
- Temporal and spatial dynamics leading to more efficient adaptation

Specific WG III priority issues

- Assess options for fast reductions in global emissions:
  - IC and DC contribution in global stabilization scenarios, and assessment of mitigation options and costs
  - Experiences with the implementation of GHG emission reduction policies until now: Performance of instruments, costs, linkages to other policy areas
  - Implementation of mitigation policies by the private sector: Industry initiatives, CSR, voluntary actions, product standards
  - Development policies that integrate significant GHG emission reductions
  - Up-to-date assessment of low stabilization scenarios and pathways
- Detailed assessment of technical options:
  - Bioenergy, land use links, development issues (food security, land competition), other potential mitigation options, negative emissions
  - Renewable energy – ”winners” (biochar, solar, etc.)
  - Sectors: Agriculture, Forestry, Industry, Buildings, Transport
  - Cross sectoral issues e.g. transportation and electricity
  - Fuel prices
- Key methodological issues:
  - Cost concepts consistent across sectors and options
  - Adaptation and mitigation cost concepts
  - Uncertainty and costs, decision making
  - Discounting and uncertainty
  - Induced technological change
  - Behaviour (lifestyle changes including changes in emerging economies)
  - Drivers for change in developing countries, relationship to development pathways
  - Mechanisms that can give long term stable incentives for research and development and new technologies (fuels prices, climate policies etc)
- Realistic and specific representation of DC's in international models.

Please observe, that if all these views are accommodated during the scoping process, it will implicitly mean, that other less important topics or topics with less new development since AR4 and TAR will have to be reduced in size or removed from the AR5 as compared to the AR4. Some of these topics may depend on new research.

Finally, Denmark would appreciate very much, if the text of the SYR and the summaries for policy-makers could become simpler and less condensed in order to increase readability.

Dominican Republic

3 June 09

Spanish version (English translation below)

Pláceme saludarle, al mismo tiempo acusamos recibo de su comunicación citada en la referencia, invitándonos a someter tópicos científicos relevantes que debieran ser considerados en el quinto informe de evaluación (AR5) y su correspondiente reporte de síntesis sobre cambio climático, lo cual será tratado en la "scoping meeting" a celebrarse en Venecia, Italia el próximo 13 al 17 de Julio de los corrientes. A continuación tenemos a bien enviarle las siguientes observaciones:

1. Tener en cuenta escenarios posibles que, aunque de baja probabilidad de ocurrencia, pueden tener un gran impacto, en particular con los Pequeños Estados Insulares (SIDS) en desarrollo, tales como un aumento súbito del nivel del mar;
2. Tratamiento consistente de información regional, en particular lo que tiene que ver con los Pequeños Estados Insulares en desarrollo;
3. Evaluación de los impactos del cambio climático a diferentes niveles de proyección de aumento de la temperatura (por ejemplo +2 grados, +3 grados, +4 grados) e identificar los sectores y las regiones más vulnerables, en particular en las regiones donde no se tiene información, como los Pequeños Estados Insulares en desarrollo;
4. Tratamiento consistente de los temas relacionados a los eventos extremos;
5. Temas relacionados con el océano (acidificación de los océanos y servicios prestados por los ecosistemas marinos) y el aumento del nivel del mar;
6. Temas relacionados con la seguridad (nacional e internacional) y el cambio climático;
7. Impacto en las migraciones en los países y regiones;
8. Impactos específicos en los recursos acuíferos y medidas de adaptación;
9. Profundizar en los estudios que relacionan el aumento, en frecuencia e intensidad, de los ciclones;
10. Economía del cambio climático;
11. Necesidad de evaluar en detalle los costos de las medidas de adaptación, así como el costo de la inacción;
12. Cambio climático y salud;
13. Evaluación de medidas de mitigación, como la bioenergía, y como pueden impactar en el ciclo de carbono;
14. Relación entre pobreza y cambio climático; y
15. Preguntas más frecuentes.

(English translation)

I wish to convey greetings and acknowledge receipt of your above-mentioned communication, inviting us to submit relevant scientific topics that should be considered in the fifth assessment report (AR5) and the corresponding consolidated report on climate change, which will be dealt with at the scoping meeting due to take place in Venice, Italy from July 13 to 17. In this connection, we would like to suggest the following topics:

1. Consideration of possible scenarios which, even though they have a low probability of occurrence, can have a huge impact, especially on Small Island Developing States (SIDS), such as a sudden rise in sea level;

2. Consistent treatment of regional information, in particular information relating to Small Island Developing States;

3. Assessment of the impact of climate change on different forecasting levels for temperature increases (for example +2 degrees, +3 degrees, +4 degrees) and identification of the most vulnerable sectors and regions, particularly in areas for which there is no information, such as the Small Island Developing States;

4. Consistent treatment of topics relating to extreme events;

5. Topics relating to the ocean (acidification of the oceans and services provided by marine ecosystems) and rises in sea level;

6. Topics relating to security (national and international) and climate change

7. Impact on migration in countries and regions;

8. Specific impacts on aquifer resources and adjustment;

9. More research on the relationship between the increase in number, frequency and intensity of cyclones;

10. Economics of climate change;

11. Need for an in-depth analysis of the costs of adjustment, as well as the cost of inaction;

12. Climate change and health;

13. Evaluation of mitigation measures, such as bioenergy, and means of impacting the carbon cycle;

14. Link between poverty and climate change;

15. Frequently asked questions.

Ecuador

29 May 09

Spanish (English translation below)

En este contexto y dado que para dar las prioridades de investigación y desarrollo en Adaptación y Mitigación al Cambio Climático se debe considerar el Desarrollo y el aporte Científico-Tecnológico, así como considerar el grado y áreas vulnerables en el país en relación con el Cambio Climático así como con que instrumentos y actividades contamos para hacer verdaderos procesos de mitigación al cambio climático.

En el marco de lo señalado y como aporte del Ecuador para el documento del IPCC se sugiere considerar los siguientes procesos de investigación o desarrollo científico:

Adaptación y Mitigación:

- Relación entre políticas climáticas y desarrollo sostenible
- Profundizar en los indicadores socioeconómicos de América Latina y en especial de los países que conforman la Comunidad Andina

- Un estudio sobre las consecuencias socioeconómicas para los países en desarrollo de las medidas de respuesta tomadas por los Anexo I.

Biodiversidad y ecosistemas frágiles

- Evaluaciones de los impactos del Cambio Climático en la biodiversidad y ecosistemas frágiles de alta montaña como los páramos

El manejo de aguas subterráneas, el agua desde su nacimiento hasta su vertido considerándolo como un manejo integral de la cuenca:

- Cuencas altas revegetación, reforestación con especies nativas.- Investigación genética y formar banco de semillas con las mejores cualidades y suficiente cantidad, tanto de especies vegetales propias del lugar como de árboles y arbustos que protejan los suelos y mantengan la calidad y el volumen de los ríos en los páramos y en orillas de ríos.
- Biorremediación, recuperación de suelos y acuíferos con especies orgánicas elaboradas en recursos nacionales.

La seguridad alimentaria

- El manglar es un humedal de gran importancia para aves migratorias, como fragatas, flamingos, ganzos, pelícanos. Además cumplen con la función de desalinizar las aguas de mar y son el sostén de muchos microorganismos como moluscos etc, importantes para la seguridad alimentaria. Es necesario conocer como afecta los impactos del cambio climático en este tipo de ecosistemas.
- Mejora de la productividad por m2 de frutales, plantas medicinales y otros.
- Bancos de Germoplasma – banco de semillas mejoradas
- Nuevas alternativas de proteína.

Sector Agricultura y Forestal

- Aporte de las turberas y humedales andinos como sumideros de carbono
- Esfuerzos de los países de la región andina para la conservación de humedales
- Aporte científico internacional en la conservación de los humedales andinos
- Beneficios económicos por conservación de humedales y aporte a la reducción de emisiones de CO2
- Los bosques como receptores de CO2 y su aporte a la reducción de emisiones en los países de la región amazónica.

Sector energético

- Niveles de eficiencia energética en la industria hidrocarburífera de los países miembros de la Asociación Regional de Empresas de Petróleo y Gas Natural de América Latina y el Caribe.
- Reducción de la quema de Gas Natural asociado (reducción de CO2) y su uso para la elaboración de gas licuado de petróleo.
- Uso de energía solar como fuente de generación eléctrica en la producción y desarrollo de hidrocarburos.
- Gas natural comprimido para el transporte vehicular y reducción de emisiones.

(English translation)

In this context and given that the priorities for research and development on mitigation and adaptation to climate change should consider developing and providing scientific and technological, as well as consider the degree and vulnerable areas in the country in connection with Climate Change as well as tools and activities that we make real processes for mitigation climate change.

In the context of the above and Ecuador as input for the IPCC paper suggests considering the following processes or scientific research:

Adaptation and Mitigation:

- The relationship between climate policies and sustainable development
- To deepen the socio-economic indicators in Latin America and specially the countries that comprise the Andean Community
- A study on the socio-economic consequences for developing countries of response measures taken by Annex I.

Biodiversity and fragile ecosystems

- Evaluations of the impacts of climate change on biodiversity and fragile ecosystems of high mountain moorland
- The management of groundwater, water from birth until their discharge treating it as an integral management of the basin:
- Upper re-vegetation, reforestation with native species
- Genetic research and form the seed bank with the highest quality and sufficient quantity of both plant species to the site of trees and shrubs that protect soils and maintain the quality and volume of rivers in the mountains and river banks.
- Bioremediation, recovery of soils and groundwater with organic species produced in national resources.

Food safety

- The mangrove is an important wetland for migratory birds such as frigates, flamingos, geese, pelicans.
- Besides complying with the role of desalination of sea water and are the backbone of many micro-organisms such as mollusks etc, important for food security. It is necessary to know how it affects the impacts of climate change on these ecosystems.
- Improved productivity per m2 with fruit trees, medicinal plants and others.
- Germplasm banks
- Bank of improved seeds
- New alternatives for protein.
- Contribution of Andean peatlands and wetlands as carbon sinks
- Efforts of the Andean countries for the conservation of wetlands
- Provide scientific international wetland conservation Andean.
- Economic benets for wetland conservation and contribution to reducing CO2 emissions.

- Forests as CO2 receptors and their contribution to reducing emissions in countries of the Amazon Region.

Energy Sector

- Levels of energy efficiency in the oil industry in member countries of the Regional Association of Oil and Natural Gas in Latin America and the Caribbean.
- Reduce the burning of associated natural gas (CO2 reduction) and their use for the production of liquefied petroleum gas.
- Using solar energy as a source of electricity generation in the production and development of hydrocarbons.
- Compressed natural gas for transportation and vehicular emission reduction.

Finland

01 June 09

With reference to your letter of 29 April inviting governments to submit policy relevant scientific technical topics to be addressed in the Fifth Assessment Report and Synthesis Report we would like raise few topics and cross-cutting issues. This submission by the Finnish IPCC Focal point is based on a broad consultation with leading scientists in Finland as well as government representatives who represent users of the IPCC assessment reports.

The submission from Finland is structured according to the three IPCC Working Groups (WGs) and into cross-cutting issues. However, it should be noted that many of the topics have relevance to two or even three WGs. The author teams should consider which topics need to be written jointly with WGs in the AR5.

WG1

Aerosols

1. Aerosol direct and indirect effects form the largest scientific uncertainty in global radiative forcing. Quantification of anthropogenic and natural aerosol contributions to the Earth's radiative balance remains a challenge that need to be resolved in order to reduce the uncertainties. The formation of new particles in the atmosphere is a process that is known to occur over most land areas. Over the oceans, free tropospheric new particle formation may dominate over that occurring in the boundary layer. The gas-phase species triggering new particle formation may at least partially be different from those causing the growth of the particles to climatically active sizes. In order to clarify preindustrial and present-day contributions from new particle formation to atmospheric aerosol and CCN budgets, the relative roles of natural and anthropogenic precursors have to be understood.

Greenhouse gases

1. After apparently stable period methane concentrations increased again in 2007 and 2008 that raised much attention in media. It turned out that our tools and understanding are too limited to analyze sources and processes behind atmospheric methane concentration variations. We need better observations and modeling tools to estimate the effect of changing environmental conditions on methane concentrations. Special attention should be paid on emissions from wetlands, arctic lakes and methane hydrates.
2. Organic soils in boreal and arctic zones and some tropical areas contain vast amounts of organic carbon. These ecosystems are also the most important source of methane to the atmosphere. Moreover we lack reliable models of nitrous oxide production and emissions from organic soils. Human activity has changed ecosystems on peat soils dramatically in

vast areas in the boreal and tropical zones. Climate change will further modify functioning of these ecosystems and environment especially in permafrost regions. We need more studies on greenhouse gas balances on organic soils and how climate change and anthropogenic pressures alter them.

Seal level

1. The future rise of the global sea level due to melting of Antarctic and Greenland ice sheets is of paramount importance. The available estimates of the rise in the 1-3 meter scale seem to base on inadequate modelling using mainly statistical approaches. As the sea level rise may be the most threatening impact of the man-made climate change in timescales of 100 hundred years and longer, the physical and thermodynamic modelling of the development of major ice sheets should be given very high priority.

WG2

Land use and terrestrial carbon

1. A variety of different forest biomass fuels are currently used and are increasing in replacing the fossil ones. [[The more intense use of forest resources has consequences on the capacity of forests and forest soils to act as carbon sinks]]. There are large uncertainties in the climate change mitigation potentials of the biofuels. Life cycle analysis should be used in assessing these issues. AR 5 should provide analysis on these issues based on available research. IPCC should also address methodological issues and provide clear scientific guidance on how to take these issues into account in calculating and reporting national GHG emissions and removals.
2. The estimates of carbon pools and dynamics of carbon fluxes in terrestrial ecosystems vary due to different assessment methods that are used in different countries. To fully understand the carbon pools in forest ecosystems, critical evaluation of the data is needed in order to understand and to take into the account the variation in the accuracy of the estimates.

Forests

1. The role of worldwide deforestation in accelerating climate change is recognized. Due to its multifaceted socio-economic nature, the question of how to tackle the deforestation still remains and needs to be solved. New information on this issue is appearing that will be available for the IPCC AR5.
2. Climate change increases the risks of forest ecosystems to various damages. Biodiversity, genetic diversity questions are important since these strongly affect the ability of forests to resist, adapt and recover from biotic/abiotic stresses. New information has appeared since AR4 and should be used for updated synthesis and conclusions. Such analysis should also include issues such as resilience of forest ecosystems, as new information will be available of the means (such as forest management) that can be applied to improve resilience from various stresses.
3. Increasing use of biomass in bioenergy production may require more intensive use of forest resources. Critical assessment is needed to understand the consequences for sustainability of other ecosystems, like aquatic ecosystems.

Fresh waters

1. Numerous groups in the world have been working intensively with terrestrial and ocean carbon budgets/cycling for decades and these studies have been summarized in the past IPCC reports. Because freshwater ecosystems cover only a small fraction of the Earth's surface area (Downing et al. 2006), they have often been neglected as potentially important components in landscape energy or element cycles. However, recent studies have shown that lakes and rivers play a significant role in the transport, storage, and decay processes of the terrestrially fixed carbon not only regionally but also globally (Cole et al. 2007). As biogeochemically active sites lakes and rivers can exert thus a disproportionately large impact on carbon mass balances and cycling rates and should be included in the landscape C budgets. Spatially representative randomly selected Finnish lake data bases demonstrate

that lakes contribute significantly both to landscape C pools and fluxes and consequently to catchment C sequestration in the boreal zone. The annual CO_2 emission from Finnish lakes was estimated as 1.4 Tg C, approximately 20% of the average annual C accumulation in Finnish forest soils and tree biomass in the 1990s (Kortelainen et al. 2006).

2. Climate change scenarios predict increasing precipitation and temperature for Northern Europe, which can further significantly contribute to biogeochemical cycles. For example, methane emissions from lake littorals have been shown to increase with increasing temperature (Kankaala & Bergström 2004). Further, the total area of artificial lakes is growing, and they are even more efficient carbon sinks than natural lakes. Downing et al. (2008) estimated world's farm ponds alone to bury more organic carbon than the oceans and all manmade impoundments to bury presently four times more carbon as the world's oceans.

WG3

Field biomasses and food production

1. Climate change has profound impacts on field crop production in northern countries including Finland. It will extend the thermal growing season thereby offering new opportunities, but along with aggravated challenges of various kinds. Climate change impacts and risks differ according to crop species and types: some benefit more than others, while some crops may fall out of production. Even though crop production in Nordic countries is not merely going to benefit from climate warming, it is likely to play an increasingly important role in agricultural production within Europe, especially in contributing to compensation for the likely yield losses in more vulnerable agricultural regions of Southern Europe.
2. Field biomass production competes for available arable land with food and feed production sectors. To find a balance between these two main production forms, additional information is needed to better understand and to be able to quantify:
    - Yield potential enhancement of field biomass crops compared to food and feed crops as well as changes in potentials but also sustainability of production when crops are grown for multi-purposes (both biomass and food/feed) with recurrent and thorough biomass harvests
    - Quality risks in future climates when comparing food, feed and bioenergy crops
    - Adaptation options of food, feed and biomass crops compared to challenges caused by climate change
    - Regional and local centralisation potential of food and feed production, release of arable land from their production due to higher yielding capacities and “spontaneous” field availability to biomass crops
    - Impact of changes in use of arable land on GHG emissions, economics etc.

Economics of Climate Change

1. Uncertainties related to costs (or revenues) and effectiveness of climate change mitigation efforts should be reported quantitatively. More emphasis should be put on regional and sectoral differences in mitigation costs also.
2. Dynamics of investments and technological change should be more carefully studied. Mitigation of climate change would need large investments on energy supply and demand sides as well as infrastructures, which would require long lead time and new financing mechanisms for technology transfer. This is not in line with the scenario studies assuming global perfect markets. On the other hand, scenarios indicate that an urgent action would be needed.
3. Global and regional potentials of fossil, renewable, and nuclear energy sources need updating based on the most recent literature. The update should include both technical and sustainable potentials. Critical discussion would be needed especially on biomass potentials and their linkage to land use changes. Also, a discussion of the technical potentials of geologic CO_2 storage would be needed based on the most recent demonstration projects and literature.

4. There is a need for impact assessments of policy and management options regarding how to link terrestrial systems with carbon credit markets. Assessments should cover also problems in CDM like permanence, uncertainties, leakage, etc. These assessments should be made within a wide-range modeling approach covering other policy instruments as well.
5. Trade in the global markets: how to divide the costs of carbon dioxide emissions – who pays?

CROSS CUTTING ISSUES

Extreme events and their impacts

1. At the moment we can see a strong upsurge in efforts to better assess regional/local resilience in conjunction with extreme events happening in those regions. However to have a better grasp of the implications of extreme events we need cross-cutting analysis in two respects:
   - assessment of extreme events is usually done by category with limited or no consideration of interactions between categories of extreme events in terms of the resulting overall vulnerability and resilience of the region (next to extreme weather events this may include dramatic ecological changes due to CC); AR5 could contain an overview of work done in this field, as well as needs for methodological development, capacity building and practical advice tools for all kinds of users (see also next point on education); among others such a review can draw on the planned Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation.
   - an extreme event in one region will also impact other regions; neighbouring regions may be affected ecologically (e.g. polluted effluents) and economically (e.g. temporary and permanent resettlement, and demand surge effects on labour markets); yet, extreme events in one region can also strongly affect many regions abroad via (shocks in) trade relations, and major disturbances in logistic systems. An option would be to scan for studies that have assessed implications of extreme events through simulation of the propagation of the disturbances in the trade and logistic system (possibly in a world which is already under stress due to other CC phenomena).

Education and communication

1. AR5 may need greater engagement of scientists in the area educational analysis concerning different levels of education. What are the limitations to mitigation and adaptation that arise from deficiencies in education?
2. Effective mass communication and policy effectiveness. Up to now studies on communication and CC dealt primarily with awareness, views on own responsibility, capability and willingness to act, etc. Separate from that there have been surveys on policy instruments and packages. However, the communication aspect of implementation of mitigation and adaptation policy measures has received fairly little attention. The communication aspect can in this case be understood in two ways: (1) communicating the workings of a policy measure (tax, subsidy, norm, etc.) and (2) communication (monitoring - feedback - motivation/reward) as an instrument in its own right
3. The IPCC process has until now produced wide and comprehensive Assessment Reports with roughly 5-6 year intervals. Noting the timeliness of global climate negotiations for mitigation and adaptation, e.g. the UNFCCC COP process, and also the rapid production of new scientific results in the peer-reviewed literature, there is a clear need for limited special assessments on key areas with 1-2 year intervals.

References

Cole, J.J., Prairie, Y.T., Caraco, N.F., McDowell, W.H., Tranvik, L.J., Striegl, R.G., Duarte, C.M., Kortelainen, P.L., Downing, J.A., Middelburg, J. & Melack, J.M. 2007. Plumbing the global carbon cycle: Integrating inland waters into the terrestrial carbon budget. Ecosystems 10: 171-184.

Downing, J.A., Cole, J.J., Middelburg J.J., Striegl, R.G., Duarte, C.M., Kortelainen, P., Prairie, Y.T. & Laube, K.A. 2008. Sediment organic carbon burial in agriculturally eutrophic impoundments over the last century. Global Biogeochemical Cycles 22, GB1018, doi:10.1029/2006GB002854.

Downing, J.A., Prairie, Y.T., Cole, J.J., Duarte, C.M., Tranvik, L.J., Striegl, R.G., McDowell, W.H., Kortelainen, P., Caraco, N.F., Melack, J.M. & Middelburg J. 2006. The global abundance and distribution of lakes, ponds, and impoundments. Limnology and Oceanography 51 (5) 2388-2397.

Kankaala P. & Bergström I. 2004. Emission and oxidation of methane in Equisetum fluviatile stands growing on organic sediment and sand bottoms. Biogeochemistry 67: 21–37.

Kortelainen, P., Rantakari, M., Huttunen, J.T., Mattsson, T., Alm, J., Juutinen, S., Larmola, T., Silvola, J. & Martikainen, P.J. 2006. Sediment respiration and lake trophic state are important predictors of large CO_2 evasion from small boreal lakes. Global Change Biology 12: 1554-1567.

Germany

prepared for P-30, 15 April 09

Introduction

We would like to use this opportunity to submit our initial views on the policy questions and cross-cutting information we wish to be considered in the AR5 process in order to support the international climate policy process, in particular the UNFCCC process. This submission by the German IPCC Focal point also makes use of a broad consultation recently held with German scientists including AR4 authors, as well as users of IPCC products.

We would also like to refer to our submission from 18 February 2008 on our views on the future of the IPCC including its structure, work programme and main products, which already gave some general input in terms of the IPCC contribution to understanding and solving the problem of climate change and its impacts in the time available to avoid dangerous climate change and how this compares to the UNFCCC time scale.

