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SCOPING PAPER FOR A POSSIBLE TECHNICAL PAPER ON CLIMATE CHANGE AND WATER

(Submitted by the Co-chairs of Working Group II)

A scoping paper for a possible Technical Paper on Climate Change and Water (TPCCW)

(Prepared at the request of the Working Group Two Co-chairs,
Oswaldo Canziani and Martin Parry
- by **Zbigniew W. Kundzewicz and Luis J. Mata**)

1. Background and motivation.

The IPCC, in several meetings, have stressed the importance of incorporating water-related issues more fully in to IPCC work. According to many experts, water and its availability and quality will be the main pressures, and issues, on societies and the environment under climate change.

The history of events leading to the development of this scoping paper is laid out below:

- **IPCC XIX (April 2002, Geneva):** there was a call for IPCC to prepare a Special Report on Water and Climate from the Executive Secretary of the World Climate Programme – Water, and International Steering Committee of the Dialogue on Water and Climate.
- **Consultative meeting on Climate Change and Water (11-12 November, 2002, Geneva)** was convened to consult with relevant international organisations and key experts (see Appendix 2) on the most appropriate way for the IPCC to tackle the issue of water. The meeting agreed the following:
 - A Special Report in 2005 or 2006 would have little value as it would quite quickly become outdated by the 4th Assessment Report (AR4).
 - Instead, an IPCC Technical Paper on Climate Change and Water based on AR4 would have more value.
 - IPCC should consider giving water a more integrated and expanded treatment within the 4th Assessment Report than in the TAR.

Various other options were discussed and rejected by the meeting:

- A Technical Paper based on the 3^d Assessment Report and delivered in 2005, would not add any information to that already available and absorbed by the water community (The Dialogue on Water and Climate have now published a substantial report on climate change and water for the 2003 World Water Forum. This is based on IPCC's TAR, with extensive additional discussion on implications for management)
- The option of giving no additional attention to climate change and water was considered inappropriate given the undeniable importance of water.
- **IPCC XX (February 2003, Paris):**
 - The Panel decided not to prepare a Special Report but rather to treat water as a cross cutting theme in AR4.
 - Different views were expressed regarding the timeliness of a decision on a Technical Paper on Climate Change and Water. The Panel agreed that a scoping paper for a possible Technical Paper be prepared for further consideration at IPCC-XXI.

2. Main Objectives

The technical paper would seek to improve our understanding of the links of both natural and anthropogenically induced climate change, its impacts, and adaptation and mitigation response options, with water issues. In particular, it will inform policy makers and stakeholders about the implications of climate change and climate change response options for water resources, as well as the implications of water

resources for climate change and climate change response options, including associated synergies and trade-offs.