Synthesis Report

We would like to highlight that the Synthesis Report, in our view, plays a crucial role in answering policy relevant questions, as many of these questions are by their nature cross-cutting in relation to the IPCC working groups. As we already pointed out in our submission from 18 February 2008, the process should be improved in order to have a stronger Synthesis Report. In particular, its preparation should start earlier. This has in principle been agreed by the IPCC in its 28th session in Budapest. Specifically, as we already pointed out, the Synthesis Report should be anchored right from the first scoping of the AR5 with guiding questions that are clear from the start for each WG.

We would therefore make two suggestions related to the process of scoping the AR5:

- The Scoping meeting in July should devote sufficient time to also scope the Synthesis Report and to identify specific issues that need to be addressed by the Working Group reports to be able to address the questions of the Synthesis Report. Lessons should be drawn from the experience with the TAR and AR4 in this regard.

- For the approval of the structure of the Working Group reports, the IPCC plenary should look at the draft structures approved by the individual Working Groups from the perspective of addressing the questions to be addressed by the Synthesis Report. By starting with the questions to be answered, the WG structure can be (re)designed to deal with these coherently in one WG or across WGs. It has to be emphasized that this is of course aimed solely at the structure of the WG reports for consistency's and comparability's sake, not at their contents or results.

This implies a somewhat iterative approach to approving the structure of the Synthesis Report, with an initial structure (identifying main questions and issues) that should be already approved by the Plenary and used in their deliberations to approve the individual Working Group reports.

It should also be ensured that the authors of the Synthesis report get a clear mandate to do a real synthesis – including producing new figures that truly synthesise the content of the Working Group reports – and not primarily a cut-and-paste exercise as happened in the AR4. In this regard, it is also important to improve the treatment of cross-cutting issues. One example could be crosscutting authors as has been proposed.

Policy Questions and Crosscutting Issues

From our point of view, many of the policy questions that need to be addressed by the AR5 are still the same as the ones addressed by the SYR of the TAR and the AR4, such as:

- What can scientific analysis contribute to what constitutes „dangerous interference with the climate system"? How can a "safe level" be defined?
- What is the evidence of past and observed climate change and its consequences?
- What are the risks for extreme events and abrupt/non-linear/irreversible/large scale events and feedback effects implied with a range of emissions scenarios, including ambitious mitigation scenarios?
- Which impacts of climate change/which risks can be avoided with a range of emissions scenarios and at short/mid- and long term timescales?
- What are potentials, options and strategies to achieve emissions reductions that avoid different level of climate change and serious impacts?
- What are the options to cope with unavoidable climate change?
- What are costs implied with different scenarios and strategies/options for mitigation and adaptation?
- What are the benefits, including co-benefits of mitigation and adaptation measures?
- What are the implications of uncertainty with regard to future developments in the context of an analysis of risks?
- What are the climate impacts as well as economic consequences of delaying action on climate change?

In addition, there are some new questions that the AR5 would need to address, as it would be published in 2014, that is, with a context of increasing experience with climate policies at national and international level:

- What are the experiences gained so far with climate policies and strategies?
- Are we on track regarding achievement of long-term goals that have been decided or proposed by the international community or by countries/groups of countries?
- Are strategies and policies regarding mitigation and adaptation delivering the intended results?
- What is the role of public and private financing in different climate policies and strategies?
- Is Stabilisation of GHG emissions concentration on a very low level still feasible?
- What are costs and appropriate strategies if one considers an imperfect world?
- What can be done in the short-, mid- and long term both on mitigation and on adaptation?
- What are opportunities and costs of several policy instruments?

Some of the key crosscutting aspects that need to be handled better in the AR5 include

- Consistent assessment of very low emissions mitigation scenarios (consistent with long-term targets being discussed in the UNFCCC negotiations), including their socioeconomic, technological and climate system and climate change impact implications over relevant time scales (many decades to centuries). Emission scenarios that keep global mean warming below 2 degree C with a higher probability need to be treated explicitly both from the standpoint of technologies and economics.
- a consistent assessment of risks at global, regional and local levels, in particular a consistent description and assessment of plausible scenarios with resulting high impact but low probability, such as rapid sea-level rise;

- evaluation and treatment of uncertainties, including assessment of policy implications of uncertainty;
- evaluation of the main findings from an economic point of view (economics of climate change);
- consistent treatment of regional information including that which may only be relevant to a few areas;
- consistent treatment related to extreme events;
- relationship between climate policies and sustainable development;
- relationship between climate policy and land use/land-use change;
- assessment of new technologies and their potential effects on other systems;
- a common language and understanding of how to approach risk and uncertainty across the WG report writing teams should be developed, e.g. by developing a cross cutting guidance document;
- findings in the SPMs should not be restricted to "high confidence" findings, as many findings can be highly relevant, even if they are uncertain, e.g. if they are related to high-impact events.

Greece
01 June 09

In replay of your letter 29.04.2009 concerning the submission of policy relevant scientific technical topics to be addressed in the Fifth Assessment Report and its Synthesis Report, I have the honor to present to you the issues that Greece would like to include:

- Future increases of greenhouse gas concentrations will contribute to the average cooling in the stratosphere. Chemical reaction rates in the atmosphere are dependent on temperature, and thus the concentration of ozone is sensitive to climate changes. Stratospheric cooling was observed during the past two decades. Further changes to the temperature and circulation of the stratosphere could affect climate and weather in the troposphere.
- In areas like in the Mediterranean region, where climate change may lead to significant reduction in precipitation, the water resources and more frequent heat waves with more intense urban ozone and aerosol pollution events, new scientific and policy challenges, have to be faced and revisited.
- Mediterranean vulnerable communities such as elder and children with chronic diseases as well as ecosystems may be among the most impacted by the destabilization of the climate system.
- Areas in which the synergy of extreme events amplifies the vulnerability of these places to climate change, should be identified and studied appropriately. Among these areas included are regions where natural and manmade disasters may appear in relatively close timing, which can amplify the effects to humans and the ecosystems of great socioeconomic importance. The Mediterranean and several parts in the tropics are included among these regions. Natural disasters include earthquakes, tsunamis, vulnerable to land slides and avalanches regions as well as drought and flooding regions. Most affected areas by global change are included in AR4 and in the foreseen AR5 but the synergy of manmade and natural effects is not.

Hungary
29 May 09

I. Views on general approach

- **I/1.** *Complex approach besides sectoral topics*. It is suggested that, beside the sectoral approach (i.e. mitigation, impacts and adaptation concerning agriculture, tourism, energy etc.) it would be important to address such complex or integrated areas as e.g.: integrated mitigation and adaptation in cities (settlements); agriculture, rural development and water management; climate change and migration etc.
- **I/2.** *Crosscutting aspects of mitigation and adaptation*. It is suggested that AR-5 make the next step towards integrating climate change mitigation and vulnerability/adaptation issues with each other and with sustainable development. This would be desirable both at the conceptual and assessment level as well as at the level of policy analysis (analysing implications of alternative strategies without being policy prescriptive). The AR-4 has made a major step relative to TAR in which mitigation-adaptation linkages were "hidden" in one section of Ch. 10 of WGIII. Devoting a chapter to mitigation-adaptation linkages (Ch. 18) and to adaptation-sustainability linkages (Ch. 20) in WGII and to mitigation-sustainability links (Ch. 12) in WGIII was successful as these chapters seem to be well received, especially by developing countries. However, there was not much link among these chapters. The establishment of the informal team to coordinate between WGII and WGIII produced only modest success.
- **I/3.** *Sustainable development*. One possible strategy for a better integration might be to commission the chapters linking sustainable development to adaptation (WGII) and mitigation (WGIII) with a harmonized outline and with partly overlapping writing teams. In addition to exploring the sustainable development linkages, they should also assess the vulnerability/adaptation implications of mitigation (in WGIII) and the mitigation implications of adaptation (in WGII). Accordingly, in addition to assessing the emerging literature in their domains, these writing teams should also have the mandate to track these linkages in all chapters of the given WG and synthesize the main insights for science and policy. The scope of these two chapters should range from the global integrated assessment models to national climate assessments and policies to the regional/local case studies and projects.
- **I/4.** *Better integration of the work on emission scenarios with AR5 assessment work.* The work on the report on emission scenarios should preferably be integrated with the early work on AR5, rather than simply passing on ready-made scenario results to AR5. This would allow to consistently discuss both the extent and the costs of mitigation possibilities. With this early cooperation both processes would benefit.

II. Concrete suggestions

- **II/1.** *Emissions analysis*. It would be ideal if the WGIII report of AR5 covered the breakdown of emissions in a new structure. The division by economic sectors was already extensively analyzed by AR4, and it is not necessarily the most ideal division since these are statistical categories used in economics, not reflecting well the typology or categories of emission „drivers". A possible division could be based on those human needs/services/activities that are responsible for the emissions at the end of the day (e.g. food, shelter/settlements, mobility, leisure, health and comfort, information/communication and entertainment, other). This would also facilitate a more thorough integration with the discussion on sustainable development and development pathways. Of course this also has its drawbacks, and we could support other alternative structures as well if they catch the underlying drivers of emissions in a more innovative way than economic statistical categories. Either way, it is crucial that a separate section is dedicated to nutrition, for if it „gets lost" among the several sectors it cuts across (agriculture, buildings, industry, transport, etc.), then we miss out on major mitigation options (e.g. partial switch from beef to poultry or a vegetal diet, and other trade-offs such as import vs. local but more energy-intensive greenhouse production, etc.). Apart from this, a section could also be dedicated to urban issues / settlement models; the role of infrastructure; another cross-

cutting theme that is a significant driver of emissions but is hard to address in a sectoral framework.

- **II/2.** *Importance of life cycle analysis*. As far as the literature base allows, it would be nice if AR5 attempted to dwell more upon life cycle analysis than on assessing mitigation options based on direct emissions only. Obviously, the literature on this is still in its infancy, but there has been much progress during the last couple of years.
- **II/3.** *Adaptation tools* It is suggested that AR5 would provide concrete tools for adaptation, such as: information exchange (clearing house) on the best practices in adaptation; evaluation methods of the national, sub-national, regional, municipal level adaptation strategies; tools for integration of adaptation into the sectoral and public policies (i.e. development policies, energy, transport, agriculture policies, water policies etc.)
- **II/4.** *Importance of adaptation.* It is suggested to put more emphasis on the necessity and importance of the adaptation because of (i) the climate change would be hardly avoided, (ii) the mitigation of climate warming depends on the international agreement, while the adaptations depend on the local initiatives and decisions, (iii) the adaptation would have many advantages also in case, if the climate would not changed or changed differently from those were projected. More attention must be paid to the limitations and constrains of the adaptation measures, especially in case if they would be also affected by the climate change. *E.g.* the hydrological conditions of the reservoirs being an effective tool in adaptation to climate variability in past may worsen if the climate changes would accompanied with decreasing precipitation and increasing its variability. More attention must be paid to the mutual connection between adaptation and mitigation.
- **II/5.** *Europe and adaptation.* The European chapter in the AR4 report is rather unbalanced regarding to different parts of continent. The former social countries are less represented, one reason of which is that report is based mainly on the peer reviewed English language scientific articles. More attention must be paid to the national reports, the scientific authenticity would be justified by the National IPCC Committees. The National reports may present some good exercises regarding the adaptation measures accepted in past in different countries and would serve as a good examples for others.
- **II/6.** *Impacts by subregions.* It is suggested to put more emphasis in the regional chapters including chapter Europe on the regional differences of climate change impacts within the continents. It is suggested to indicate by sectors which parts of Europe may be affected sooner adversely and which parts beneficially, also to which extent the magnifying regional differences in Europe's natural resources and assets would affect the policy of given sectors. *E.g*. the climatic conditions of crop productions are expected improved in north-western Europe, while are expected worsen in south-eastern Europe which would have probably an adverse effect on the agriculture of the latter parts of Europe.
- **II/7** *Uncertainties and counter-arguments*. The IPCC WG-I could deal with the arguments and views expressed by the so-called climate skeptics to some extent, if those views are scientifically well based. In this way the Panel could decrease the frequency and harmful effects of the parallel treatment and equal weighting of the scientific and the sceptic information by the media. Correct arguments could assist the better understanding of readers/users of the IPCC products. In other words, exact, scientific and referred answers are needed to the repeatedly occurring sceptic argumentation. In some cases, such divergent views could prompt a need for some further research.
- **II/8.** *Critical thresholds.* Both the sectorial and the regional impacts of climate change may have any critical (threshold) magnitude to avoid which anyway seems to be very important and inevitable. The specification of these critical (threshold) magnitudes by sectors and by regions would be served as a useful argument for policy maker to make any climate-related decision.
- **II/9.** *Overall cost analysis*. When it comes to costs, it is important to put more emphasis on integrating indirect costs and benefits into the calculations as well – that is, the co-benefits, transaction costs, and policy implementation costs, costs of capital, etc. This also applies to the potential calculations, as their results may look significantly different if these costs were also

taken into consideration besides the direct costs and benefits. Unfortunately the literature is still not ready for a complete integration of indirect costs and benefits, however, there have been advances in some critical areas since AR4, such as in the area of co-benefits.

India

20 May 09

India welcomes the opportunity to submit views and suggestions on relevant scientific technical topics to be addressed in the Fifth Assessment Report and its Synthesis Report in pursuance of the decision taken at the 30th Session of the Intergovernmental Panel on Climate Change held in Antalya, Turkey during April 21-23, 2009.

We visualize consideration of the relevant scientific and technical topics in the Fifth Assessment Report and its Synthesis Report both in the thematic consideration of topics as well as in the question and answer format, as both have value and use and application advantage. In this light, given below are the **issues**, **topics** and **questions**, indeed, in relatively mixed form principally to highlight consideration of these elements in the form of scientific/technical topics and policy relevant questions and issues which might be relevant in and towards enhancing the understanding of the complexities of climate change and related issues by the policy makers to serve as policy relevant information in devising the response strategies/policies/programmes to address concerns of climate change.

We think that consideration and treatment of these in explanatory mode and question and answer format, as appropriate, would be helpful in making IPCC products more useful.

A. Scientific/Technical Topics

Anthropogenic Influence on Climate
Aerosols and Regional Climate
Regional Detection and Attribution of Climate Change

B. Policy relevant scientific/technical questions and issues

These have been organized corresponding to the three Working Groups of AR 5

I. SCIENCE OF CLIMATE CHANGE

- How anthropogenic activities influence change in climate – an elaboration with schematic diagrams may be useful.
- Emissions and concentrations of greenhouse gases - difference and relationship between emissions and concentrations i.e. if X million tonnes of CO_2 emissions or CO_2 equivalent emissions are released into the atmosphere, how much will it add to atmospheric concentration of CO_2. It would be helpful to know the relationship between quantities of emissions and quantitative increase in the concentrations of CO_2.
- Can the enhanced concentrations of greenhouse gases in the atmosphere be reduced and in what time frame – how much emissions or CO_2 equivalent emissions constitute increase of 1 PPMV?
- How reduction in emission at local and national level help to reduce global concentrations of greenhouse gases?
- Relationship between air pollutants and greenhouse gases.
- Impact of local pollutants on regional/national climate.
- Linkages of Ozone depleting substances (ODS) and greenhouse gases – a more explanatory treatment of the interrelatedness will be helpful.
- Elucidation of the linkages between air pollution and global warming.
- To what extent partitioning of anthropogenic component of climate change is possible (against natural variability)?

- In terms of mass, how much Carbon does one part per million by volume of atmospheric Carbon Dioxide represent?
- Water vapour is also a greenhouse gas. What is the global warming potential of water vapour? Does water vapour regime above national boundaries add to impacts of climate change. Likewise, hydroxyl radicals (OH) act as a natural sink of methane. Is it feasible or possible or desirable to take into account the average moisture regimes into consideration for removals by sinks in the regional/national context.

II. IMPACTS, VULNERABILITY AND ADAPTATION TO CLIMATE CHANGE

- How ecosystem services are influenced or impacted by the climate change?
- Application of knowledge on global climate change to regions, sub-regions, national situations and limitations thereof.
- Treatment of uncertainties at regional and sub-regional levels of observed and projected impacts of climate change.
- Enumeration of significant gaps in availability of information for assessment.
- Treatment of uncertainties at regional and national level and limitation of application of assessed knowledge.

III. MITIGATION OF CLIMATE CHANGE

- What is the relationship between mitigation of climate change and sustainable development?
- What is the impact of implementation of Kyoto Protocol in reducing the climate change?

IV. SYNTHESIS REPORT

- It would be useful also to address and assess the cumulative impact of implementation of other multilateral environmental agreements in combating climate change.

Ireland

22 April 09

Introduction

Ireland recognises the important contributions made by the Intergovernmental Panel on Climate Change (IPCC) to advancing the understanding of climate change and the various natural and anthropogenic drivers of climate change. Its work is vital to international determination of required actions to address the challenges of climate change.

The general and specific comments that are provided here should be taken in the context of the previous submission on the future of the IPCC. The comments are not intended to be comprehensive but rather to highlight a number of issues and areas, which were identified as requiring attention.

Overview and general comments

The 4th Assessment Report (AR4) has provided a key turning point in our collective understanding of climate change. The 5th Assessment Report (AR5) must build on this work to advance in

- Providing increased clarity on attribution of the causes of climate change
- Identification of response options both in relation to mitigation actions and adaptation to climate change

The focus of the report should be aligned to provide increased support for policy makers while avoiding being policy prescriptive and while retaining the high scientific standards in reporting advances in scientific understanding.

The report should therefore inform on challenges to achieving the objective of the UNFCCC by updating knowledge on the extent and rate of climate change and its consequences. It should also include practical options to effectively address climate change.

Synthesis report
Ireland considers that the Synthesis report is the key communication tool to address the above issues, at the level required for decision makers. The decision to provide a synthesis report is therefore welcome. As the synthesis report will be a core product of the AR5 process it should be at the heart of the scoping process.

The scoping process should, at an early point, focus on the synthesis report and how it will communicate key information. This should address;

- what key material is expected from working group reports,
- how it will be synthesised and,
- what added value will be provided for decision making.

This will provide a guidance framework for the working groups and enable synthesis of material across the reports in a more synergistic manner.

Working group Reports
The roles of the three working groups have been well established at this point. It is essential that they work closely together and use shared understanding across key areas. The move to use Representative Concentration Pathways (RCP) is welcome and should enable improved transparency and more effective working across the groups. Ireland wishes to highlight the need to focus on low RCP values. It notes that working group 3 will have a particular role in showing how low RCP may be achieved. This will be an important contribution of the AR5 assessment process and report.

In order to increase clarity and assist in communication, common definitions and terminology should be used for cross cutting issues e.g. in relation to confidence levels or use of uncertainties. In this context Ireland wishes to highlight that in the AR4 the use of the term “feedback” is somewhat ambiguous. Work is needed to address this issue in the 5th Assessment report to ensure that its use is clearly correct in the context of particular issues.

Working group 1
It is anticipated that uncertainty levels surrounding radiative forcing will be reduced and that the upper and lower boundaries on climate sensitivity can be identified more clearly. It is also necessary to assess variations in sources and sinks for the main greenhouse gases, carbon dioxide, methane and nitrous oxide, noting that recent variations in atmospheric methane levels need to be resolved.

Ireland wishes to specifically highlight the need for progress on radiative forcing of aerosols and aerosol cloud inter-actions. The use of data from observation systems may contribute to this effort.

There is also a need for a more integrated approach to land use and soil in relation to analysis of GHG emissions, sink and prospective changes in this under future climate conditions, changed atmospheric composition (elevated CO_2) and management practices. Peatlands may require specific attention.

Working group 2
It is recognised that information from higher resolution models and other approaches as well as advances in observation systems is required. Regional as well as global impacts should be

addressed in a manner that can help inform actions and where possible provide clarity on costs of impacts or benefits from avoided impacts.

Ireland wishes also to note the importance of oceans as a component of the climate system and as a buffer for climate change. The AR5 should assess the rates of change of key ocean systems, stability of ocean circulation patterns as well as the long term implications of changes in ocean energy balances. The implications of ocean uptake of CO_2 on short, medium and long time scales should be addressed.

Where possible, input from practitioners and actual experiences of adaptation actions should be included in the report. This should not serve to reduce scientific integrity of the IPCC process. If necessary, such material may be handled in a manner that ensures it is clear that it differs from mainstream peer reviewed scientific publications.

Working group 3
A key aim should be to assess how low emissions development pathways can be achieved and enabled in a non-prescriptive manner. Further analysis and even quantification of the co-benefits of mitigation actions, e.g. improved air quality or increased technology development, is a key part of this assessment. It will also be crucial to assess, at least in part, how current policies on climate are or have been implemented and their effectiveness and to identify associated lessons for the future.[1]

The issues associated with agriculture, and linkages between forestry, land use/soils and agriculture need greater attention. These linked areas will be increasingly important and challenging in relation to meeting climate objectives, maintaining food security and achieving sustainable development objectives. These areas warrant collective attention in the working group report and a section of the synthesis report.

Italy
04 June 09

AR5 - WGI:

1) More emphasis on climate simulations ensembles and multi-decadal climate predictions.

2) More emphasis on regional trends, detection/attribution and projections

3) Identification of vulnerable hot-spots

4) Identification of tipping points

5) Better assessment of aerosol and land-use change effects

6) Improvement in sea-level rise projections, including regional SLR

7) Better assessment of projections in polar cap melting, Greenland and West Antarctica ice melting, shutdown of the ocean conveyor belt, fate of the Amazon rainforest

8) More emphasis on ocean acidification

9) Full and precise assessment of the role of the sun in past climate change

[1] A special report on this topic may be warranted at a later date.

10) Aerosol-cloud-precipitation processes:

- Recent studies suggest that increased aerosol loading in the atmosphere due to anthropogenic activities, most evident at the regional scale, has changed the balance of radiant energy within the climate system and altered the hydrological cycle in ways that make the climate system more conducive to precipitation extremes. The interactions between aerosols, clouds and precipitation in the climate system are the largest uncertainties in the estimation of anthropogenic climate forcing and climate sensitivity.
- Recent developments in process understanding, modeling, and observational capabilities make it now possible to address long-standing and fundamental questions in this field. Until now, aerosol-cloud-precipitation processes are represented in large-scale models only in a very crude and highly parameterized fashion. Recent improvements of process-level understanding of aerosol-cloud-precipitation interactions can be efficiently incorporated into large-scale models in order to constrain or improve estimates of the global effects of aerosol, clouds and precipitation on climate. Improvement of the availability of high quality data observed over long periods for all the regions where it is possible to find the necessary data. These are indispensable to make high resolution climate grids over long periods for validation and downscaling of scenarios produced with climate models and impact studies in the energy sector and all productive sectors.

11) Representation of stratospheric variability in climate models:

- One aspect that has so far been neglected (Chapter 8, IPCC 2007) in climate models is the representation of stratospheric variability, in spite of the growing body of evidence that variability in the stratosphere has a significant impact on modes of variability of the tropospheric and surface climate (*Baldwin and Dunkerton 2001, Thompson et al 2002, Norton 2003, Charlton et al 2004, Manzini et al 2006, Cagnazzo and Manzini 2009, Ineson and Scaife 2008*).
- In addition, the impact of climate change on the mass circulation in the stratosphere is a topic of current research (*Butchart and Scaife 2001, Butchart et al 2006*) and its feedback on stratospheric composition and surface climate is in large part unknown. The emerging role of modeling the stratosphere in coupled atmosphere-ocean models is now recognized internationally (*Kushner et al 2007*).
- In addition it is important to have more emphasis on properly describing the future recovery of the ozone hole in climate models.
- Finally, on the basis of the above scientific background, it is recommended to the climate model groups to consider, at least for some special integrations among those in discussion for CIMIP5, to include a well resolved dynamical stratosphere in their coupled atmosphere ocean model. A well resolved dynamical stratosphere will directly tackle the stratospheric variability issue mentioned above, as well as providing the potential for capturing the downward impact of a properly described ozone hole (in the 20th century) and ozon recovery (in the 21st century). A further step, would of course be to additionally include a full representation of stratospheric chemistry.

AR5 – WGII:

1) Cost/benefits of adaptation options, ranking of adaptation strategies and adaptation/mitigation linkages:

The issue of climate change autonomous and planned adaptation is one of the cores of AR4 WG2II (together with impacts and vulnerability). In particular, adaptation discussed either as policy instrument *per se* or in its relationship with other strategies to cope with climatic changes, primarily mitigation, is treated in two chapters of AR4 WGII: chpt.17, and 18. These chapters, although very helpful in clarifying the main issues at stake, basically fail to:

- provide even an "indicative" quantitative support to **ranking different adaptation strategies in term of cost effectiveness** proposing **some insights on regional differences** (for instance what kind of adaptation types are most useful in developed countries, which in developing countries? Which actions should be given priority?).

- provide **policy indication, based on cost/benefit or cost/effectiveness analysis at least on the "quality" of an optimal (utility maximizing, cost minimizing) mix of climate change strategies.** There is indeed a consensus that a winning climate change strategy must compound mitigation and adaptation, but for instance how much resources (e.g. investment) should be devoted to one strategy or to the other? Which has to be undertaken first? If we adapt how our decision to mitigate will be affected? What are the main drivers of these choices?
- provide **insights on the possible role of adaptation as a strategic negotiation item in international environmental agreements**. Can the inclusion of adaptation in a post-2012 negotiation round foster the participation of developing countries in a climate change treaty, can it make them more willing to accept stronger mitigation effort?

Another common claim put forward since the *IPCC - FAR (1991)* is that social economic systems adapt autonomously and, accordingly, that initial - or differently said "direct" - climate change impacts can be amplified, or (more probably) smoothed. However also this claim has not been supported by quantitative evidence if not in the specific field of the assessment of climate change impacts in the agricultural sector, where farm-level (autonomous) adaptation is one of the key component determining the magnitude of the final climate change impact. **But is there any insight on the magnitude and direction of autonomous adaptation? By how much it could smooth the initial impact? These questions need to be answered *before* any sound climate change policy can be designed.** The risk is to devote unnecessary or insufficient resources

Since the *IPCC - AR4 (2007)*. the literature on adaptation treating all these issues is expanding considerably, thus we deem essential that *IPCC - AR5*:

- will provide **a clear analysis of cost and benefits of different adaptation options** providing as much as possible **a ranking of strategies** going form those with the lowest to those with the highest cost/benefit ratio, possibly differentiating among world regions.
- will offer **an assessment of climate change strategy where adaptation *and* mitigation are analysed within the same internally consistent framework**: this to provide policy insights, based on robust analytical evidence, of the possible spatial and time trade-off or complementarity between the two. Broadening the remark: despite the acknowledged link between sustainable development, climate change mitigation, and adaptation, **the AR4 does not include quantitative assessment of complex interactions between climate and other policies.** Notable progress has been achieved on the issue of induce technological change, but more analyses in this direction is still needed. **How non-climate policies and non-climate concerns such as development, innovation, food security, biodiversity, co-benefits, enhance or halt the efficacy of climate action is also an issue to be investigated further.** *(note this theme is suitable to be treated also by WGIII)*
- will investigate the issue of **adaptation and mitigation in the framework of international environmental agreements:** in particular emphasizing the possible role of adaptation to enlarge the participation of developing countries in the mitigation effort.
- could conveniently report on the ability of social economic systems to adapt simply by reacting to market induced signals offering some quantitative insights.

2) More emphasis on extreme events analysis and extreme events impacts assessments:

- Change in extension of dry season,
- Change in frequency of extreme events: changes in heat-wave duration and intensity, changes in number of frost days, changes in precipitation intensity and flood probability. Impacts of climate change on Alpine fauna,
- Summer heat-wave and impacts on health, fires and agriculture,
- Impacts of climate change on geographical distribution of vector-related diseases.
- Changes in seasonality of run-off over Alps,
- Impacts of climate change on hydropower generation,

- Necessity of improved water management: balance between hydropower, cooling implants in other power stations, agricultural needs and population needs at time of high demand (during heat waves).
- Importance of real-time monitoring, availability of historical climate information and use of predictions (from medium range to seasonal predictions and local scenario projections) in water management practices.
- Impacts of changes in time distribution of precipitation on land degradation,
- Compound events impacts: combined effects of population growth, possibly reduced water resources and higher temperature,
- Results on ground water availability and its direct and indirect response to climate change via more intense exploitation.

3) More emphasis on the Mediterranean area, which is a climate hot spot.

4) Better characterization of the climate change influence respect to other human-induced pressure factors responsible of environmental problems such as desertification, loss of biological diversity, coastal erosion, hydro-geological risk, diseases.

AR5 – WGIII:

Mitigation studies assessed in the *IPCC - AR4 (2007)* are mostly based on top-down models that use a "*global least cost approach to mitigation portfolios and with universal emissions trading, assuming transparent markets, no transaction cost, and thus perfect implementation of mitigation measures throughout the 21st century*" (*IPCC, 2007, SPM WGIII*).

Phrased differently, most of the results reported in the AR4 implicitly assumed the existence of a first best world. In such a world, all externalities, not only the environmental ones, are internalized. Participation to climate change mitigation is immediate and global. Obstacles and limitations, of both technological and political nature, to the use and the deployment of mitigation options are not considered. Universal emission trading and therefore full trade without any type of limitation (on the timing, quantity and regional participation to trade) is available. Finally, perfect inter-temporal foresight is often assumed. In other words, it can be said that the AR4 has provided an assessment of mitigation scenarios in a first-best world.

The AR5 could depart from this framework and **analyze in a quantitative way mitigation scenarios in a second best world, providing a systematic assessment of the economic, environmental and social implications of foregoing, one by one, the assumptions described above. It could envisage scenarios of limited participation, trade, or technology options.** The departure from first best scenarios itself is likely to change substantially the range of mitigation costs, pictured by the AR4 around 1% of gross world product.

Other possible policy relevant topics to be addressed in AR5-WGIII are:

1. ***The impact of R&D in improving mitigation technologies and/or reduce their costs.***
2. ***Uncertainty of emission GHG data, especially for LULUCF activities.***
3. ***Links between climate change and air quality policies: i.e. impact of PM controls in developing country in GHG-emission levels and vice-versa.***
4. ***Analysis of key social and psychological motivations that work as barriers against climate change mitigation (i.e. cultural models, organised belief patterns) and role of education, communication and policy incentives.***
5. ***Analysis ok linkages between mitigation policies and energy security policies.***
6. ***Uncertainty analysis of mitigation potentials and mitigations costs***
7. ***Impact of R&D and 'technology learning' on the speed of technology transfer.***
8. ***Links between GHG emissions and peak-oil scenarios.***
9. ***Uncertainty analysis of fossil reservoirs for carbon, oil and gas.***
10. ***Potential co-benefits of mitigation options based on the energy use of different types of biomass.***

11. ***The criteria for long-term sustainability of mitigation strategies based on the energy use of biomass.***
12. ***The advantages and disadvantages of short time commitments vs. longer time commitments in GHG mitigation.***

Japan

29 May 09

Japan welcomes the invitation by the Secretary of the IPCC dated 29 April, 2009 for the submission on the policy relevant scientific technical topics to be addressed in the Fifth Assessment Report (AR5) and its Synthesis Report, and hereby submits its view as follows.

Japan expects that the following key policy relevant topics be fully addressed in a structured and focused manner in the AR5, while stressing that it should not be policy prescriptive. Most of these topics may be the refinement or further elaboration of previous IPCC assessment reports, therefore, the assessment work should start from asking whether such previous assessments were adequate and/or are still valid. The topics suggested below are not exhaustive, and Japan would be happy to further elaborate these and other topics during the scoping and development of AR5.

1. Relationship among atmospheric GHGs concentrations, global GHGs emission scenarios/pathways, climate variables and associated impacts, and costs of measures while taking into account uncertainties

The AR4 summarized the results of scenario studies on the relationship among atmospheric GHGs concentrations, global GHGs emission scenarios/pathways, climate variables and associated impacts, and costs of measures, which provided policy makers with extremely useful information in considering the direction of future GHGs emissions reductions. However, the information contained still has much room for refinement. Japan specifically expects that the AR5 will address the following elements:

- incorporation of simulation results with global climate models;
- consideration of feedback effects and contribution of aerosols in the models based on the latest scientific understanding;
- atmospheric GHGs concentrations at given timeframes such as 2050 and 2100 as well as at stabilization;
- possibility of different scenarios/pathways, including 2nd best and 3rd best scenarios, to reach given atmospheric GHGs concentrations;
- detailed analysis of scenarios/pathways in terms of feasibility and costs incurred;
- balanced description of the scenarios for both developed and developing countries, while noting that actual contribution from each country group is out of the scope of the AR5;
- integration of analyses on mitigation potentials by sector;
- closer linking of bottom-up and top-down models;
- tipping elements and thresholds which may entail catastrophic consequences;
- uncertainties associated with the parameters and analyses.

2. Regional context of climate change, vulnerabilities and impacts

It is understandable that policy makers want to know as to how climate change will affect their own region or country rather than the whole globe. Therefore, regional climate change projections and their impacts deserve much more attention in the AR5. The current regional categorization seems largely still valid in the AR5, but an additional consideration on climatic zone may be necessary in regional categorization. However, bearing in mind IPCC's global nature, Japan suggests that the regional categorization in the AR5 not be spatially too detailed in order not to lose the global perspective/context of regional assessments. Some aspects of mitigation may be addressed in the regional context together with impacts, vulnerabilities and adaptation. However, sectoral

categorization may continue to be more useful for the assessment of mitigation potentials and measures, considering that reduction of GHGs has the same climate consequence no matter where it occurs. In the regional assessments, Japan specifically expects that the AR5 will address the following elements:

- detailed projections of climate change and extreme events in the near and long future with more precise spatial and temporal resolutions;
- quantification of relationship between climate variables and associated region-specific impacts;
- identification of implications of non-qualified impacts including anthropogenic ocean acidification, etc. ;
- applicable adaptation options which are compatible with regional, natural, economic, political and cultural circumstances.

In terms of global impacts of climate change, emerging topics including ocean acidification and its impacts on ecological and socioeconomic systems should be further explored and highlighted in the AR5. Given the unique characteristics and the importance of ocean acidification issue, it is worthwhile considering the insertion of a separate chapter for this topic.

3. Economics of climate change taking into account costs of mitigation, adaptation and damages

To help policy makers and the private sector make informed decisions on investments for future climate mitigation/adaptation measures, the economics of climate change deserves much more attention. Deeper investigation and the costs of action and inaction need to be addressed. In this regard, Japan specifically expects that the AR5 will address the following elements:

- monetization, as far as possible, of damages due to climate change and avoided damages through adaptation measures, as well as co-benefits and indirect effects of mitigation and adaptation measures in order to analyze the economics of mitigation and adaptation investments;
- comparison and balance of overall costs of mitigation, adaptation and damages taking fully into account of their different temporal and spatial contexts, opportunity cost for other social and economical activities, and uncertainties;
- detailed assessments of costs, cost-effectiveness, and feasibility of key existing and future mitigation technologies including those enabling net negative emissions (e.g. bio-energy with CCS).

4. Comprehensive options for technology development, policy measures and international cooperative framework

As climate policy progresses toward the long-term significant reduction of GHGs, policy makers are becoming more and more aware of the mutually facilitative nature of technology development, policy measures and international cooperative framework. Japan considers it quite useful for policy makers if the AR5 could provide options comprehensively addressing these elements, taking into account the existing initiatives at global, regional, national and sectoral levels. In this regard, Japan specifically expects that the AR5 addresses the following elements:

- identification of promising technologies (including best available technologies by sector) , mitigation potentials, barriers and solutions in technology diffusion and transfer;
- assessment of current status and future prospects of policy measures and options in each mitigation sector, taking into account future technology development;
- effectiveness and significance of public-private partnership;
- effective international cooperative frameworks ensuring the participation of both developed and developing countries as well as facilitating technology development and policy measures, without prejudging future negotiations.

It is very important to invite broader participation of the private sectors in the process of developing the AR5, formally and informally, in order to acquire upfront information and practical assessment

for the above mentioned issues. We would like to emphasize that the international workshop hosted by Japan in September 2004, with participation of private sectors, were extremely valuable as an input to AR4. We would like the Scoping Meeting to consider options for facilitating private sectors' participation. Such options may include explicit invitation of private sector experts as CLA/LA/CA of the AR5 and participants of relevant expert meetings, and convening a workshop to collect technological information from the private sector.

In addition, mitigation policies should be discussed in conjunction with adaptation policies, taking into account the costs, cost-effectiveness, and feasibility, as referred in paragraph 3. In this regards, the collaboration of WG2 and WG3 is necessary, and this may be achieved through holding joint meetings or workshops, and results may be addressed in the Synthesis Report.

5. Possible pathways to low carbon societies compatible with sustainable development and economic growth

There is no question that significant reduction of GHGs could only be achieved by the development and deployment of innovative low carbon technologies, as well as significant social, economic, institutional and behavioral changes. Future societies with very little GHG emissions are often referred to as "low carbon society" but, possible means to realize it and pathways toward it are yet to be identified. Japan considers that the "low carbon society" concept should be scientifically explored (with significant contribution from economics and social sciences) to provide the basis for policies and measures to materialize it, while ensuring compatibility with sustainable development and economic growth. In this regard, Japan specifically expects that the AR5 will address the following elements:

- definition of "low carbon society" and means to measure the degree of achievements compatible with sustainable development and economic growth;
- technical innovation and deployment required in a different country context and development stage, as well as the effectiveness of sharing international roadmaps for innovative technology development;
- social, economic, institutional and behavioral changes required in a different country context and development stage;
- possible pathways/scenarios toward a low carbon society in line with GHGs emission reductions to mitigate projected climate change.

6. Scientific base for communicating uncertainties to policy makers and to the public

As IPCC assessment reports progress, the scientific basis of uncertainties is becoming richer. However, policy makers still often struggle to understand the implications of IPCC assessments on policies and measures, as well as to communicate the uncertainties to the public for better-informed decision. Japan expects that, as one of the important cross-cutting issues, the AR5 will address uncertainty issues comprehensively, especially with a view to better communication to policy makers and the general public.

Kenya

02 June 09

POLICY RELEVANT SCIENTIFIC TECHNICAL TOPICS FOR IPCC-AR5

Climate variability on a Seasonal-to-annual time-scales has been connected to impacts on almost every aspect of human life including: agricultural yields, water resources, energy demand and supply, transportation, forest fires, human health and welfare, and many others. Potential future human-induced changes in climate as has been demonstrated by IPCC assessment reports could have additional effects, including altering the lengths of growing seasons, the sustainability of water resource management systems, the geographical ranges of plant and animal species,

biodiversity and the incidence of extreme climate events that affect both natural and human-made environments. Improving our ability to assess potential vulnerability and resilience to future variations and changes in climate and environmental conditions could enable governments, businesses, and communities to reduce negative impacts and seize opportunities to benefit from changing conditions by adapting infrastructure, activities, and plans. However, there is still a high level of uncertainty regarding precisely how much climate will change overall and in specific regions. Following therefore are proposed policy relevant scientific technical topics the AR5 need to address for the benefit of policy makers, planers and implementers:

- What are the relative roles of natural and human-induced forces in bringing about change, and how might human-induced and natural forces interact in the future?
- How has the climate system responded to both natural and human-induced forces, and how might it respond to potential future forcing?
- What is the sensitivity of natural and managed ecosystems to climate changes and how will sensitive systems be affected by climate variability and changes in the future?
- What are the projected costs and effects of different potential response strategies to manage the risks of climate change?
- How can we use and improve the climate change knowledge to protect the global environment and to provide a better living standard for all?

Malaysia

29 May 09

A. AR5 Working Group Reports

Policy Relevant Scientific Technical Topics

We support the preparation of additional information at the regional levels as this will assist members in providing appropriate information for respective governments. Therefore we consider those proposed regional reports are very important. We suggest the policy relevant scientific technical topics, which must be included in all the Working Group reports, on the following:

- Regional assessments, which is going by each region (e.g. Southeast Asia, South Asia, South America etc.) to be discussed in more details under scientific/policy topics.
- Special topics on extremes (i.e. on current climates and projections chapters) with more details **on regional basis**, in WG-1 and its associated WG-2 reports.
- Special topics on the effects of global warming on food security, with more details **on regional basis** in WG-2 report. (Note: the previous AR4 had not given special emphasis on this topics)

B. AR5 Synthesis Report

Malaysia broadly supports the preparation of a synthesis report (SYR) for AR5. As according to the procedures the SYR would “synthesize and integrate material contained within IPCC Assessment Reports and Special Reports”, hence, its scope would include material contained in the three Working Group contributions to the forthcoming AR5.

Therefore, the AR5 SYR should not introduce any new materials into it and neither it should attempt to rewrite the AR5. The SYR should address cross-cutting issues that are policy relevant but the SYR MUST NOT TRY TO BE POLICY PRESCRIPTIVE. We prefer the “chapter” format as formulated in AR4, and not the “Q&A” format as used in the TAR.

The AR5 SYR should also be outlined to have adequate synthesized discussions on a regional basis.

C. Participation of Malaysia's Scientists in AR5 – General Comments

Malaysia would like to make a statement on the issue of participating scientists in AR5 preparation. As experienced in AR4, we are not very happy with under representation as LA from developing countries, particularly from "smaller" developing countries such as Malaysia. We need to register our dissatisfaction here, with regards to low selection of scientists from the "smaller" developing countries during the AR4 exercise. In particularly, we were very concerned, that none of our nomination was being selected for the LA in all the Working Groups for the AR4. We may not support the idea of limiting the numbers of scientists participating in the process of AR5, because this may lead to the failure of getting all good expertise. Furthermore, without any representative from our country, it may lead to a biased assessment. We are also very concerned on the denial of our opportunity for a capacity building process to our young scientist in climate change science. Therefore, we appeal that the IPCC bureau must find ways to rectify this weakness so that it will not recur in AR5 process.

Mali

18 May 09

(*French version, English version below*)

Le Mali en tant que membre du GIEC apprécie les résultats obtenus dans les différents rapports et plus particulièrement ceux du 4è rapport d'évaluation. Ces résultats ont fait l'objet au Mali de large diffusion en français auprès des enseignants, des scolaires, des ONGs, des communicateurs (radio, TVet journaux), des élus locaux et des parlementaires. Ilsont été également traduits en langues nationales et diffusés auprès du monde rural.

Cependant dans ce rapport des insuffisancessont constatées notamment au niveau des pays en développement et plus particulièrement au niveau de l'Afrique. Afin de répondre aux préoccupations de plus en plus croissantes face aux effets et impacts des changements climatiques il serait vital de prendre en compte ces insuffisances dans le 5è rapport d'évaluation du GIEC.

Le Mali dans sa politique de réduction de la pauvreté accorde la priorité au développement durable à la satisfaction des besoins alimentaires de la population, à la santé, aux infrastructures de transports, à l'énergie et à la gestion des ressources en eau et de l'environnement. Tous ces aspects sont aujourd'hui gravement touchés par la désertification, la variabilité et les changements climatiques (sécheresse, inondation, vent violent, vague de chaleur), entrainant des conséquences graves (déficit alimentaire et hydrique, déplacement des populations, maladies, ensablement des cours d'eau, pertes de bétails etc ..).
Les actions futures du GIEC doivent prendre en compte ces préoccupations en mettant l'accent sur:

- l'appui à l'exploitation de la base de données météorologiques existantes notamment au Mali depuis 1895, par la mise à disposition de modèles de traitement appropriés;
- le renforcement des capacités en modélisation;
- l'aide à la définition des scenarii climatiques et socio économiques locaux;
- l'appui à l'amélioration du réseau de collecte des données météorologiques et environnementales par la forte implication des centres de recherche régionaux;
- l'amélioration du développement des produits météorologiques pour l'alerte précoce;
- la mise en place d'un système de communication approprié;
- l'appui à l'analyse du potentiel solaire et éolien pour des besoins d'utilisation énergétique;
- le transfert de technologie dans le domaine de l'atténuation et de l'adaptation;

des études environnementales notamment l'évolution de la désertification et aussi l'ensablement des cours d'eau;
le rapport sécurité alimentaire et biocarburant;
les aspects d'assurance climat;
les aspects climat/santé;
l'appui à l'évaluation des coûts et des conséquences socio- économiques des mesures d'adaptation et d'atténuation aux changements climatiques.

(*English translation*)

As a Member of the IPCC, Mali appreciates the results achieved in the various reports and in particular those of the Fourth Assessment Report. In Mali these results have been distributed widely in French among teachers, students, NGOs, the media (radio, television and newspapers), local elected officials and members of parliament. They have also been translated into national languages and distributed among the rural population.

This report does mention, however, some deficiencies at the level of developing countries and in Africa in particular. With the aim of responding to rising concerns in the face of the effects and impacts of climate change, it is essential to take account of these deficiencies in the IPCC's Fifth Assessment Report.

Mali assigns priority in its poverty reduction policy to sustainable development in meeting the population's food needs and in providing for public health, transportation infrastructure, energy, water resource management and environmental management. All of these aspects are seriously affected today by desertification and climate variability and change (drought, floods, strong winds, heat waves), which have serious consequences (food and water shortages, population displacements, disease, silting of waterways, livestock losses, etc.).

The future actions of the IPCC should take these concerns into account by placing an emphasis on:

1. Support for operation of the meteorological data base, which draws on records going back to 1895 in Mali, by making the relevant processing models available;
2. Reinforcement of modelling capacities;
3. Assistance in the definition of local climate and socio-economic scenarios;
4. Support for improvement of the network for the collection of meteorological and environmental data through the broad involvement of regional research centres;
5. Improvement of the development of meteorological products for early warning;
6. Implementation of a suitable communication system;
7. Support for the analysis of solar and wind potential to meet the needs of energy users;
8. Technology transfer in the area of mitigation and adaptation;
9. Environmental studies, in particular on the development of desertification and silting of waterways;
10. The connection between food security and biofuels;
11. Aspects of climate insurance;
12. Health/climate aspects;
13. Support for an assessment of the socio-economic costs and consequences of climate change adaptation and mitigation measures.

Maldives
11 May 09

In response to note 4995-09/IPCC/AR5, the Republic of Maldives is pleased to have this opportunity to propose the following topics for inclusion in the Fifth Assessment Report.

As the Maldives and many other delegations noted during fruitful discussions on the future of the IPCC that took place during the 28th Session and 29th Session of the IPCC (see http://www.maldivesmission.ch/fileadmin/Pdf/Environment/Statement_IPCC_0908.pdf), the IPCC and its Assessment Reports must flexible enough to respond to new needs and imperatives. One area where greater emphasis is needed is better integrating social science disciplines into the IPCCs work. While the physical sciences must remain a cornerstone of the Panels activities; the growing scientific consensus in this area means that we, the IPCC, must begin to look at other areas that have perhaps been neglected in the past but which could make a telling contribution to the global policy discourse on climate change. Key areas where the Maldives would like to see greater emphasis from the IPCC are the relationship between climate change and sustainable development, the regional-level impacts of climate change including for Small Island States, and, importantly, the human dimension of climate change including the human rights implications of the problem.

On the final point, the Maldives believes that the IPCC can make an important contribution to understanding and raising public awareness about the real-world present and future impacts of climate change on people and communities around the planet. By focusing on the effects of climate change on people, their lives, living standards, means of subsistence, security, heath, welfare and human rights, the IPCC can help provide important data and evidence to support policy-makers in their vital work. The IPCC should therefore dramatically increase its engagement with the social sciences research community and the human rights research community as part of its future work, especially in the context of Working Group II.

Mauritius
25 May 09

Regional Impacts

As a SIDS, Mauritius would like to see more detailed studies on regional impacts of climate change. The impacts could be related to changes in oceanic behaviour and their eventual impacts on tropical cyclones (strength and frequency), warming of the ocean with depth and the impact of the stored energy on regional general circulation.

Such considerations would help in determining the behaviour of natural disasters and their eventual impacts on small islands.

Economic Consideration

Methodologies for the evaluation of economic impacts of climate change should be developed. This would allow a better presentation, to decision makers, of the economic consequence of (no) action to mitigation the impacts of climate change. Estimation of mitigation and adaptation costs in order to maintain the sustainable development goals of SIDS can be addressed.

Case studies

- Case studies for adaptation to CC need to be presented. For example, the need to change port infrastructures and other coastal structures.
- The impacts on coastal boreholes and the need to, and way of, protection of incursion of sea water into coastal acquifers and boreholes as a result of sea level rise.
- Mauritius would be ready to provide a picture of regional climate change based on data collected over half century on remote, tiny and uninhabited islands which have seen no human interference.
- Disasters Risk Reduction should be included in the climate change program.
- Issues of stress on Tourism per sq km specially for island states and can also be considered.
- Water stress basin enhancement for the population
- Life style and behaviour changes under various scenarios would social science and climate change.

Mexico

29 May 09

Spanish (English translation below)

PRESENTE

Por medio del presente y en atención a su oficio No. 4995-09/IPCC/AR5 con fecha 29 de abril del año en curso, le envío algunas consideraciones sobre los tópicos técnico-científicos que creemos relevantes para ser incluidos en el 5to Reporte de Evaluación del Panel Intergubernamental de Cambio Climático (IPCC - AR5).

De acuerdo a los trabajos realizados en el proceso de desarrollo del Programa Nacional de Cambio Climático en México, se hizo evidente que existen muchas dudas por parte de tomadores de decisión así como de los encargados de desarrollar políticas de mitigación y adaptación, con respecto a la interpretación de los resultados de modelos climáticos regionales y especialmente en entender el concepto de incertidumbre ante cada escenario.

Adicionalmente se ha observado un fuerte cuestionamiento con respecto a los escenarios de emisiones preguntando si existe la posibilidad de diversificarlos a futuro considerando la incertidumbre en el desarrollo socio económico global y regional.

Tomando en cuenta estos puntos se propone lo siguiente:

1. Desarrollar, caracterizar y entender el modelo del sistema climático observado en forma más completa y realista, a fin de reducir los sesgos e incertidumbres de éste.
2. Utilizar este modelo para simular la interacción química, biogeoquímica y del clima con un enfoque de forzamiento y retroalimentación.

3. Dentro de los procesos químicos y biogeoquímicos es importante prever el comportamiento de aerosoles y entender los procesos de la atmósfera alta considerando que estos procesos han generado mayores incertidumbres en los resultados de modelación del AR4.
4. Es importante mejorar la modelación de algunos procesos físicos regionales muy importantes en la región CAM. Por ejemplo, la Oscilación Julian – Madden.
5. Crear respuesta de ecosistemas y su posible dinámica ante los escenarios climáticos proyectados o que se desarrollen.
6. Continuar con la modelación del incremento del nivel medio del mar y sus proyecciones regionales ante los diferentes escenarios, buscando definir las regiones costeras más vulnerables en cada escenario.
7. Es deseable incrementar la resolución de los modelos regionales particularmente en regiones topográficamente muy complejos como es México.

(English translation)

Through this letter and with regard to your official letter No. 4995-09/IPCC/AR5 dated April 29, 2009, I am sending some comments on the technical and scientific topics we feel are relevant for inclusion in the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC – AR5).

From the work done on the development process by the National Program for Climate Change in Mexico, it was clear that there was a great deal of doubt among decision-makers and those responsible for developing mitigation and adjustment policies as to how to interpret the findings of regional climate models, especially when it came to understanding the concept of uncertainty in each scenario.

Moreover, many questions were asked as to emission scenarios, in particular as to the possibility of future diversification, in view of the uncertainty surrounding global and regional socio-economic development.

Taking these points into consideration, our suggestions are as follows:

1. Develop, characterize and understand the climate system model observed in a more complete and realistic form, with a view to reducing bias and uncertainty;

2. Use this model to simulate chemical, biochemical and climate interaction with an approach based on forcing and feedback;

3. Within chemical and biochemical processes, it is important to predict the behaviour of aerosols and to understand processes in the upper atmosphere, given that these processes generated greater uncertainties in the AR4 modeling findings;

4. It is important to improve the modeling of some regional physical processes which are crucial in the Central American region, for example the Julian-Madden Oscillation;

5. Create ecosystem response and possible dynamics with regard to predicted or developing climate scenarios;

6. Keep on modeling rises in average sea level and regional forecasting in the different scenarios, seeking to identify those coastal regions that are most vulnerable in each scenario;

7. It is desirable to enhance resolution of regional models, particularly in topographically complex areas such as Mexico.

Mongolia
08 June 09

IPCC Synthesis Report

- We would like to highlight that the AR5, in our view, would play a critical role in answering policy relevant scientific and technical questions of the governments. In particular, Synthesis Report should give a comprehensive picture of cross-cutting issues in relation to the IPCC working groups.
- To identify specific issues that to be addressed by the Working Groups from the perspective of addressing the questions to be addressed by the Synthesis Report.

IPCC WG I

- Detailed assessment of scientific knowledge and existing Global Circulation Models to project future climate changes at global and regional, if possible sub-regional levels
- Links between greenhouse gases, air pollutants and climate change.
- Assessment of understanding about changes in cloud physical processes, cloud formation mechanism because of climate change and interrelationship between clouds and climate change, as well as climate change and cloud resources.

IPCC WG II

- Identification of most vulnerable regions and sectors and more clear definition about 'most vulnerable regions/countries/sectors
- Identification and assessment of indicators of vulnerability for different regions and sectors
- More accurate assessment of climate change impacts on terrestrial and grassland ecosystems, animal bio-capacity and their migration, human health, etc.
- Climate change related risk assessment and management,
- Recommendable mid-term and long-term adaptation measures in most vulnerable regions and sectors,

IPCC WG III

- Social, Economic and Environmental consequences and benefits of GHG mitigation measures, especially for the low income developing countries and high energy-heat-consuming countries
- Recommendable policy measures to be issued to take mitigation measures, in particular NAMA, in developing countries

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Netherlands
28 May 09

The Netherlands has collected research agenda's and views from different ministries and organisations, and has selected items relevant for the scoping of the AR5 and the synthesis report. Below a summary is presented.

All views highlight the following:

- The importance of retaining the central position of the scientific basis in the AR5. There is a great wish to gain more insight in tipping points and the identification of most vulnerable regions (hotspots);

- More emphasis on regional areas with very high population density, such as mega-cities and delta's;
- An assessment of methods for down-scaling would be very helpful to further relevant knowledge on regional climate change;
- Include a wide range of mitigation options, both assessed bottom-up and top-down and to integrate them with socio-economic development studies.

Related themes that deserve special attention:

1. Delta regions, their vulnerability to climate change and the role of water;
2. Sustainable and low carbon infrastructure;
3. Metropolitan climate change;
4. Integrated studies (impacts, cost-benefits, synergies adaptation-mitigation and air pollution);
5. Relation between climate change and with crises like the ones on finance, energy and food and future deficits in natural resources (e.g. vulnerable land, water and phosphate).

There is a strong need to include peer-reviewed 'gamma' research studies relevant to climate change, with socio-economic dynamics and governance as central themes. The studies should relate to adaptation, mitigation and their interactions.

The gamma-related research themes should include:

1. Human behaviour:
    a. Socio-economic behaviour related to adaptation and mitigation options
    b. Climate change realism;
    c. Effective communication methods;
2. Climate policies:
    a. Dealing with scenario uncertainties;
    b. Regionally-based climate scenario-to-policy translation tools;
    c. Influencing processes, learning from the past, sustainable climate policy by frequently changing governments;
    d. Level-Playing field and taking into account regional values.
    e. Economy-climate win-win options;
    f. Dealing with different timescales of government time scales (short) and climate change time scale (long).

We recommend AR5, including the SyR will include gaps in knowledge, so it will enhance climate research programming.

New Zealand

01 June 09

New Zealand would like to see the IPCC Fifth Assessment Report include the following:

1. **A full review of the metrics available to determine greenhouse gas equivalence.** We note that the danger of irreversible climate change caused by long-lived greenhouse gases such as carbon dioxide is clear and is expected to be explicitly established in the Working Group I Report. We share the concerns of other governments that descriptions are needed of metrics that might be chosen to suitably limit the emissions of such gases. If no single metric is appropriate, because the various greenhouse gases are not reduced to equivalence by a single metric, we expect the IPCC to make this clear and to provide robust advice on alternative ways the international community might specify the limitations on greenhouse gas emissions needed in order to avoid irreversible climate change.

We would expect the analysis to include evaluation of the use of metrics in terms of economic cost, climate change risk, and climate change lock-in. [WG1, Cross-cutting]

2. **A review of the concept of interchangeability within a 'basket' of greenhouse gases.** This review should cover the basis of the economic arguments referred to in the AR4 (WG III: 3.3.5) which suggest that a multi-gas approach reduces the costs of meeting emissions reduction targets. We are concerned that the use of the concept of a 'basket' and the accompanying expectation of economic efficiency assumes that the impacts and resulting damages from the emissions in the basket are fully costed. The economic modelling supporting the use of a basket of gases appear to use 100-year GWPs as the exchange metric, and in our view this manifestly fails to properly cost the emissions of long-lived gases as it does not include those costs beyond the 100-year period. [WG3, but feeding in to (1) above, so also WG1 and cross-cutting]

3. **A review of emissions from food production** (differentiated from 'all agriculture' emissions including non-productive land and livestock) This information is important for future policy development and the evaluation of climate change policy impacts on food production. [WG1, WG3?]

4. **A more detailed assessment of the mitigation potential associated with food production**. We would expect this to include (but not be limited to) such details as:

    a. presentation of results on a 'per-unit-product' basis (recognising the need to produce more food from existing farmed areas)

    b. disaggregation by system (e.g. dairy, beef, sheep, goats, pigs, chickens, … and productive and non-productive land and livestock …)

    c. the effect of post-harvest losses, post-purchase wastage, and the relative potential in the wastage and production areas

    d. how leakage issues might be addressed

    e. an evaluation of practical on-farm mitigation in comparison to research studies of theoretical potential

    f. differences in mitigation potential with local and regional farming differences

    g. an analysis of MRV options for different agricultural systems

    h. flow-on effects from the use (e.g. for bio-energy production) of currently-discarded crop residues and the resultant potential for lowered soil carbon sequestration

    i. a 'whole-of-system' approach that captures the effect of displacement of emissions from one gas to another (e.g. in pastoral ruminant agriculture, the increased methane production from more intensive stocking when nitrification inhibitors are used to reduce nitrous oxide emissions; in rice production, increased nitrous oxide and carbon dioxide emissions when lowering methane emissions)

    j. the pathway to realising the technical potential identified for e.g. 2030. (Identifying what is the realisable potential now, and what are the things that need to change in order to get to the technical potential in 2030.)

    [WG3]

5. **A more in-depth assessment of adaptation options for agriculture.** This might include more regional-scale information and an analysis of socio-economic as well as physical pressures. [WG2]

6. **A particular focus on small island states and on the least developed countries, when assessing impacts, vulnerability and adaptation.** We note that these states may not have the resources to engage as fully in the IPCC process as their vulnerability might justify. [WG2]

7. **Adequate coverage of the southern ocean region and its marine resources, when assessing impacts, vulnerability and adaptation.** There is an increasing literature on the southern ocean. [WG2]

8. **Adequate coverage of issues relevant to small economies.** We would like to see recognition of the particular difficulties that might arise in small and relatively un-diversified economies through the imposition of emission limits locally and the implementation of mitigation policies elsewhere. The assessment of the potential for mitigation will be more accurate when it reflects these difficulties. [WG3]

9. **A review of the use of non-CO2 multipliers for aviation.** A number of different multipliers have been suggested to account for the non-CO2 component of climate change forcing by aviation emissions. Currently there is no agreement on a preferred multiplier and a default value of unity is widely used. A clear assessment of the merits of the different options for accounting for aviation emissions would assist a policy choice and simplify the evaluation of present and future aviation operations scenarios. The assessment would be most useful if it included an assessment of regional differences, if any. (We recognise aviation contrails may be less influenced by the lower background aerosol concentrations in the southern-hemisphere than other clouds but note there may be other confounding effects.) [WG1]

10. **A review of the radiative and precipitation properties of southern-hemisphere clouds, including aviation contrails.** Our understanding is that most climate models do not account for the lower droplet numbers and increased droplet size in many southern-hemisphere clouds. We would welcome an assessment of the significance of the differences between southern- and northern-hemisphere clouds for climate change projections. [WG1]

11. **An update of recent developments in carbon capture and storage**. Concerns have been expressed about the permanence of various storage options, particularly geological sequestration and bio-char. We would welcome an evaluation of recent work in this area and information on verification methods. [WG3]

12. **A review of soil carbon storage and processes**. Different assessments of the potential of soils as carbon sinks have been promoted. New Zealand would welcome an assessment of the potential carbon sink, the lifetime of the storage, the effect of land-use changes, and the effect of projected climate changes. [WG3, possibly also WG1 and WG2]

13. **A review of spillover effects**. It would be helpful if the assessment process included an assessment of the available analysis and modelling of the impacts of mitigation policies and measures. [WG2, WG3]

14. **An assessment of alternative pathways towards stabilisation**. While the AR4 WG III Box 13.7 and the associated analysis have been very helpful to policymakers, a more detailed exposition of different pathway options will be needed in preparation for future negotiations. This could usefully include for example an assessment of the literature covering 'shallow-start – steeper following' reduction pathways; different country groupings than used in Box 13.7 (with more classes – e.g. as a minimum Annex I, Advanced non-Annex I, rest-of-world); more detail on the reduction pathways within each country group; and the impact on the analysis of changing the extent of domestic versus off-shore reductions. [WG3]

Republic of Korea
29 May 09

Working Group III

Policy relevant scientific technical topics

1. Review of Data Consistency
2. Development of efficient technology transfer models

Background Remarks

1. When dealing with a wide variety of data sources and databases writing reports, maintaining the consistency of data is the most critical factor.
Therefore, it is strongly recommended that all data used in reports be reviewed by the experts of WGs

2. Although the deployment, diffusion and transfer of technologies are keys to improving the economic and social viability of the mitigation options for countries, especially for the developing countries, there is still no win-win technology transfer model between advanced and developing countries. Therefore, it is recommended that WG3 consider the development of specific technology transfer models.

Slovakia
29 May 09

Policy relevant scientific technical topics to be addressed in the Fifth Assessment Report and its Synthesis Report

Developing and applying scenarios
- Regional climate change, climate seasonality, atmospheric circulation changes
- Climate extremes
- Urban climate
- Air quality

Hydrology and water resources
- Dangerous meteorological phenomena (primarily heat waves, extreme precipitation and storms)
- Dangerous hydrological phenomena (primarily floods and droughts)
- Water quality (temperature, eutriphication)
- Relationship between Hydrological cycle and ecosystems
  - water retention in the landscape

Ecosystems and change of landscape
- Climate change and ecological landscape stability
- Climate change and forest and agriculture production
  - Argo- and eco- systems functions in climate change condition
- Soil degradation

Urban areas, energy, industry
- Renewable energy sources and region structure
- Spatial development, spatio-structural changes

- Socio-cultural changes in the demand for buildings
- Immigration, demographic change and sustainable spatial development

Human health
- Food habits (human nutrition) in the climate change
- Social behavior of population in the climate change

Europe
- Regional climate change, climate seasonality, atmospheric circulation changes
- Climate extremes
- Dangerous meteorological phenomena (primarily heat waves, extreme precipitation and storms)
- Dangerous hydrological phenomena (primarily floods and droughts)
- Water quality (tempature, eutriphication)
- Hydrological cycle and ecosystems functioning
- Climate change and ecological landscape stability
- Climate change and forest and agriculture production
- Renewable energy sources and region structure
- Adapting cities and urban regions to the requirements of energy optimized urban structures and the consequences of climate change.
- Epidemics, tropical diseases in climate change
- Social adaptation of population in climate change

Spain
03 June 09

Spain appreciates the invitation made by the Secretary of the IPCC the 29th of April 2009 (Ref. letter 4995-09/IPCC/AR5) to submit policy relevant scientific technical topics to be addressed in the Fifth Assessment Report and its Synthesis Reports. Spain considers that the invitation favours and improves the participative process in the elaboration of such an important document.

Spain would also like to take this opportunity to express its gratitude to the IPCC and to all the participants in the successive assessment reports and other documents that have been elaborated by IPCC for all the continuous efforts that have been made along the years, which have allowed the elaboration of better products both in quality and content.

Spain is submitting its initial points of view about the more relevant topics that should be considered in the elaboration of the structure and the content of the AR5 and its Synthesis Report.

a) General comment:

One of the elements that should be taken into account before the elaboration process of any document is the targeting user to whom is addressed, and more specifically in the case of the Synthesis Report. The policymakers are the last recipients of the scientific, technical and socioeconomic information provided by the IPCC and besides this information is subsequently debated both in international, in particular in UNFCCC, and national fora. For this reason, the 5th Assessment Report and its Synthesis Report, due their great political importance, should also be improved by addressing those questions relevant from the political point of view, without being prescriptive in any case.

b) Policy relevant scientific and technical topics

Regarding the work of the different Working Groups, a greater coordination during the elaboration process of each volume that will be part of the 5th Assessment Report should be pursued. It is also desirable a greater integration of the results so that the crosscutting issues among the different Working Groups could be addressed in a more global and effective way, specially between Working Group II and Working Group III. Within these crosscutting issues and specifically in the interrelationship between mitigation and adaptation to climate change, an important element to be considered is the cost and benefits of adaptation and mitigation in all levels, from the global to local perspective and the quantification of action and inaction costs, all these under different scenarios.

An important topic that should be taken into account is the study of ranges of the different stabilization scenarios and its consideration from a scientific, technical and socioeconomic perspective which is the safest scenario in terms of impacts, vulnerability and adaptation.

It should be also considered from the Working Group I perspective, what are the probabilities of occurrence of abrupt and irreversible changes as well as the probability of frequency change of high impact weather events for a range of emissions scenarios, including the lowest and more ambitious mitigation scenarios at all levels. High impact weather phenomena affecting different regions should be also included, not only tropical cyclones, as e.g. future evolution of Mediterranean cyclones frequency.

The validation of global climate models at regional level is another aspect that should be deal with by identifying regions where the different climate models better respond. This validation exercise should be accompanied by a coordination effort and improvement in the domain of regional modelling.

With regard to adaptation, impact assessment should be addressed from a much wider point of view than it has been done to date. The existing interrelationship among different sectors sensitive to climate will be affected by the adverse climate change effects. The modifications or impacts identified in each sector will also affect and feedback other related sectors (e.g. water resources and biodiversity, mountainous areas, islands, etc).

On the other hand, sectors not enough covered in previous assessment reports such as tourism, infrastructures, marine resources, finance, industry, etc should be addressed in a more detailed way in the next assessment report. Moreover, some sectors have been evaluated from a very narrow perspective in previous reports. The perspective should be expanded in the next assessment report. This is, for example, the case of impacts in coastal zones. Not only the sea level rise will be decisive in the changes that will occur in these places but also variations in other variables of coastal physical dynamics, ocean acidification, etc will be determining factors to assess climate change marks.

Relevant issues such as maritime and air traffic emissions, new energy sources, inclusion of new categories, mitigation potential divided in Annex I and non Annex I countries should also been assessed. Mitigation analysis should be included not only at global but also at regional level together with the identification of social and economic instruments for mitigation.

The approval and deployment of a future agreement in Copenhagen under United Nation Framework Convention on Climate Change (UNFCCC) will demand new tasks to the scientific community in order to respond to the questions raised as result of that compromise. In this regard, the 5th Assessment Report, which deadline is planned for 2014, should review from the scientific, technical and socioeconomic point of view the issues derived from the agreement that could need an assessment or contribution of new knowledge, such as the identification of new technologies needed to fulfil the reached agreements.

c) Synthesis Report

As we have previously commented, and in order to improve the content of the whole report, it should be carried out a better coordination among the Working Groups. And not only the coordination should be necessary to harmonize the information and the content of each Working Group but also the elaboration of the synthesis in one and only document covering the work done by the three groups is crucial to fulfil the information needs for policymakers all over the world.

To give an answer to this global need of outstanding political information, the synthesis report should be able to answer the questions made from the international level to the local level going through regional, sub regional and national level as far as possible.

Another aspect that should be also addressed by the Synthesis Report is the comparability issue and the continuity of certain significant elements already presented in previous synthesis reports. For example, the possibility of representing the evolution of graphs or summary boxes with the corresponding updates from each assessment report. The comparison with previous releases of the same graphs would allow an straightforward representation of evolution of knowledge along the years. Besides, the inclusion in the synthesis report of new graphs and summary tables made from information obtained from the three Working Groups is an important issue that should not been neglected.

Sri Lanka

01 June 09

Reference No. 4995-09/IPCC/AR5 dated 29 April 2009, I am submitting some policy relevant technical topics to be addressed in the AR5 and its Synthesis Report.

1. Health impacts and trends due to concentrations of pollution particles with the global warming.
2. Socio economic impacts of the people in vulnerable areas for weather related natural disasters.
3. Effects of extreme events for the tropical agricultural crops and sudden crop failures.
4. Health impacts due to high heat index and heat index trends.
5. How climate change affects women in rural area, as a gender issue.

Sudan

07 June 09

1- The issue of resource-based conflicts and the role of climate change in triggering them – and the resulting migration and displacement. We know that environmental factors play a central role in local disputes and competition over resources. Emerging literature made it evidence that understanding the root causes of the problem is key to finding lasting solutions.
The role of adaptation, institutions and policies etc.

2- We would like to see equity issues (gender, inter-generational etc) and the historical responsibilities of industrialized countries, given due consideration in the AR5, including the link of climate change to development (past, present and future development).

3- More integration between the three WGs reports and the links between mitigation, adaptation and sustainable development- this should start with the integration in the process rather than looking for it in the final product through e,g more interaction between the authors of the 3 working groups.

Sweden
29 May 09

We are pleased to have the opportunity to provide our view in beforehand to the scoping discussion on AR 5. We are certain that most of our suggestions already will be in the mind of experts participating in the meeting, but here are some topics we would like to see in the AR 5 and its SYR.

1. The world's forests as a carbon sink in a changing climate is an important aspect of the carbon cycle. There seems to be different research results whether tropical and boreal forests will be a sink or a source in a future warmer world with higher greenhouse gas levels in the atmosphere. The AR5 could more highlight this topic.
2. Different emission trading systems may be linked in the future – what will the consequences of different ways of link these system have on the emission levels. The impacts on economy efficiency should be included as well.
3. Continued highlighting of emission stabilisation scenarios and costs. Describe the levels of greenhouse gases in the atmosphere and related emissions paths that could lead to the two degree target.
4. Costs for emission reductions compared to costs for damage due to increased greenhouse gas levels and their impacts on ecosystem services, built environment etc.
5. An analysis of methods to overcome inertia and obstacles for reducing emissions.
6. Improve the discussion on feedback mechanisms, such as permafrost melting, sea temperature and carbon uptake, the impact of temperature increase on photosynthesis and carbon sequestration in vegetation and soils, and how the albedo is affected by ice and snow cover and cloud formation.
7. For the physical planning, the security marginal for a sea level rise in a 100-years perspective are most important. Impacts of potential extreme sea level rise should be highlighted.
8. Geoengineering was negatively addressed in the AR 4, but what new information is there and what pros and cons would be the effect.
9. Strengthening the cross cutting issue of sustainable development and climate change mitigation and adaptation.

Switzerland
31 May 09

Working Group I

1. Title of the suggested topic:
Chemistry, Aerosols, and Clouds

2. Short Description
Review of the state of the system and its susceptibility to change with a focus on interactions with circulation systems, and interactions among subsystems:

- **Chemistry**: Oxidizing capacity of the atmosphere; Polar stratospheric clouds & high-latitude ozone depletion; Precursors to aerosols
- **Aerosols**: Primary emission processes; Global distribution of aerosols; Role of cloud active aerosol; Surface albedo
- **Clouds**: Better, including regional, constraints on cloud properties; Development of theoretical ideas on cloud feedbacks; Vertical structure of clouds and convection
- **Subsystem interactions:** Aerosol-cloud-precipitation; Aerosol-chemistry; Chemistry-convection/clouds

Further notes:

- We suggest to focus on just the overall aerosol effect (direct and indirect) instead of too many individual aerosol effects on clouds: this is more appropriate both from observational constraints from an energy balance perspective and from inverse models
- There has been a developing understanding of how chemistry and air-pollution depends on structural aspects of the circulation, in particular clouds and convection. These links could be developed.
- We think that one needs to mention Geo-Engineering as a manifestation of aerosols effects on climate and climate change

3. Justification of the topic

A chapter focusing on these compositional contributions of the atmosphere to the climate change problem is warranted because they are so essential, and have long been neglected. Specifically: Cloud feedbacks determine climate sensitivity and continue to be the largest source of inter-model differences in estimates of climate sensitivity. Aerosols are the largest uncertainties in forcing and have pronounced regional signals. Clouds, cloud processes and the aerosol are crucial to setting the energy budget regionally, and hence the credibility of regional climate prediction, not to mention surface coupling (carbon cycle, surface-albedo feedbacks, etc). Continued and increasing interest in how climate change will affect regional airquality and human health.

6. Person(s) submitting the topic (including e-mail address)

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Bjorn Stevens (bjorn.stevens@zmaw.de)
on behalf of the Aerosols, Clouds, Precipitation and Climate (ACPC) steering committee that consists of representatives from iLEAPS (Meinrat Andreae, Markku Kulmala and Daniel Rosenfeld), IGAC (Sandro Fuzzi, Graham Feingold, and Colin O'Dowd) and GEWEX (Bill Lau, Ulrike Lohmann and Bjorn Stevens).

1. Title of the suggested topic:

Other perspectives of climate change: rapid or abrupt climate change & changes in the probability distribution function

2. Short Description

This topic focuses on statistical analysis of various time series data to a) quantify the degree and types of rapid or abrupt climate change events of the past, and b) analyse changes in the variability of the time series over time and not just of the mean or the trend function.
The relevance for (a) lies in the fact that climate change need not be a smooth process, as has been addressed repeatedly in the palaeo climate literature in particular. As for (b), changes in the extreme quantile functions in particular, namely the tails of the probability distribution functions of the stochastic processes of interest (i.e. of the time series observations) have direct relevance for risk analysis.

3. Justification of the topic

Typically in the literature, 'climate change' is addressed as the phenomenon of a smooth change in the mean (trend) function. However, two additional aspects are also of interest and should be addressed by appropriate analysis of time series observations. These are a) Changes in the quantile curves of various time series observations. This corresponds to quantification of changes in the entire (underlying) distribution function over time, including variability and extremes. b) Quantification of rapid climate changes of the past, as observed in various published palaeo time series observations.

4. Key References

Ghosh, S., Draghicescu, D. (2002) Predicting the distribution function for longmemory processes. International Journal of Forecasting, 18: 283-290.
Menendez, P. and Ghosh, S. (2006), On some nonparametric methods for assessing climate change", 2006 Proceedings of the American Statistical Association, Nonparametrics Section [CD-ROM], Seattle, WA: American Statistical Association

5. Comment (if necessary)
The above work (Gosh 2002) was done as part of developing statistical methods for assessing space-time changes in the distribution of (heavy) precipitation events in Switzerland (Swiss NSF project). This paper considers a methodological issue in the prediction problem, which has direct relevance for risk assessment via prediction of probabilities of events of interest, as well as high and low quantiles (cf. extremes) of processes.
In related research, these issues are further extended to address long-term trend, estimation of rapid climate change points and statistical age-depth modelling via analysis of some unequally spaced palaeo time series observations (ice and sediment core data) (Menendez and Gosh 2006).

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1. Title of the suggested topic:
Paleoenviromental records as a key to understand environmental response to strong and rapid climate change

2. Short Description
Paleoenvironmental time-series (e.g. pollen, charcoal, macrofossils, ostracodes, diatoms, grain sizes, magnetism, isotope analyses, element analysis) provide unique opportunities to reconstruct past environmental changes. Research has emphasized how important it is to consider such information for a better understanding of ecosystem and societal responses to climatic changes. Precision and resolution of such environmental time-series reach those of the Greenland and Antarctica ice cores and can be matched to these climatic records by (precise) chronology in order to study how humans, ecosystems and organisms responded to climatic change in the past. These insights are useful to anticipate future environmental dynamics.

3. Justification of the topic
The IPCC Report (fortunately) lays much weight on paleoclimate in Working Group I Report "The Physical Science Basis", but most strikingly paleo-environmental research is almost completely neglected in the Working Group II Report "Impacts, Adaptation and Vulnerability". No leading paleoecologist is part of the group. This is a serious scientific gap that should be bridged as soon as possible. The report of Working Group II could be substantially improved by considering paleoecological research adequately.

4. Key References
Overpeck J, Whitlock C and Huntley B 2003 Terrestrial biosphere dynamics in the climate system: past and future. In Paleoclimate, Global Change and the Future, Eds K D Alverson, R S Bradley and T F Pedersen. pp 81-103. Springer, Berlin.

6. Person(s) submitting the topic (including e-mail address)
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Working Group II

1. Title of the suggested topic:
WGII Chapter: Mountains and Highlands

2. Short Description
This chapter focuses on the magnitude of the climate signal at high elevations and on physical and biological responses of mountain regions, especially, but not only, those with permanent or significant seasonal cryospheres, to projected changes in means and variances of temperature, precipitation, other climatic variables and feedback mechanisms, such as albedo. Physical

responses include, but are not limited to, changes in permafrost, snowpack, and glacier mass balance, in surface and subsurface hydrology, especially timing and nature of discharge regimes as well as water quality, in geomorphological processes mediated by frozen and liquid water, in soil forming processes, in vegetation structure, composition and migration, in disturbance regimes and in carbon storage and nutrient cycling.

3. Justification of the topic

Physical and biological processes in mountains are exceptionally sensitive to climate change. Mountains are geomorphically dynamic, with great diversity arising from altitudinal zonation and disturbance. In mountains as in polar regions the 0° isohyet separates vastly different biophysical regimes that give rise to this diversity. A change in the altitude of that isohyet will expose new substrates to different processes, creating novel regimes. These changes in regime will, as in coastal areas, have great impacts not only on the tenth of humanity that lives in mountain regions but also on that half of humanity that depends on water resources emanating from mountain regions. In much of the world mountain populations are more vulnerable to climate change and its impacts than are urban or lowland populations. In addition, the scarce water resources from mountain regions are often a source of political tension among downstream nations.

4. Key References

Bradley, R. S., F. T. Keimig, and H. F. Diaz. 2004, Projected temperature changes along the American cordillera and the planned GCOS network. Geophys. Res.Lett., 31, L16210, doi:10.1029/2004GL020229.

Nogues-Bravo, D., M.B. Araujo, M.P. Erread, J.P. Martınez-Rica. 2007. Exposure of global mountain systems to climate warming during the 21st Century. Global Environmental Change 17 (2007) 420–428 doi:10.1016/j.gloenvcha.2006.11.007

Viviroli, D., H. H. Dürr, B. Messerli, M. Meybeck, and R. Weingartner. 2007. Mountains of the world, water towers for humanity: Typology, mapping, and global significance, Water Resour. Res., 43, W07447

Baron, J.S., T. M. Schmidt, and M. D. Hartman. 2009. Climate-induced changes in high elevation stream nitrate dynamics. Global Change Biology (in press).

J. Lenoir, J. C. Gégout, P. A. Marquet, P. de Ruffray, and H. Brisse. 2008. A significant upward shift in plant species optimum elevation during the 20th century. Science 320 (5884), 1768. DOI: 10.1126/science.1156831

Stewart, I.T. 2009. Changes in snowpack and snowmelt runoff for key mountain regions. Hydrological Processes 23(1):78-94. 10.1002/hyp.7128

Watson, R. T. and Haeberli, W. (2004): Environmental threats, mitigation strategies and high-mountain areas. In: Royal Colloquium: Mountain Areas – a Global Resource; Ambio Special Report, 13, 2-10.

5. Comment

Impacts on ecosystem services arising from mountain regions and thereby on human societies that depend on them vary considerably across the globe and as such, should be treated explicitly in each of the regional chapters. It is particularly important that mountain regions be addressed in chapters on Asia, Africa and Latin America where mountains are important not just for the resources they export but also a prime human habitat above arid or otherwise inhospitable tropical environments.

6. Person(s) submitting the topic (including e-mail address)

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1. Title of the suggested topic:
Aeroallergens and pollution

2. Short Description
a) The concomitant action of aeroallergens and pollution on the development of respiratory diseases and allergy became evident from new research results in the last years. These topics were separately treated in chapters 8.2.6 and 8.2.7 from AR4-WGII report.
b) The measurement of allergens in the air is also very recent topic (e.g. just started EU project HIALINE)

3. Justification of the topic
a) Up to now, the effects of many environmental factors have mostly been considered separately. The effects of simultaneous or successive exposure to pollution and environmental factors such as allergens received increasing attention in recent years.
b) There is more and more evidence that not only the allergen carrier (e.g. pollen grains) should be monitored, but also the allergen concentrations. This is allowed by recent technical developments.

4. Key References
a) Schober W, Behrendt H. Einfluss von Umweltfaktoren auf die Allergieentstehung.
HNO 2008 ; 56 : 752-8.
D'Amato G, Cecchi L, Bonini S et al. Allergenic pollen and pollen allergy in Europe.
Allergy 2007: 62: 976–990.
b) Buters JT, Kasche A, Weichenmeier I, et al. Year-to-year variation in release of Bet v
1 allergen from birch pollen : evidence for geographical differences
betweenWest and South Germany. Int Arch Allergy Immunol 2008 ; 145 : 122-30

6. Person(s) submitting the topic (including e-mail address)
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1. Title of the suggested topic:
Regional high-resolution (economic) impact modeling on a 2030 timescale
(or Careful consideration of future climate extremes and their societal and financial consequences on a time horizon 2030)

2. Short Description
Adaptation options are often assessed on a qualitative level, rather than quantitatively on a regional high-resolution scale, which would be needed for taking adaptation decisions. Further research would be required to assess economically what makes sense to invest in (risk reduction, avoidance or transfer solutions) and how to compose a suitable adaptation strategy.

3. Justification of the topic
Adapting to unavoidable effects of climate change and preparing for future changes must become a priority for many countries. Rising temperatures appear to have already induced several system and sector changes, and a further temperature increase may have significant impacts on all sectors relevant to human life.
Developing countries, which already pay a high price for their vulnerability to climate, are particularly at risk from the impacts of further climate change. Some governments have embarked on a range of adaptation efforts to respond to this challenge, and funding sources to support adaptation measures have been increasing. However, while several of these efforts have been described and analyzed in detail, decision makers are still struggling to adopt systematic approaches to their adaptation strategy. The absence of local and regional economic assessments of adaptation options means that interventions frequently turn out more costly than necessary, are weakly prioritized, and are often designed in isolation of development policies.

6. Person(s) submitting the topic (including e-mail address)
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Working Group III

1. Title of the suggested topic:
Effects of climate change on economic performance and violent conflict

2. Short Description
The relationship between climate change and violent/armed conflict (interstate and/or intrastate) has been the subject of some recent research. With a few exceptions, this literature has not been able to empirically establish the existence of a robust, systematic, causal relationship. This may reflect the absence of such a relationship in the real world. However, in our view, this is simply a consequence of the theoretical and methodological limitations of existing work. We propose to examine this relationship along two dimensions:
(1) Carefully specify the mechanism through which climate may affect the incidence of conflict. In particular, one should focus on the chain linking climatic conditions, economic welfare, and conflict, but also emphasize how the latter part of this link depends critically on the institutional features of political systems.
(2) At the methodological level, researchers should try and solve the simultaneity problem that has plagued the existing literature – climate conditions affect the economy and conflict, but the effects may also operate the other way.

3. Justification of the topic
In a world increasingly likely to be subject to severe climate change, the gaps in our knowledge about the consequences of climate change in terms of increasing the probability of violent conflicts are daunting. More importantly, the potential for "conventional wisdom" to be established based on spreading of hearsay and unfounded claims is clearly evident and potentially detrimental to appropriate policy action. The formulation of appropriate policies by the international community aiming at preventing violent conflict requires knowledge of the relative contribution and interactions of economic conditions and political institutions, the two main channels of transmission of climate change to violent conflict. Research results on this issue entail important implications for policymakers interested in knowing how to peacefully cope with the effects of climate change.

4. Key References
Buhaug, Halvard, Nils Petter Gleditsch and Ole Magnus Theisen (2008) "Implications of climate change for armed conflict," paper presented at the World Bank Workshop on *Social Dimensions of Climate Change*. The World Bank, Washington D.C., 5-6 March;
http://siteresources.worldbank.org/INTRANETSOCIALDEVELOPMENT/Resources/SDCCWorkingPaper_Conflict.pdf.

5. Comment
We are currently launching a research project on this issue and are planning to have robust statistical results by mid-to-late 2010.

6. Person(s) submitting the topic (including e-mail address)
Prof. Dr. Vally Koubi, Department of Economics and Oeschger Center, University of Berne, vally.koubi@vwi.unibe.ch
Prof. Dr. Thomas Bernauer, Institute for Environmental Decisions, ETH Zurich, thbe0520@ethz.ch

1. Title of the suggested topic:
Special chapter on human dimensions of mitigation measures

2. Short Description
Most of the IPCC AR4 WGIII report focused on technical aspects of mitigation options (potentials of renewable energy, energy efficiency, emission scenarios, etc.), but only in very short paragraphs dealt with human aspects of mitigation (e.g. WGIII, 6.7.6, 6.7.7). However, one of the big challenges in mitigation will be to „turn knowledge into action". There are a number of corresponding psychological issues (e.g. risk perception, common action). How should we communicate the climate problem to initiate action? How do people perceive the problem? Why are no-regret measures not implemented? Such and similar questions should be assessed thoroughly. There are a number of corresponding topics which are addressed by projects of the International Human Dimensions of Climate Change Program (IHDP). They should be included in the next IPCC report.

3. Justification of the topic
The transition of existing knowledge concerning climate change mitigation into action as soon as possible and in as many countries as possible will be a key constraint to the possibility to keep climate change below a reasonable threshold. Therefore the mechanisms influencing this transition should be thoroughly assessed to enhance knowledge on how to communicate, how to motivate people, how to stimulate common action, how to create awareness. While the prescriptions for actions may be very different depending on the political system, the cultural and ethical background of the society and the economic structure, an scientific aassessment of different approaches and best practices is important to support decision makers.

4. Key References
Programs that provide substantial input
International Human Dimensions Program on Global Environmental Change (IHDP) http://www.ihdp.org/ and especially their core science projects:
Urbanization and Global Environmental Change (UGEC) http://www.ugec.org/ ;
Industrial Transformation (IT) http://www.ihdp-it.org ;
Earth System Governance (ESG) http://www.earthsystemgovernance.org/ and its predecessor program Institutional Dimensions of Global Environmental Change (IDGEC) http://fiesta.bren.ucsb.edu/~idgec/

6. Person(s) submitting the topic (including e-mail address)
ProClim- Forum for Climate and Global Change, Swiss Academy of Sciences, Schwarztorstr. 9, 3011 Bern, http://www.proclim.ch

1. **Title of the topic**:
Carbon markets and protectionism

2. **Short description**
IPCC's fourth assessment report emphasises that CO2 abatement policies were not really successful until now, but there is no explanation. Although the EU and some other countries like Switzerland have introduced carbon markets, there are still doubts that all EU countries or Switzerland will attain their greenhouse gases reduction objectives. Indeed, the introduction of an emission rights market should have been enough to fulfil Kyoto objectives, but many countries use the instrument as a way to protect their industry against international competition, instead of really aiming at reducing emissions.

3. Justification of the topic
CO2 abatement policies based on emission rights are actually inefficient because they are not designed adequately. An assessment and comparison of current practices is therefore essential to avoid the postponing of CO2 abatement. A lot of countries will create their own AAU rights market in the near future, and learning lessons from recent experiences is of vital importance.

4. Key References
Godard O. (2005): Evaluation approfondie du plan français d'affectation de quotas de CO2 aux entreprises, Cahier du laboratoire d' econométrie: 2005-013.
Dupuis J. (2008): Analyse politique des conditions de succès et d'échec des marchés de droits d'émission. Lausanne: Université de Lausanne Institut d'études politiques et internationales.
Knoepfel P., Nahrath, S., Varone, F., & Savary, J. (in press): Analyse des politiques de l'environnement. Zurich: Rüegger.

5. Comment
Olivier Godard has shown how France used the ETS market to grant a subsidy to some part of the industry. The same phenomenon can be observed in Switzerland and is described in a book Peter Knoepfel to be published soon (see ref. above).

6. Person(s) submitting the topic
Peter Knoepfel: Peter.knoepfel@idheap.unil.ch
Johann Dupuis: Johann.dupuis@idheap.unil.ch

1. **Title of the topic**:
The weakness of adaptation strategies at the national level

2. **Short description**
IPCC's fourth assessment report noticed that adaptation strategies are still weakly implemented in vulnerable countries and that the multilateral financing is still not sufficient. But an assessment of actions in developed countries to support the implementation of adaptation projects in the third world is lacking. We think that there is a necessity to evaluate to what extent adaptation projects are part of the development aid. Is adaptation supported in development aid policies? What are the differences between countries and how can these differences be explained? Is adaptation in third world countries an issue in the policy agenda of developed countries?

3. Justification of the topic
Because multilateral financing of adaptation is still insufficient and because article 4 of the UNFCCC requires that annex-1 countries support the adaptation needs of developing countries by providing technical assistance, technology and money, the assessment of annex-1 country's aid policies is necessary.

4. Key References
We have conducted an evaluation of the importance of adaptation strategies in the national debate in Switzerland, which is going to be published this year:
Dupuis J, Knoepfel P, A. (*to be published*). L'adaptation des pays pauvres aux changements climatiques: le double langage de la Suisse.

6. Person(s) submitting the topic (including e-mail address)
Peter Knoepfel: Peter.knoepfel@idheap.unil.ch
Johann Dupuis: Johann.dupuis@idheap.unil.ch

1. Title of the suggested topic:
Ethical Expertise for AR5

2. Short Description
We suggest that a chapter with a general overview of the ethical issues in climate change be included in AR5. Such a chapter should provide an analysis that can support political decision-making and facilitate structured discussion. Thus, it should not arrive at specific conclusions regarding the morally "correct" climate policy, but enumerate the approaches available in the state of the art literature as well as portray the most relevant arguments concerning all sides of the debate. Above all, authorities in the field of ethics rather than social or natural scientists should prepare such a chapter.

In case a chapter on ethical issues should not become a reality, we urge that, at the very least, in those chapters where ethical issues are expressly addressed, the expertise of professionals in the field of ethics is sought and that such professionals be included in the list of authors.

3. Justification of the topic
It is widely acknowledged that ethical questions play a central role in climate change issues and policy and that these questions are often quite intricate and not accessible to being judged by common sense alone. This is evidenced by the fact that a large and growing literature on climate change written by ethics specialists has appeared over the past years.
However, despite the fact that the IPCC reports obviously treat ethical issues, this literature has not found much access into the IPCC reports. But when they do treat these issues, they do not address them with the same rigour and the same scientific quality as other questions. There is an almost complete lack of professional specialists in ethics among the coordinating, lead, and contributing authors.

4. Key References
Gardiner, S. (2004). "Ethics and Global Climate Change," *Ethics* 114: 555 – 600.
Caney, S., S. Gardiner, D. Jamieson & H. Shue (eds.) (2009, forthcoming). *The Ethics of Climate Change* (New York: Oxford University Press).

5. Comment
This input is based on an initiative started in the spring of 2009. The initiative can be found in the attached document. It was signed by a large number of academics, including many leading figures in the field with peer reviewed publications.
We would be glad to be informed about how the input is handled – also to inform the signatories. We are very happy to discuss any further critical questions you might have about the content of the initiative, its origin or its exact goals etc.

6. Person(s) submitting the topic (including e-mail address)
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Dominic Roser (roser@ethik.uzh.ch, 044 254 38 45)

Cross-Working Group Topics WG I,-II

1. Title of the suggested topic:
Uncertainties associated with soil moisture-vegetation-climate interactions

2. Short Description
Soil moisture is a key variable of the climate system. It constrains plant evapotranspiration and photosynthesis in several regions of the world, with consequent impacts on the water, energy and biogeochemical cycles. Moreover it is a storage component for precipitation and radiation anomalies, inducing persistence in the climate system. Finally, it is of key relevance for climate variability and extreme events, in particular in the context of climate change. However, ground observations of soil moisture are very scarce, which leads to high uncertainties in the representation of the associated processes in current climate models. The associated uncertainties should be better highlighted in the IPCC AR5 report (in particular in the WG1 report). This is particularly relevant for projected changes in extreme events such as droughts, heatwaves and extreme precipitation events.

3. Justification of the topic
Soil moisture-vegetation-climate interactions play a key role for climate change (e.g. Seneviratne et al. 2006a), but current AGCMs strongly differ in the representation of the associated processes (e.g. Koster et al. 2004, Seneviratne et al. 2006b, Pitman et al. 2009, see Seneviratne et al. 2009 for an overview). These aspects have been insufficiently addressed in the past IPCC reports. For instance, Chapter 4 of the IPCC AR4 WG1 report addresses aspects of land hydrology (snow, ice), but does not include any reference to soil moisture. The corresponding section in Chapter 3 is very brief and mostly focused on the PDSI, without mentions of key limitations of this approach. The

impact of known uncertainties in soil moisture-vegetation-climate interactions for projected climate change is insufficiently addressed in Sections 7, 8, 10 and 11.

4. Key References

Seneviratne, S.I., D. Lüthi, M. Litschi, and C. Schär, 2006a: Land-atmosphere coupling and climate change in Europe. Nature, 443, 205-209. (can be downloaded from: http://www.iac.ethz.ch/people/sonia)
Seneviratne, S.I., T. Corti, E.L. Davin, M. Hirschi, I. Lehner, and A.J. Teuling, 2009: Investigating soil moisture-climate interactions in a changing climate: A review. Submitted to Earth-Science Reviews. (Invited Review)

6. Person(s) submitting the topic (including e-mail address)

Prof. Sonia Seneviratne, ETH Zurich, Switzerland, sonia.seneviratne@env.ethz.ch

1. Title of the suggested topic:
Abiotic and Biotic Carbon Cycle

2. Short Description

The global carbon cycle was not properly addressed in the AR4. Two chapters spread over two working groups dealt with this topic, i.e. Denman et al., 2007 and Fischlin et al., 2007.

3. Justification of the topic

Many readers have not realized the split of this topic into two chapters in two different volumes. Moreover, the two SPMs of WGI (about climate-carbon cycle feedback, p.13) and II (about biotic feedbacks and land use change, p.11) summarized key findings from those two chapters, yet, used very different language. Again a reason why some readers may have overlooked the connectedness and may have read similar messages as very different findings.

4. Key References

Denman, K.L., Brasseur, G., Chidthaisong, A., Ciais, P., Cox, P.M., Dickinson, R.E., Hauglustaine, D., Heinze, C., Holland, E., Jacob, D., Lohmann, U., Ramachandran, S., da Silva Dias, P.L., Wofsy, S.C. & Zhang, X., 2007. Couplings between changes in the climate system and biogeochemistry. In: Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K.B., Tignor, M. & Miller, H.L. (eds.), Climate change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 499-587.
Fischlin, A., Midgley, G.F., Price, J.T., Leemans, R., Gopal, B., Turley, C., Rounsevell, M.D.A., Dube, O.P., Tarazona, J. & Velichko, A.A., 2007. Ecosystems, their properties, goods and services. In: Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. & Hanson, C.E. (eds.), Climate change 2007: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel of Climate Change (IPCC). Cambridge University Press, Cambridge, UK, pp. 211-272.

6. Person(s) submitting the topic (including e-mail address)

Prof. Andreas Fischlin, Terrestrische Systemökologie, Institut für Integrative Biologie (IBZ) ETH Zürich, ETH Zentrum, CHN E35.1, Universitätsstrasse 16, 8092 Zürich, Phone: +41 (0) 44 633 60 90/85, e-Mail: andreas.fischlin@env.ethz.ch

1. Title of the suggested topic:
Identification of thresholds or rate of changes and communication of the risks to exceed these limits

2. Short Description

The communication in the IPCC Summary of Policymakers until now has mainly focussed on mean trends, accompanied by uncertainties. More recently, for an increasing set of topics probability

functions for projections are available. The identification of critical thresholds or critical rates of change and the communication of risks to exceed these limits should be enhanced, like e.g. the risk of exceedance of +2-degree or +3-degree warming, which are thought to be thresholds for „dangerous impacts“ or „severe negative impacts“ on agriculture, respectively, for a certain scenario.

3. Justification of the topic
Climate projections are often perceived as predictions. The communication of mean values or ranges do not adequatly inform about risks of occurrence of high (or „dangerous“) values. Since projections are inherently uncertain, it is important to also address risks in policy discussions. This would on the one hand inhibit discussions about the uncertainty of specific values, because the term „risk“ already expresses uncertainty, and on the other hand would draw the discussion on the important problem of risk of „high-end“ developments, which is currently not part of the political discussion. It would also underline the problem that a scenario leading in the mean to a warming of e.g. 2 degrees only means a 50% chance to meet the +2 degree threshold.

4. Key References
den Elzen, M., M. Meinshausen and D. van Vuuren (2007). "Multi-gas emission envelopes to meet greenhouse gas concentration targets: Costs versus certainty of limiting temperature increase." Global Environmental Change-Human and Policy Dimensions 17(2): 260-280.
Meinshausen, M., N. Meinshausen, W. Hare, S. C. B. Raper, K. Frieler, R. Knutti, D. J. Frame and M. R. Allen (2009). "Greenhouse-gas emission targets for limiting global warming to 2C." Nature 458(7242): 1158.

6. Person(s) submitting the topic (including e-mail address)
ProClim- Forum for Climate and Global Change
Swiss Academy of Sciences, Schwarztorstr. 9, 3011 Bern, http://www.proclim.ch

Cross-Working Group Topics, WG I-II-III

1. Title of the suggested topic:
Improved governance of water

2. Short Description
Water is relevant in most aspects of the physical, biological and socio-economic systems. It directly influences energy supply (hydropower), tourism (snow, water usage, glaciers), forestry and agriculture (productivity changes with changes in water supply, need for irrigation) and services from natural and semi-natural ecosystems. Changes in climate are likely to affect precipitation and, where relevant, the behaviour of snow and glaciers, and thus will have major impacts on the seasonality, quantity, and quality of surface runoff. Conflicts in water use (e.g., between agriculture, hydropower, tourism or mining, for example) as the resource diminishes through reduced precipitation in some areas and glacier and snow retreat in others will require novel water resource governance, because it will not just be a matter of adjusting to shifts in the physical environment but also to social changes related to new intensities of use and new market conditions affecting distribution.

3. Justification of the topic
Achieving sustainable water use poses particular challenges for policy making because of its nature as a public good and because it often has both upstream/downstream *and* transboundary characteristics. Climate change and concomitant socio-economic changes will test the resilience of current water management policies and may increase tensions among different economic actors. Novel water governance will thus become necessary to facilitate adaptation and prepare the way towards reducing detrimental competition among economic sectors that are all currently staking claims to dwindling water resources in many parts of the world.

4. Key References (if necessary and including web link / abstract as attachment)
www.acqwa.ch; http://www.dundee.ac.uk/water/aboutus/

6. Person(s) submitting the topic (including e-mail address)
Martin Beniston, Head of the Institute of Environmental Sciences, The University of Geneva, Switzerland (Martin.Beniston@unige.ch)

1. Title of the suggested topic:
Answers of IPCC to the most common sceptic's arguments

2. Short Description
Most of the sceptic's arguments against a human influence on climate are addressed in the IPCC report, but hidden in the whole report. We propose to prepare an answer for the most common arguments in a special section.

3. Justification of the topic
Since sceptic's arguments are widely used in the public (internet, newspapers, etc) and are important in the political discussion it might be useful to propose an answer for the most common arguments. Some of the arguments are so strange or for experts in the field obviously wrong, that they are not discussed in the report. These answers may, however, not be evident for lay people or politicians. An „authorative" comment of the IPCC therefore might be helpful.

5. Comment
Since the arguments might change over time (the „global warming has stopped" argument has only appeared recently), an update might be appropriate from time to time. We thus suggest a separate volume or a web-based instrument to be able to be updated on a regular basis. This may require a corresponding mechanisms / groups / responsibilites to be defined.

6. Person(s) submitting the topic (including e-mail address)
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1. Title of the suggested topic:
Cities and Climate Change

2. Short Description
A chapter on cities should be added to each IPCC WG Report and the SR:
• The City Chapter in the Working Group I Report should analyse the specific quality and scope of emissions from cities, in particular with regard to their dynamics. The key question is how urbanization will affect climate change (in a positive and/or negative way).
• The City Chapter in the Working Group II Report is particularly important for the assessment of the specific impact of Climate Change in the most vulnerable urban environments of Megacities.
• The City Chapter in the Working Group III Report would highlight the potentials of cities to play a decisive role in climate change mitigation, with the help of their central governments.
• The City Chapter in the SR would summarise these consolidated findings.

3. Justification of the topic
Cities and urban areas – home to 50 % of the world's population – are responsible for 70-80 % of the global Greenhouse Gas (GHG) emissions. On the other hand many cities are highly exposed to the effects of climate change. They need specific adaptation policies and action plans. Areas in which cities can make a difference, among others, are:

- Transport - increase public transport, ensure low or zero emission; establish smart traffic guidance systems, which reduce congestions and ease access.
- Waste – pioneer energy from advanced waste management technologies.
- Energy Efficiency – support environmentally sound technologies, retrofit public, private and commercial buildings.
- Lighting – accelerate the uptake of energy efficient lighting, such as LED's.
- Renewable Energy - lead and encourage uptake of renewable energy forms
- District Heating – Develop modern highly efficient energy networks
- Efficient Water Supply - boost water efficiency through sharing best practice.

Cities worldwide are already demonstrating leadership, taking responsibility for their GHG emissions and working towards sustainability. In fact, a large number of cities have already put forward ambitious reduction targets and achieved significant greenhouse gas reductions, but they can go even further – if they have the right tools and support from their national governments, as well as from bilateral or multilateral cooperation programmes under an enabling national and international framework. Given that by 2030 two thirds of the world's population will live in urban areas, it is expected that the cities' importance for combating climate change will even increase: Thereby, enhanced mitigation actions in cities could play a pivotal role within the future framework of nationally appropriate mitigation actions.

5. Comment
This proposal was developed jointly with the C40 Climate Leadership Group. The C40, under the chairmanship of Mayor David Miller, Toronto, comprises the world's largest cities, which are committed to tackling climate change (www.c40cities.org). The Swiss City of Basel is one of 16 smaller cities from around the world which were invited to become affiliates of the C40 because they are regarded as exemplary role models with features that may help solve CC related problems elsewhere.

6. Person(s) submitting the topic (including e-mail address)
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Elisabethenstrasse 22, 4051 Basel, Phone +41 61 205 10 10.

1. Title of the suggested topic:
Consistent baselines for the climate scenarios and consistent scenarios throughout the three reports

2. Short Description
In the IPCC AR4 report different baselines for climate scenarios were used. In WG I and II, the year 1990 was used as baseline for the climate scenarios, whereas WG III used pre-industrial values. We strongly recommend to define standard baselines for the whole report (either 1990 or pre-industrial) to ensure comparability of the results of the three working groups and to facilitate communication of the IPCC report. It would also be helpful to recommend the use the same periods of average for the calculation of climate variables (e.g. 1980-1999, 2080-2099). WG III introduces stabilization scenarios (Kat. I – VI), which are not discussed in the WGI and thus from a physical point of view, in addition to the SRES scenarions used in WG I and II. It would be helpful to discuss a common set of scenarios in all working group reports.

3. Justification of the topic
Much of the discussion about mitigation options have been focussed on a +2-degree threshold. This threshold, initially introduced by the EU, refers to the pre-industrial baseline. However, the climate projections presented in WGI refer to the 1990 baseline. This difference is confusing and probably is not noticed by many readers. It makes any communication and discussion extremely difficult. It also masks the problem, that the +2-degree threshold, which corresponds to a +1.5-degree threshold compared to 1990, is a scenario barely within the scenario range discussed in WG I.

4. Key References
IPCC AR4, WGI, Table SPM.3
IPCC AR4, WG III, Table SPM.5

6. Person(s) submitting the topic (including e-mail address)
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Thailand
30 May 09

Organization: Life Cycle Assessment Laboratory, National Metal and Materials Technology Center, National Science and Technology Development Agency (LCA Lab/MTEC/NSTDA)

As our organization works on the filed of Life Cycle Assessment and LCA applications, we would like to suggest a research policy for IPCC to create a harmonization system for helping our climate situation using Carbon Footprint. (a practical standardized system)

Carbon footprint of products or services is recently widely used as a public communication to raise awareness on global warming issue; especially on consumer level, which is used LCA as a basic tool. To approach the solution of climate change problem, there should be a suggested or standardized methodology that can be used as a reference.

ISO-TC207/SC7 is working on this issue now (ISO/NP 14067). However, it would take at least 2-3 years from now to finalize

IPCC could use its capacity to create such a system and methodology as soon as possible and promote it on the global level in order that all the activities would lead in the same direction to solve the climate change problem.

On the other hand, once the global warming issue is focused through CDM or carbon footprint activities, other environmental problems should be also considered to prevent the burden shift of the environment from one to another.

Turkey
04 June 09

Relevant topics for the AR5-Turkey

- Geographical balance for participation of experts should be ensured in the preparatio of AR5.
- An appropriate representation of scientific papers from all countries should be equally assessed for the relevant volumes and chapters of the AR5;
- More geographically balanced information should be included in regional chapters.
- Turkey was included in the Asian Countries in the IPCC AR4 WGII Report. In other words, only arid and semi-arid parts of Turkey were taken into account. This assessment doesn't reflect both the observed and projected climatic changes in Turkey and it is not presenting Turkey's climatic features and characteristics of its rainfall climatology. Turkey is located in Mediterranean macro climate zone. More than half of Turkey's land area has humid or semi-humid climatic features and relevant vegetation types. Therefore, Turkey supports the proposal on more detailed regional division, in better agreement with climatic and socioeconomic features in AR5. Turkey should be assessed in the region of Europe in AR5 and proposes a new subregion called "Mediterranean and Southern Europe".
- Turkey fully supports the proposal on "Special Report on Extreme Events and Disasters". Since climate analysis can help in mitigating effects of climate change in the activities of such as transportation, settling insurance claims, planning and management of capital projects, Turkey took initiative for becoming a subregional Mediterranean Climate Center under WMO RA VI RCC Network in October 2008. Turkey is willing to cooperate and collaborate in mitigating/adapting the consequences of climate related extreme events with all countries, particularly Eastern Mediterranean Countries. Turkey would like to contribute to this report with specific case studies.

United Kingdom of Great Britain and Northern Ireland
29 May 09

In response to the request for submissions for the 5th Assessment Report (AR5) scoping meeting in July, please find attached the response from the UK government. Please note that this builds on our letter to you prior to the 30th Session and so should be used as our most up to date views on the scope of the AR5.

Annex A draws on some lessons from the AR4 experience. It highlights to us the inherent difficulties of synthesis which the Working Group Report structure presents. It confirms us in the view that synthesis needs to be built in from the beginning and needs to be reflected in the scope of the individual reports.

Annex B notes the areas which we believe need new or enhanced consideration (many of these could fit into more than one working group, so we have also made suggestions for where they could be placed).

Annex C suggests some policy relevant questions which could provide guidance to the authors. These are in addition to those that were posed in the 3rd Assessment Report, which we suggest are also considered by the authors.

Annex D gives a straw-man outline for the synthesis report.

Please note that I have been nominated as the UK's new Deputy Focal Point for the IPCC in support of David Warrilow. I would be grateful if you could copy correspondence also to me.

Annex A: Lessons from the AR4

- Synthesis should be built in from the beginning. We need to avoid being restricted by WG structure. This means that there needs to be some parallel structure between WG reports (for example we need to deal with regional issues the similar way in each WG report.)
- Essential for synthesis to provide guidance through policy relevant questions – see some examples in Annex C
- Maintain flexibility to enable focus on live policy and science issues, even quite late in the process.
- Have a clear communication strategy at the beginning
- Move some sections covering background science on background material and methodologies to Annexes – where they are not directly relevant to policy makers (for example, technical information about climate modelling)
- More innovative approaches to looking at regional impacts – possibly having these in separate volumes

Annex B: Areas needing enhanced/new consideration

Working Group 1

Integrate paleo-data into all relevant parts of the report on observed climate change.

Working Group 2

Security and CC
Impacts on Agriculture

Working Group 3

Geo-engineering (options and implementation)
Emissions from aviation and shipping
Economics; Investment patterns and trade, inertia of the economic system to rapid decarbonisation
Life cycle assessment
Nuclear (fission and fusion)
The contribution to responses of developments in nanotechnology
Technological innovation for adaptation
CCS

Cross cutting issues

Oceans: Sea level Rise, ocean acidification, marine ecosystem impacts (WG1,2)
The role of soils – potential feedback loops, impacts on soils (WG1,2)

Ecosystem services and their co-benefits for adaptation and mitigation (WG1,2)
Emissions from permafrost (WG1,3)
Feedbacks (WG1,2,3)
Links to other policy areas – air pollution, desertification, deforestation, biodiversity (WG1,2,3)
Human behaviour and societal issues (WG2,3)
LULUCF; REDD; Agriculture and food security (including monitoring and verification of emissions reductions) (WG2,3)

Further consideration of the role of the built environment (WG2,3)

Annex C: Policy questions to be considered in the report

These are in addition to those listed in the 3rd Assessment Report

What are the risks of climate change associated with different greenhouse gas stabilisation levels?

What stabilisation levels will avoid "dangerous levels" of climate change, noting that there may be differing views on what is "dangerous"?

What emission pathways are required to achieve different levels of stabilisation?

What are the societal, economic and technological changes that may be required to achieve different stabilisation levels?

What are the barriers to achieving such changes and how might they be overcome?

What are the potential conflicts of such changes with other development objectives?

Annex D: Straw-man outline for the synthesis report

1. Past and current climate change and its effects. (WG1,2)
2. Future climate change and risks (and key vulnerabilities), with BAU emission scenarios (WG1,2,3)
3. Avoiding dangerous climate change – risks and mitigation pathways (WG1,2,3)
4. Mitigation policies and measures (WG3)
5. Mitigation technologies (WG3)
6. Adaptation options, methods and approaches (WG2)
7. Economics of climate change (WG2,3)
8. Human behaviour and climate change (WG2,3)
9. Vision for a low carbon society (WG2,3)
10. Specialised science-policy issues; e.g. REDD, LULUCF, Bunkers, CCS
11. Specific regional issues (WG 1,2,3)
12. Interaction with other policy issues (e.g. biodiversity, agriculture, water, health etc) (WG1,2,3)
13. FAQs

Additional points:
prepared for P-30, 15 April 09

Style of report

Synthesis should take pre-eminence. In fact the whole report could be prepared as a synthesis.

Policy relevant questions essential to meet policy community needs and to give an overall structure to the report. Will help deal with cross cutting issues and provide basis for synthesis if well posed. Helpful to organise around policy needs rather than scientific disciplines.

Aim for less of a text book

Could be helpful to break into smaller volumes and have some sections written jointly by WGs. This would help synthesis.

Nature of scoping agreement

Scope is about content and structure.

Scope should be enabling and not limiting.

Avoid putting science into a straight jacket.

Scoping process should cover subject areas and questions .

Identify “users” for different parts of the report and consult them.

United States of America

02 June 09

The United States appreciates the opportunity to submit policy relevant scientific technical topics to be addressed in the IPCC Fifth Assessment Report and its Synthesis Report. The United States’ suggested topics are listed below. We submit this list with the understanding that these topics are intended to provide general guidance to the scientific experts who will gather at the AR5 Scoping Meeting in July. As these experts have been selected for the specific purpose of drafting Working Group outlines for the consideration of the IPCC Plenary, we understand that discussion will be of a relatively general nature, to help flag issues for the over AR5 proces. We also understand that there will likely be a second AR5 Scoping Meeting focused on the Synthesis Report, where topics will be discussed in detail for the purpose of structuring the Synthesis Report. We may have additional, targeted policy relevant topics to contribute to that Meeting.

Suggested Policy Relevant Scientific Technical Topics:

1) **Changes in drought and heavy rainfall and their implications for crops, health, flooding, and other impacts.** There have been many recent advances in understanding of the hydrologic cycle, and these are of high relevance for policy. Both physical science (WG1) and impacts (WG2) should be included. The topic is important, and could be a candidate for the SYR as well as the WG reports.

2) **Carbon cycle feedbacks** can have a major impact on climate change projections, as carbon is released from the ocean and soils in a warming world. The potential for climate discontinuities, or tipping points, is of particular interest. There have been a number of important recent papers providing better diagnosis of models and a few dealing with atmospheric measurements.

3) **The period past 2100:** The AR5 is committed to providing information on climate past 2100. It will also be important for it to provide help in thinking about making decisions that affect a period so far in the future. In particular, the IPCC should directly address (1) the very large uncertainty in climate simulations for that period, (2) the almost total unknowability of thinks like population, GDP, and technology, and (3) the kinds of areas where we know enough now or can know to let this period contribute to good decisions.

4) **Time scales of ice sheet feedbacks and lags.** Carbon is expected to be emitted in the 21st century, resulting in a warmer world. Carbon emissions can be expected to stop sometime in the next century or two, as carbon supplies are exhausted and as alternatives become more competitive. What happens next has been little explored. Some recent work suggests that the ice sheets may outlast the emitted carbon (Charbit et al., GRL, 2008) while other papers (e.g., Rignot et al. Science, 2008) suggest a much more rapid evolution will yield large sea level rise quickly, possibly on a time scale much faster than the phaseout of carbon energy sources. Issues of physical processes and time lags should be explicitly explored in AR5, ensuring that an undue emphasis is not put upon specific numerical values for sea level rise but rather a physical understanding.

5) **Climate tradeoffs among the range of greenhouse gases and aerosols.** Carbon trading requires the best possible information to compare the climate effects not just of CO2 but of the full range of gases, and, if possible, aerosols. Interactions with WG3 would be helpful here, since information on emissions, their sources, and reduction potentials is also critical, and the synthesis of the two would be a useful component of the SYR as well as the WG reports. Information on the lifetime of the gases and their radiative forcing is essential, and more is needed. New studies dealing in more depth with the time scales of the related climate responses (e.g., persistence after emissions stop) need more examination in AR5. A discussion of appropriate metrics and their implications for mitigation strategies is relevant in this context. The AR5 should also address the degree to which different forcings can result in regional responses (including not only sulfate aerosols, but also soot, the effects of soot on snow, etc.).

6) **Attribution of climate changes that extend beyond global mean temperature.** This issue was advanced in the AR4 but much more is needed in AR5). The impact of a range of forcing agents for aspects of climate response that extend beyond global temperature alone (e.g., the effects of aerosols on rainfall), the robustness of drought projections, the understanding of heavy rainfall, understanding of both Arctic and Antarctic sea ice extent changes, etc. is absolutely critical to examine. This will require better coupling between the forcing chapter or sections in the WG1 report, model evaluation chapter or sections, and attribution. It will also require quick action to work with WCRP to get the best possible documentation of what is being put in the models, including aerosol forcings, ozone depletion, etc.

7) **Impacts, risk and adaptation.** It will be important to assess impacts of climate change in the context of other stresses, including stresses related to development status, economic base, infrastructure, geopolitical setting, land use, and ecological resources. This assessment should be framed in terms of risk management, where risk integrates consequence and probability. This means that AR5 will need to expand the coverage of adaptation to include more information on consequences, experiences with mainstreaming, and decision support for adaptation strategies. Coverage of impacts should also be broadened to increase coverage of oceans, security, indirect impacts, interactive impacts, and impacts related to extremes and disasters. Ocean acidification warrants particular attention.

8) **Integrating climate science with climate impacts**, especially in areas where the impacts can provide strong feedbacks to the climate system, including land and ocean carbon cycles, exchanges of other greenhouse gases, and ice.

9) **Regional aspects of climate change** should be treated in an a way that reduces redundancy with sectoral chapters and increases integration of climate science, impacts, adaptation, and vulnerability.

10) **Regional differences in emission baselines and mitigation potentials.** These are implicit in the IAMs used for the RCPs, but are not treated in much depth in AR4. Baselines are a large source of uncertainty in costs/feasibility of stabilization, and they warrant a detailed review.

11) **Uncertainty and policy revision.** New domestic and international policies are seeking to balance the desire for clear signals to households and investors against the inherent uncertainty over events spanning many decades. The AR5 should review the literature on balancing uncertainty and action with a specific eye towards how policy revision interacts with specific institutions, such as emission trading programs with various features (banking, borrowing, cost containment).

12) **Delayed entry, constrained policy, and stabilization.** There has been considerable work in EMF-22 and others looking at the effect on stabilization scenarios of delayed entry among developing countries as well as the use of constrained (non-market-based) policies. This should be included in the AR5 or special report.

European Community
prepared for P-30, 08 April 09

1. General points

Despite the considerable advancements of climate change science in recent decades - evident by the IPCC Assessment Reports -, important uncertainties and knowledge gaps still remain. It is now widely recognised, especially after the IPCC AR4, that we have enough evidence to start acting through adaptation and mitigation; however, a better understanding of the causes and evolution of climate change and its impacts on humans, and ecosystems will allow us to act with greater efficiency.

Given the complexities of the earth system, the global economy and the need to deviate significantly from business as usual development paths, thus given the magnitude of the challenges, an integrated approach in climate change research needs to be employed. This need for integrated research is widely recognised since long. There is a clear need for closer cooperation within and across the three IPCC Working Groups (WGs) to address more efficiently cross-cutting issues (some examples of these areas for interaction are indicated below). To that respect, better integration of natural, social and economic aspects, will be essential in order to achieve a robust scientific understanding of the functioning of the Earth-climate system and be able to answer, with higher confidence, fundamental scientific questions that are of high policy relevance.
Integration of solid scientific analyses, undertaken in all 3 WGs, around policy needs and questions, will maximize the relevance and impact of the findings, especially in relation to global efforts to combat climate change.

The scope of the AR5 and it's working group contributions should open-up options rather than restrict them. In particular it should allow and encourage contributing to assessing key cross cutting questions from the perspective of individual working groups, where this is necessary. This would prepare and enable a solid basis for an integrated assessment in a synthesis report. This opening-up options including enabling interaction between working groups is in particular relevant some time after the UNFCCC COP 15 in Copenhagen will have concluded a new global approach to tackling climate change, which may bring up new - yet unknown - policy needs.

There is a need to move the assessment towards a more holistic view, where synergies and trade-offs of various policy options and actions are better taken into account. We would hope that the AR5 - based on a robust assessment of the physical science basis - could strengthen its assessment on the economics of climate change. This relates to both main policy strategies: adaptation and mitigation. Most helpful are assessments of costs of adaptation including cost of impacts, as well as the potential and cost of mitigation options. Cost estimates are essential for policy measures and choices at regional scale. Consistent

cost metrics and relevant uncertainty estimates should also be communicated with indications on the harmonized methods used for the treatment of uncertainties across the disciplines covered by AR5.

There is also a need to better identify barriers for the uptake of useful adaptation and mitigation measures and in particular approaches how to overcome them. The AR4 sections are often of a very general nature, and a more regional approach would be helpful, possibly in the form of case studies.

In particular, we believe that a Synthesis Report, being such a key document for informing policy making, should be worked on right from the start. With a view to integrate and synthesise the findings, rather than selectively summarize them in the second place the three Working Groups may wish to organise their work both in terms of structure and development process, with a defined scope of the synthesis report and areas for cooperation and integration in mind. It is also essential that the development of AR5 is accompanied by a communication strategy.

2. The physical science basis - WG I

Obviously we would like to see an increased effort on the key uncertainties as identified in the AR4. The AR5 will have to address these - and indicate clearly the progress made since AR4- as they are often related to significant reasons for concern, such as sea-level rise or high-impact, low-probability extreme events. The AR5 should provide information in particular on the following issues where we see the need for in-depth assessment:

- Carbon cycle and other greenhouse gases (notably CH4 and N2O) in terrestrial ecosystems and in particular issues related to: vulnerability of carbon sources/sinks under future climate conditions and land-use change and practices; links with nitrogen and hydrological cycles; the role of agriculture, forests, peat-lands, biomass and soil; emissions in relations to thawing of permafrost. Strong cooperation with WGII and WGIII is needed.

- Changes in the CO2 uptake capacity of the oceans under a changing climate and implications for ocean acidification (in cooperation with WGII).

- Better understanding and quantifying carbon-climate feedbacks and the implications for mitigation efforts (the latter in cooperation with WGIII)

- Improved understanding of thresholds and tipping points likely to lead to abrupt changes in the earth-climate system.

- Trends and projections in key climate variables (e.g. temperature, precipitation, frequency and strength of cyclones, glaciers, sea level, ice sheets in particular Greenland and West Antarctic ice sheet).

- Links between atmospheric chemistry, air pollution and climate change. Cooperation with WGII (e.g. impacts on human health) and WGIII (synergies and trade-offs between air pollution and climate change mitigation options and policies) will be essential.

- Processes related to aerosols and cloud formation and their impact on climate change.

- Detection, attribution and projections of climate change/climate change variability at regional scale, and implications for vulnerability and impacts assessment (in cooperation with WGII).

3. Impacts, adaptation and vulnerability – WG II

The AR4 Working Group II report has been extremely helpful for developing adaptation policies in the Europe and a key reference for concepts such as vulnerability and adaptation For AR5, we would hope for even more focus on providing the elements for an integrated assessment modelling of adaptation options. These include:

- Assessing climate change impacts at different levels of projected temperature (e.g. +2°C, +3°C, +4°C) and identify most vulnerable regions and sectors. Special effort should be devoted to regions where such information was missing (e.g. Africa, SE Asia, low-lying islands).

- Costs of adaptation actions –as well as cost of no action- need to be assessed in detail.

- Resilience thresholds beyond which human systems and ecosystems are no longer capable to maintain the required functions. In that respect, it is important to assess climate change, water resources, biodiversity, water quality and land-use changes in an integrated way (in cooperation with WG I).

- More accurate estimation of impacts in the agriculture and forestry sectors based on finer spatial scales and shorter time-frames will benefit planning of future management requirements and adaptation measure in view of a changing climate (in cooperation with WG I) .

- Overview of adaptation measures (i.e. state of actions) based on past legislative instruments (such as National Adaptation Strategies), as well as a review of these together with the state of play on adaptation indicators.

- Assess critical global interactions: impact on migrations, impact on global trade from changes in availability and demand of natural resources and productivity, impact on security and conflicts.

- Assess and update indicators of vulnerability for different regions and sectors that would help identifying the most urgent areas for adaptation action.

- Specific assessments linked to impacts on water systems and the way adaptation options are designed in the context of integrated water resources management, in particular measures linked to climate change-related extreme events such as droughts and floods (in cooperation with WG I)

- Assess state-of-play on ocean acidification due to CO2 uptake by marine ecosystems and climate change (in cooperation with WG I)

- Ways to handle uncertainty for medium and long-term impacts and how to translate it into risk assessment and management.

4. Climate change mitigation -WG III

Development of low greenhouse gas stabilisation scenarios need to be assessed and developed in line with limiting global average temperature increase well below levels associated with considerable impacts exceeding the adaptive capacity of systems and increasing considerably the risk for irreversible effects. In particular also a global average temperature increase of 2°C above pre-industrial should be a focus area of the assessment of related mitigation options but also remaining impacts (cooperation with WG I and WG II)

- Economics are key. The AR4 has done considerable work at assessing mitigation potentials at various assumed carbon prices. However, we would like to see in-depth assessments on what kind of mechanisms would give efficient results. There are a number of low-cost mitigation measures which do not materialise due to failures in the economic/social structures.

- A portfolio of policy measures should be assessed (e.g. market based focusing on emission trading, legislative) in terms of technical feasibility, environmental impact and cost effectiveness, considering regional specificities (cooperation with WG II)

- The mitigation potential of agriculture and forestry needs to be addressed in an integrated way globally and for key regions (e.g. including enhanced biomass use, changes in deforestation, links with food security and international trade, effects on droughts and floods on crop yield). Further work is required to incorporate recent scientific knowledge in the assessment of mitigation options in the sector, where uncertainties are particularly high, and multiple inter-linkages between different sources of emissions exist. More detailed information is needed on the feedback mechanisms that might be of relevance (e.g., how mitigation measures like bioenergy can have an impact on the C cycle). Furthermore, there are a lot of methodological issues still open concerning that relate, not only, to accounting/monitoring, but also to what type of policies are appropriate for mitigation (both in reduced deforestation and degradation –REDD- and concerning LULUCF in general), how much they cost, and how they relate to the carbon market. Strong interaction/cooperation between all three WGs will be needed.

- Going beyond the assessment of the AR4, often presenting what could happen in an ideal world (a perfect market or a universal carbon tax), we would hope that the AR5 could also consider the literature which increasingly becomes now available on what is likely to happen given real-life situations (gradually developing carbon market, imperfect participation, costs and uncertainties of monitoring, issues related to time scale). This could inform the policy debate concerning LULUCF, the Clean Development Mechanism (CDM) and concerning cap and trade systems, including an OECD-wide carbon market by 2020.

- There is a further need to assess the cost data for different types of policies as this would inform the policy debate later on. This helps to define what is the appropriate own action

for all countries, including developing countries, and it gives more information on what costs are involved and how they could be financed. It will be useful to provide more insights on the timing issues: the need to act by when (mitigation and adaptation) and how this could drive down costs over the longer term.

- More coherence in the assessments would help the policy relevance significantly. There are significant trade-offs among mitigation actions, like between bioenergy production and carbon sequestration on the same piece of land. Often, mitigation options are not independent of each other, not fully scalable and not additive. These were not sufficiently brought out in AR4, which properly listed all options, but often did not put them into context.

- Novel options to combat climate change (including geo-engineering) should be assessed in an integrated way (technical and economic feasibility, effectiveness, consequences and unintended 'side-effects' /feedbacks, as well as social, ethical and governance issues)

FAO – Food and Agriculture Organization
28 May 09

The Food and Agriculture Organization of the United Nations (FAO) has made a compilation of suggestions it would like to see addressed in the 5th Assessment Report (AR5) of IPCC. The suggestions are the following:

1. The need to improve climate change scenario downscaling in four ways: (i) better spatial coherence taking into account topography; (ii) climatological coherence, i.e. downscaled data with a realistic statistical structure of all climate variables; (iii) realistic representation of current variability; and (iv) useable medium-term projections (i.e. 10-15 years). This is a crucial knowledge in many sectors including agriculture applications and disaster risk management.

2. Improve the skill of decadal climate prediction in light of urgent needs for adaptation in the next couple of decades.

3. The land-atmosphere coupling will be tightened up and more certainty is needed regarding the projections for rainfall (mean and variability) at regional and finer spatial scales and at different temporal scales. It's a crucial knowledge for rainfed and irrigated agriculture, both.

4. Regional climate projections using dynamical downscaling (regional climate modelling) and statistical techniques - finer spatial scale information is required to come up with adaptation measures for various populations in different climatic conditions within a country. AR4 used predominantly results from GCMs, and this is not sufficient.

5. Assessment and mapping (semi-quantitative) of soil carbon and soil carbon sequestration potential, including a review of techniques that have actually been used in various climate /agroecological zones to increase soil carbon + the side-benefits of soil carbon sequestration in adaptation.

6. The need to assemble global background information about crop distribution and phenology if we are to make realistic impact assessments building on substantive information available on sub-national crop distribution within FAO (AgroMaps, Global Land Use System) and non-FAO (Ramankuty, IFPRI and IIASA).

7. The need to develop climate classification systems that adequately represent agricultural crop and livestock distributions and the impacts of variability, building on existing climatic classification systems that well reflect agricultural crop and livestock distribution such as FAO (AEZ) and non-FAO (Köppen-Geiger).

8. In food chapter of WG2, to address a wider range of impact and adaptation issues and policies from crop production changes to food security as a whole. This should be addressed not only at global level but also at regional level.

9. Temperature and CO2 impacts on evapotranspiration and biomass production in key farming systems.

10. Temperature and rainfall/runoff impacts on river basin water balances (including groundwater recharge and discharge) in relation to key irrigated farming systems. We suggested a typology on the FAO Water website - http://www.fao.org/nr/water/art/2008/flash/ccmap/gallery1.html

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IAEA - International Atomic Energy Agency
28 May 09

Concerning mitigation technologies in WG III, AR-5 should be more balanced in presenting the costs and mitigation potentials as well as other benefits and risks of different energy technologies than was the case in AR-4. Specifically, the mitigation potential of nuclear energy as one of the lowest (on a full life cycle basis) GHG emitting technology should be presented on equal footing with other technologies, particularly in the Executive Summary and the SPM. Moreover, AR-5 should also assess the increasing literature about the non-power uses of nuclear energy (seawater desalination, hydrogen production, oil shale and oil sand processing, petroleum refining, etc.) and the associated mitigation potentials.

It is also suggested that AR-5 make the next step towards integrating climate change mitigation and vulnerability/adaptation issues (driving forces, processes, broader implications) and explores their linkages to sustainable development. This would be desirable both at the conceptual and assessment levels as well as at the level of policy analysis (analysing implications of alternative strategies without being policy prescriptive). The AR-4 has made a major step relative to TAR in which mitigation-adaptation linkages were “hidden” in one section of Chapter 10 of WGIII. Devoting a chapter to mitigation-adaptation linkages (Chapter 18) and to adaptation-sustainability linkages (Chapter 20) in WGII and to mitigation-sustainability links (Chapter 12) in WGIII was successful as these chapters seem to be well received, especially by developing countries. However, there was not much link among these chapters. The establishment of the informal team to coordinate between WGII and WGIII produced only modest success.

One possible strategy for a better integration might be to commission the chapters linking sustainable development to adaptation (WGII) and mitigation (WGIII) with a harmonized outline and with partly overlapping writing teams. In addition to exploring the sustainable development linkages, they should also assess the vulnerability/adaptation implications of different mitigation options (in WGIII) and the mitigation implications of various adaptation strategies (in WGII). Accordingly, in addition to assessing the emerging literature in their domains, these writing teams should also have the mandate to track these linkages in all chapters of the given WG and synthesise the main insights for science and policy. The scope of these two chapters should range from the global integrated assessment models to national climate assessments and policies to the regional/local case studies and projects.

IASC – International Arctic Science Committee, jointly with
SCAR – Scientific Committee on Antarctic Research
01 May 09

The International Polar Year (IPY) 2007/2008 officially ended one month ago. It was an intensive, internationally coordinated scientific research campaign in the Arctic and the Antarctic sponsored by the International Council for Science (ICSU) and the World Meteorological Organization (WMO). The IPY has entrained the intellectual resources of thousands of scientists representing an unprecedented breadth of scientific specialities. It took place during a time when our planet was changing faster than ever in recorded human history, especially in the polar regions. Polar changes are critical because of various feedbacks involving the ocean, the cryosphere and/or the biosphere, each of which has the potential to accelerate the rates of global changes.

The International Arctic Science Committee (IASC) and the Scientific Committee on Antarctic Research (SCAR) are ICSU´s two regional polar bodies.

IASC was established in 1990. Its main aim is to initiate, develop, and co-ordinate leading edge scientific activity in the Arctic region, and on the role of the Arctic region in the Earth system. It also provides objective and independent scientific advice to the Arctic Council and other organizations on issues of science affecting the management of the Arctic region.

SCAR was established in February 1958 to continue the international coordination of Antarctic scientific activities that had begun during the ICSU-led International Geophysical Year of 1957- 58. Its main aim is to initiate, develop, and coordinate high quality international scientific research in the Antarctic region, and on the role of the Antarctic region in the Earth system. In addition it provides objective and independent scientific advice to the Antarctic Treaty Consultative Meetings and other organizations on issues of science and conservation affecting the management of Antarctica.

Given the momentous advances in polar knowledge and understanding generated and the urgencies identified within the IPY 2007/2008, we think that it is timely to propose a polar climate chapter in the next IPCC Report. IASC and SCAR would be happy to provide advice/input to help ensure that polar climate change is well documented in the next IPCC Assessment Report.

ICAO – International Civil Aviation Organization
29 May 09

I wish to refer to your letter date 29 April 2009, reference 4996-09/IPCC/AR5, inviting the International Civil Aviation Organization (ICAO) to submit policy relevant technical topics to be addressed in the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report (AR5). As in previous assessment reports, ICAO is committed to supporting activities of IPCC concerning the environmental impact of civil aviation operations.

In this context, I would like to submit the following topics to be addressed in the scope of the IPCC AR5:

- WG I – The Physical Science Basis (Chapter 2.6, pp. 186-188 of AR4)

    1. further exploration of the effects of non-CO_2 aviation emissions e.g. contrails and cirrus clouds, based upon the latest scientific understandings;
    2. a selection of policy questions to be answered with a forward-looking non- CO_2 metric for aviation;

3. appropriate metrics and methodologies for computing those metrics based on the policy questions selected in #2;
4. explore and advise on an integrated policy analysis framework that takes into account interdependencies of aviation noise and emissions impacting local air quality and global climate, as well as integrates the latest relevant knowledge from the physical and social sciences;

- WG III – Mitigation of Climate Change (Chapter 5, pp. 323-385 of AR4)

5. an update on aviation traffic and greenhouse gas (GHG) emissions trends, based upon the ICAO's latest available traffic forecast and environmental goals assessment; and
6. an update on the global policy framework in limiting and reducing GHG emissions from international aviation, in particular on the ICAO Programme of Action on International Aviation and Climate Change to be developed by ICAO, including a set of mitigation measures encompassing technological, operational and market-based measures to reduce aviation GHG emissions as well as the use of alternative fuels for aviation.

ICC – International Chamber for Commerce
15 June 09

Guidance for Business and Investment
Credibility and validity of an assessment emerge from the acceptance of the work by experts, the manner in which it is assimilated by policymakers, and its use in practice. With regard to the latter, it should be intended that individual chapters on various sectors and technologies in WG III can be taken up by business and industry as guides to future planning and action. Information on technology opportunities and barriers must be more substantial to provide a basis for studies that identify issues that must be overcome to develop viable commercial technology. It is essential to evaluate policy frameworks that address the barriers to investment that must be overcome to deploy currently non-commercial technology. Important progress could be achieved by using a more careful assessment of investment criteria that inform project decisions in various settings. These would focus on questions of existence of regulatory frameworks, risk management, and especially implications of liability for currently non-commercial technologies, access to markets, availability of infrastructure etc.

Descriptions of and bases for statements of uncertainty
Overall IPCC AR4 made an important advance in seeking to quantify uncertainty of conclusions; still there is a long way to go. In particular, IPCC could do far better in explaining not only the amount but also the basis for uncertainty estimates. Stating ranges of uncertainty is not enough, as it makes a large difference whether or not uncertainty is based on; 1) objective science-based statistical methods, e.g. in radiative forcing of GHGs or well-to-wheels emissions from existing technologies, or 2) when uncertainty is based on incomplete science referring to expert judgement, e.g. in estimates of radiative forcing from indirect aerosol effects, or 3) in an economic model of mitigation costs based on assumptions about the availability, performance and future costs of currently non-commercial technology, or 4) in an economic assessment where damage estimates in the far future depend on numerous assumptions for which there is no agreed consensus, e.g. discount rates. Where conclusions are based on "expert" judgment, it would be valuable and more transparent to describe the method used to obtain the estimates and the range of expert views on the key sources of uncertainty which is often more informative than the ranges themselves. In many cases it appears that they are simply the views of a very small number of chapter lead authors. In such cases conclusions might change dramatically based on the selection of authors.

Increased Business Participation
From the perspective of the Business community, one method of working that has been undertaken during AR4 has particular merits. That has been the organisation of business input through a series of short meetings or workshops between business experts and the Lead Authors of relevant chapters. This approach either during fact gathering or review stages has enabled a wide range of well-informed views from business to be included. This has proven to be optimum use of time for individuals who do have not have the time or resources to take part as authors. It is vital that Business continues to be involved, where possible, as authors within the report, however, expert meetings provide an excellent source of further involvement.

Integrated Assessment Analysis
There has, for many, been perhaps a lack of consideration on the issue of "integrated assessment analysis" in AR4 and things should be improved moving forward. Linking discussions within WG II and WG III on economic damages/benefit could be very beneficial. A better integration of economic impacts and avoided impacts is needed to better judge the different trajectories that will inform policy makers. Considering the deep uncertainties in the estimation of both costs and benefits, economic analyses should inform within an overall risk management framework which should be assessed in tandem. In these areas IPCC has to make progress, and looking forward this would put integrated assessment in perspective while motivating groups to engage in that activity is surely worthwhile.

Integrated Assessment Models
Another critically important point regards integrated assessment models. It is time to abandon the past IPCC practice of assessing mitigation potentials on a sector by sector basis and then seeking to roll them up into a global potential analytically. The only way to create a meaningful roll-up is to evaluate economy-wide interactions in an integrated assessment model. Sectors interact within the economy; they also draw on a common pool of input factors and often supply goods and services into a common market. Thus changes in one sector may support or inhibit changes in another sector. As well, changes may often be path dependent. Certain advances may rule out other changes once they occur. In the year 2008 there are now a variety of integrated assessment models capable of describing these interactions. They should be used to identify potential global pathways and potentials.

Policy assumptions in intervention scenarios
As Copenhagen negotiations move forward, it seems increasingly clear that the world is on a path to a mosaic of interacting national and regional policies, not a single uniform cap and trade system as has been envisioned in so many models of stabilization. It will be essential to encourage and consider a richer range of policy frameworks to evaluate economic impacts of policies. Perhaps this can be done through IPCC sponsored workshops that bring together leading analytic teams in the period 2010-2012.

Technology Deployment
It has been a number of years since the IPCC Special Report on Technology Transfer.
There have been a number of changes in this area, in particular, the development and operation of the Kyoto mechanisms and the well-documented work of the Expert Group on Technology Transfer. An important topic to be addressed in AR5 should be a review of the progress of technology transfer with particular emphasis on business foreign direct investment and the role of enabling frameworks to encourage increased deployment of existing and new technologies.

Sectoral Approaches
Considerable work is currently underway in UNFCCC bodies on sectoral approaches that could, for example, be incorporated in a decision in Copenhagen. There is a wealth of literature on various sector approaches that could form part of AR5 assessment related to policy and cooperative actions. The AR5 could produce a nomenclature to describe the various approaches that are being proposed and examined in the literature, and then assess their characteristics. Such work could also evaluate effects on competitiveness of industries as well as economy-wide effects and

impacts. Furthermore, IPCC could also evaluate the requirements of sectoral approaches on the reporting guidance required for governments/sectors to participate in such an approach.

* Due to the short period for comment, it has not been possible to obtain views from the whole ICC constituency, however, the views attached have been expressed by a number of ICC members who have been involved in the AR4 process, Special Reports and previous IPCC assessments as Coordinating Lead Authors, Lead Authors, review Editors and Reviewers.

IOC of UNESCO – Intergovernmental Oceanographic Commission
13 May 09

Thank you for the opportunity to provide policy relevant scientific topics for consideration in the scoping of the IPCC AR5 (your ref: 4996-09/IPCC/AR5). I am providing this submission in my joint capacity of Assistant Director General of UNESCO in charge of the UNESCO Climate Platform and Executive Secretary of the Intergovernmental Oceanographic Commission.

The global ocean observing system in place today was designed for detection and understanding of global climate change. Over the past decade ocean observations provided by this system, and related modeling and research, have underpinned much of the content of past Working Group 1 IPCC Assessment Reports, providing a clear understanding of much of the physical basis of global climate change.

The Intergovernmental Oceanographic Commission would like to suggest that for AR5, Working Group 2, on impacts, vulnerability and adaptation, provide an assessment of how the existing global ocean observing system, and related research and modeling products, can be used to better facilitate understanding of climate change impacts, thereby providing the basis for early warning and underpinning adaptation strategies.

One major shift in emphasis that will be required in order for systematic ocean observations to serve Working Group 2 related science, will be a shift from global to regional focus. In serving to assess the physical basis of climate change in the past, the global ocean observing system has focused primarily on monitoring global variables such as changing ocean heat content and transports, sea level rise, ocean carbon uptake, acidification, though some regional efforts, for example in the tropical Pacific for El Nino monitoring and prediction, has of course been included. Clearly, vulnerability, and strategies for adaptation, will be primarily coastal and regionally very distinct.

The IOC of UNESCO stands ready to support IPCC in addressing the challenge of assessing this critical question of assessing the adequacy and relevance of the extant ocean observing system for climate in support of the science of impacts, vulnerability and adaptation. For this purpose, we nominated some time ago, along with ICSU, Dr. Keith Alverson, the Director of the Global Ocean Observing System, to participate in the scoping meeting from 13-17 July in Venice. In the event this suggestion is eventually taken up by the IPCC, the IOC further stands ready to participate proactively in supporting the work of WG2 related to ocean observations.

IPIECA – International Petroleum Industry Environmental Conservation Association
21 May 09

Prepared by: Haroon Kheshgi, ExxonMobil Research and Engineering Company
Organization: International Petroleum Industry Environmental Conservation Association

Thank you for this opportunity to provide views on relevant topics for the IPCC AR5. The IPCC assessments provide critical information for business, and we describe some general topics that will help meet the needs of business and society. Our comments are aimed primarily at the assessment of climate change mitigation and adaptation, but also apply to synthesis.

1. **Key factors for investment**: plans for actions to address the risks of climate change imply immense investments over the next decades. It is important for the IPCC to better assess the key factors in making such investments by drawing information from those real investment decisions that are ongoing. This information could be drawn from those investments that are relevant to mitigation of emissions and, for example, the trillions of dollars that are being made now -- and will be made in the future -- to expand infrastructure and provide energy and other services. This information could also be drawn from investment decisions that affect the vulnerability of a wide range of resources, services, infrastructures (e.g. for transportation and energy) and communities. The magnitude, timing and type of investment made would be a useful assessment topic in both WG II and III reports and for a synthesis topic.
2. **Barriers and pace of change**: institutions and enabling systems may not in many cases be sufficient to allow a pace of change that would be implied by projections of climate change, or plans for emissions mitigation. An assessment of the capacity of institutions and enabling systems that would form critical barriers to the pace of change would provide important guidance for the IPCC assessments of mitigation and adaptation and could focus effort to address barriers to a more rapid response to climate change.
3. **Engagement of business and industry in the preparation of IPCC assessment**: it will be important for assessments of the IPCC to both engage expertise that resides in business and industry and also have the assessment meet business and industry needs. Business and industry has particular competence in, for example, evaluating technology and its development and deployment, investment decisions, adaptation, risk management, and consumer preferences and demand. The IPCC could improve engagement by expanding the small but successful approaches that have been used in past Assessments and Special Reports including selection of authors and engagement of reviewers from business and industry and expert meetings and workshops to expose authors to important peer reviewed and grey literature and better engage experts in assessment reviews. Furthermore it will be important to design assessment outlines to better match not only academic disciplines, but also the areas where business and industry expertise is focused (such as technology, investment, risk management…).
4. **Engagement of resource managers and regional planning managers**: adaptation to climate change is generally undertaken by those that manage resources and infrastructure (e.g. for transportation and energy) that are exposed to climate risk. It will be important to engage those with expertise in, and responsibility for resource management and regional planning to assess adaptation to climate change. It is also important to engage business to better assess how changes in resource management and regional planning may or may not serve adaptation. The *Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* should provide useful experience for the assessment of risk management in the adaptation to climate change, and the outline of the IPCC WG II report might be designed to better enable a focus on this topic.

IUCN – International Union for Conservation of Nature
29 May 09

Climate Modeling and Observations

- IPCC models should use finer differentiation of forest types in order to avoid the excessive generalization that comes from the use of FAO global statistics. Carbon flux models at present confound bush and shrub lands, agroforestry systems and numerous different forest types in ways that are unhelpful in understanding the role of forests in carbon cycles.

- Ocean acidification
- behavior of ocean currents in changing climate
- changes to sea surface temperature and interactions with vulnerable marine ecosystems and species
- changes to the ocean's and terrestrial systems capacity to serve as carbon sinks
- future sea level/storm intensity patterns
- deoxygenation/eutriphication/nitrification
- use of in situ and remotely sensed data

Atmospheric and Ocean Chemistry

- interactions between these two parts of the global climate system
- ocean acidification and affects on marine ecosystems
- destabilization of methane hydrates and implications for chemistry
- production of dimethyl sulfide by algae and implications for chemistry
- changes to oceanic carbonate system

Observations and projections of climate change impacts

- Tools and indicators for assessing climate change vulnerability
- Impacts on:
  - Biodiversity, including terrestrial and marine species and ecosystems (e.g., ecological resilience assessments)
  - Hydrology and freshwater resources
  - Identifying and categorizing species that are at increased risk of extinction due to climate change.
  - Ecosystem services
  - Agriculture, food security and forestry
  - Infrastructure and settlements
  - Human health
  - Society, human migration and socio-economic impacts
  - Economic impacts
  - additive, cumulative, and synergistic effects
  - Integrated Assessment Modeling
  - Tropical forests (esp Amazon and West African forests)
  - Drylands (esp the Sahel, Mediterranean, and Central Asia)
- Regional focus on climate change impacts
  - Africa
  - Asia
  - Oceania
  - Europe
  - Latin America
  - North America
  - Polar regions (Arctic and Antarctic)
  - Small islands

Hydrology and Water Management

changing precipitation patterns
flooding (including salt water inundation), drought, longer/shorter dry/wet seasons
changes to monsoon patterns and magnitude

Agriculture, food security and forestry

- More attention needs to be given to the carbon balance of different agricultural land use options – the different strategies adopted to increase world food supplies have quite different carbon footprints – for instance depending upon their fossil-fuel dependence, use of perennials, livestock etc.

- biofuels
- subsistence/artisanal fisheries; mechanized/industrial fishing
- aquaculture

Oceanography

changing atmosphere-ocean interactions
changing sea ice-seawater interactions
changing current patterns and upwelling/downwelling zones and associated changes to ocean productivity
changes to water masses (warming? freshening? etc.)
changes to pelagic, continental shelf, seamount, coastal, and polar ecosystems associated with these oceanographic processes

Ecosystems and Biodiversity

changes to pelagic, continental shelf, seamount, coastal, and polar ecosystems associated with the above oceanographic processes
identifying and categorizing species that are at increased risk of extinction due to climate change
determining the increased risk of extinction of currently threatened species due to climate change
increases in invasive species associated with species migrations and weakened ecosystems
changes to species composition within coastal and marine ecosystems associated with range changes, life-history changes, and species invasions

Human Health

- physical harm/death associated with extreme weather events and flooding
- contamination of food and water sources because of above hydrology/water changes + increased sea level and storm intensity
- ocean as transmitter of disease or supporting migration of disease vectors

Infrastructure and Human Settlements

- risks for islands, coastal arctic communities, low-lying deltas, low-lying coastal areas
- threats to major transportation/communication/industrial infrastructures

Socioeconomic Aspects of Impacts, Adaptation, and Mitigation

- loss of coastal/marine products and services
- coastal/marine tourism (both eco- and traditional)
- climate impacts on the shipping industry – what it means for global transportation
- opening of Arctic shipping routes
- consequences for fisheries/aquaculture
- consequences of biofuels on agricultural production
- Information disaggregated by gender

Policies, Measures, and Tools

- management of ecosystems as effective, natural carbon sinks
- marine spatial planning
- integrated coastal zone management
- improved fisheries management
- reduction of other stressors

Mitigation Technologies and Practices

- REDD
- Biofuels

- marine renewable energy sources – OTEC, tidal, currents, waves, etc.
- potential of and risks associated with geo-engineering measures – ocean fertilization, carbon capture and storage, etc.
- enhancing natural, oceanic carbon sequestration

Adaptation Practices

- Infrastructure
- Technology
- Agriculture
- Health
- Ecosystem-based adaptation
- Coastal ecosystem management
- Integrated water resource management
- Forestry – the implications for carbon balance of different forest management and conservation options needs more analysis.
- Sustainable agriculture
- Information disaggregated by gender

Costs and Financial Options

- economic valuation of ecosystem goods and services
- costs of mitigation and adaptation vs. costs of inaction [building on the Stern report]

Integration of Climate Policy and Risk Management across Sectors and Regions

- integration of ecosystem-based adaptation into sectoral and regional policies
- "ridge to reef" approach
- integrated environmental and strategic impact assessments
- integration of climate policy into coastal development plans
- preparedness and risk reduction in coastal/marine industries
- disaster risk reduction
- combination of climate and immigration policies

Climate Change and Development Strategies

- integrating risk reduction and adaptation to climate change into development and poverty reduction plans and strategies
- harmonization of national and international strategies and plans
- climate change mitigation and adaptation plans and strategies
- The strategies required to enhance the resilience of social-ecological systems to climate change need to be distinguished planned adaptation to projected or observed change – these require different approaches.

Climate Change and National Security

UNEP – United Nations Environment Programme
26 May 09

Oceans and Climate Change, specifically:

a) carbon absorption/cycling and how it is affected by anthropogenic impacts such as pollution and eutrophication;
b) the role habitats, such as seagrasses and kelp forests, play in mitigating carbon relative to terrestrial habitats included;
c) the role of fisheries and especially aquaculture including algae for biofuels in mitigating climate

change;
d) overall productivity changes and how that will flow through the whole food chain;
e) acidification - what impacts will it have on other marine organisms such as fish and their larvae, corals and other marine calcifiers;
f) impacts/trade-offs of marine based energy.

Atmosphere:

Driving forces, impacts of and responses to non-CO2 GHGs such as black carbon, methane and tropospheric ozone.

UNFCCC – United Nations Framework Convention on Climate Change
12 June 09

The UNFCCC secretariat is pleased to provide views on this matter. Below are a number of topics which, taking into account the current negotiations, appear relevant to obtaining further scientific information which may facilitate future discussions under the UNFCCC. The topics mentioned in this letter are not exhaustive, i.e. there may be other topics not mentioned here of equal policy relevance. Furthermore, the views expressed in this letter do not prejudge any views that Parties themselves may have on these topics.

Parties have welcomed the information from the IPCC regarding its plans for the AR5, as highlighted in various conclusions under the SBSTA. There have been numerous calls for the need for sound and up-to-date scientific knowledge and evidence on climate change and its impacts, in particular assessed by the IPCC as a basis for informing the UNFCCC process, for example, for supporting deliberations on overall global stabilization goals in the mid and long term.

Addressing **key uncertainties** and future research needs identified in the IPCC Fourth Assessment Report will remain one of the areas of priority for future scientific work identified in the UNFCCC process. Most recently, under the research and systematic observation agenda item of the SBSTA, Parties also encouraged the research community to continue to undertake further studies to enhance the understanding of climate change and to enhance efforts towards **greater integration of climate-related research across all disciplines,** as well as to enhance research activities relating to developing countries.

In the context of the scientific basis of climate change, a greater understanding of changes in climate and the earth's system would be needed, including further **scientific information on thresholds** (so-called tipping points) that would lead to abrupt changes in the climate system. Information on emerging scientific findings and recently observed trends in the climatic system (such as on sea-level rise and glacier melting) would be useful, as this information may be relevant for the consideration of global reduction goals.

As regards **impacts, vulnerability and adaptation** to climate change in general, a stronger focus on regional aspects may be needed, including on sound regional models. Priority also needs to be given to further work on risk reduction and disaster management, such as through improved forecasting and strengthened observations and data and regional modeling.

Reviews on the costs of adaptation may also be further considered in the plans for future work leading to the AR5. Similarly, technologies for adaptation have been identified as a priority for future work given the current limited scientific and technical information available. Furthermore, some countries see the need for information by the IPCC on potential environmental, economic and social consequences, including spillover effects, of emission reduction activities by Annex I Parties, assessing also their potential consequences at both regional and global levels.

In general, in the context of the scale of global long-term emission reductions and mid-term stabilization goals, further scientific work is needed on **stabilization scenarios.** Some Parties expressed the need for analysis of low-level stabilization scenarios (below 450 ppmv).

More in-depth analysis of **mitigation potentials**, in particular on low-emission technology and energy efficiency, as well as related cost would be useful. As the process moves towards more ambitious emission reduction commitments and actions, Parties will need to have estimates of such potential with a higher level of confidence. Further analysis of economic instruments in the context of climate change would also provide useful insights for future deliberations under the UNFCCC process.

The on-going work undertaken by the IPCC related to greenhouse gases, including new greenhouse gases, and their contribution to global warming as well as technical assessments of **alternative common metrics** to calculate the CO_2 equivalence of greenhouse gas emissions is expected to be addressed in a more extensive and comprehensive way in the AR5. This would also include consideration of uncertainty reduction relating to GWPs, GTPs and any other common metrics that might be suggested in the scientific literature.

Similarly, further work would be required on **methodological issues relating to greenhouse gas inventories** and estimation of carbon stocks, in particular for the LULUCF sector, as well as emissions from bio-fuels in the context of the full carbon cycle.

An enhanced understanding of the complex inter-linkages and interactions of changes in the climate with other systems may help obtain a more holistic perspective to global issues and facilitate better integration of climate change considerations into broader development issues, such as MDGs and sustainable development. This may also be achieved through a stronger integration of the three working group reports.

Finally, interest has been expressed on several occasions for the IPCC to find ways to provide assessed information on emerging science in shorter intervals in order to support deliberations under the UNFCCC process.

I wish you a successful scoping for the AR5 that we expect will continue to provide a solid scientific information basis for the UNFCCC process, following the successful examples of previous assessments and reports by the IPCC.

START
29 May 09

Topics for AR5

- More comprehensive coverage of biotic stresses on agriculture and forests
- More comprehensive coverage of groundwater resources
- Greater integration between chapters on issues of agriculture and health
- Climate change and landscape teleconnections (e.g. highland-lowland interactions)
- Impacts of changes in rainfall quality (shift from drizzle to heavy precipitation events) on the water resource base
- Dynamics of community based (place-based) adaptation, and opportunities for and gaps in policy support for CBA
- Strategies and methodologies for climate risk communication across different stakeholder group and spatial scales

- Strategies and methodologies for using context-specific scenarios/visioning exercises to support adaptation decision-making
- Assessing efforts at strengthening institutions, from local to national scale, for sustaining capacity building and enabling adaptation
- Assessing efforts towards innovations in education (e.g. integration of climate change science into teaching and research) for building adaptive capacity and informing national decision making in the developing world

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WHO – World Health Organization
29 May 09

Thanks you for your letter of 29 April 2009, inviting WHO to submit topics for consideration in scoping the IPCC 5th Assessment Report.

This is a welcome invitation, as the IPCC's reviews of the scientific evidence on climate change underpin much of the work of technical agencies working in this field.

As a general comment, we would like to endorse the proposals made at the conclusion of the AR4 process, that subsequent IPCC reports should place a relatively greater emphasis on the wide range of evidence relevant to support policy, investment and behavioural choices. This would imply involvement of operational decision-makers in identifying policy-relevant questions and tilt the balance towards greater emphasis on the human and economic sciences in assessing behavioural, institutional and resource challenges, in comparison to the physical sciences.

In the field of health, we are fortunate that the 193 Member States that make up the World Health Assembly have clearly outlined their priorities for applied research through a 2008 Resolution (http://apps.who.int/gb/ebwha/pdf_files/A61/A61_R19-en.pdf). They have requested applied research in the following five areas:

(a) health vulnerability to climate change and the scale of nature thereof;
(b) health protection strategies and measures relating to climate change and their effectiveness, including cost-effectiveness;
(c) the health impacts of potential adaptation and mitigation measures in other sectors such as marine life, water resources, land use, and transport, in particular where these could have positive benefits for health protection;
(d) decision-support and other tools, such as surveillance and monitoring, for assessing vulnerability and health impacts and targeting measures appropriately;
(e) assessment of the likely financial costs and other resources necessary for health protection from climate change.

This request has been further developed through a consultative process involving practitioners, leading researchers (including many IPCC authors), UN agencies and funders. The outcomes are described in a recent WHO report, attached to this letter: WHO (2009) Protecting Health from Climate Change. Global Research Priorities. (for easy please find the report at this link: http://www.who.int/phe/news/madrid_report_661_final_lowres.pdf).

We would therefore appreciate if these are considered as a request on behalf of the health sector, for issues to be covered within the scope of the IPCC AR5. While most would be covered within a health chapter within Working Group II, health is also an integrating 'bottom line' of the impacts of climate change on other determinants, such as agricultural production and water availability. It is therefore important that sections dealing with these issues also consider the ultimate effects on health and wellbeing.

In addition, given the evidence that well-designed mitigation policies could bring substantial immediate health benefits that could largely offset the cost of mitigation, we would also argue for a strong health representation in Working Group III, particularly in any sections related to electricity production, household energy use, and transport.

Once again, thank you for the invitation to contribute to this process, and we are available for further inputs into the process.

WMO – World Meteorological Organization
11 June 09

The Scoping Meeting for the 5th Assessment Report will be held in Venice, Italy, from 13 to 17th July 2009. The scoping meeting is expected to prepare a scoping paper describing the objectives and an annotated outline of the AR5 and its Working Group contributions, and to prepare a broad outline for the Synthesis Report. This note provides inputs from WMO including WCRP and GCOS.

Gaps in Observational Networks and Research

1. There is a general requirement from many quarters that IPCC should, in its AR5, identify gaps in observational networks and gaps in research.

2. In so far as the gaps in observational networks are concerned, Global Climate Observing System (GCOS) is mandated to support international policy development role of the United Nations Framework Convention on Climate Change (UNFCCC); as set down in Articles 4 and 5 of the Convention, and provide the comprehensive, continuous climate and climate-related observations needs and report on the adequacy of climate observations, specifically for climate change purposes. It has the mandate to make regular assessments of the gaps and present its assessment to UNFCCC, an inter-governmental process. However, UNFCCC being a political process, the value of scientific assessment does not drive the required attention and does not materialize into action as one would like it to be. A requirement coming from the IPCC assessment process would help in addressing the gaps in observational networks.

3. IPCC, during AR4 had consciously decided not to explicitly identify gaps (it indirectly points out to such gaps by identifying the confidence in assessments or projections e.g., Fig SPM2, AR4, and also by highlighting robust findings and key uncertainties, e.g., WG1 SPM TS.6) on considerations that the IPCC assesses the available research and does not actively drive the research agenda - otherwise it could be seen to be commissioning work to achieve a particular outcome rather than be acting as an independent reviewer of the available science. However, it is also a fact that IPCC is in the unique position to get a comprehensive view on the current ongoing research in climate domain.

4. The gaps in observational networks and research can be addressed by IPCC in its 5th cycle of assessment in one of the following ways:

a. a section in an appropriate Chapter that highlights the most critical gaps in research activities that synthesizes the views of scientists across all Chapters of the report, or
b. a special report that addresses the research and observational gaps across all the three WG reports

Greater interaction among the WGs

5. Considering that all the previous assessments have pointed out inadequate information on regional and local scales, AR5 should make special efforts to gather existing information on

relevant scales (including that available in non-English literature), and where such information doesn't exist, articulate its criticality for determining sectoral adaptation strategies.

6. There is also need for greater coordination and dialogue among the three Working Groups to ensure the feedback between/among producers of climate information (i.e. observation, research, models and analysis) and the users of such information (i.e. Framework for Climate Services and Applications), in this case policy makers.

7. WMO and NMHSs contribute to adaptation activities through provision of data and observations, methods and tools, climate risk management as well as climate prediction and services. In this sense, the report of WG-II in AR5 should recognize more explicitly the value of climate information and service delivery to climate-sensitive sectors. WG-II may consider assessment of current use of climate information in adaptation practices, identify the associated implications, and examine possible climate information strategies that need to be considered in conjunction with adaptation to climate variability and change.

8. AR5 should assess the importance of climate information as an integral component of policy formulation for mitigation of climate change. WG3 should therefore assess the availability as well as utilization of climate information for mitigation actions and sustainable development (e.g., renewable energy, urban/building planning, etc.) and determine the criticality of such information to deal with the potential impacts of both short-term and long-term climate change. In addition, WG3 may assess the socio-economic benefits of optimally utilizing climate information and prediction services in various policy options for mitigating climate change.

9. There is need for greater involvement of young scientists in NMHSs in the AR5 to the extent possible. WMO will be happy, through WCRP and its various Programmes to identify at least some of them during the Scoping Meeting in Venice in July 2009 that could be included in Chapter author teams.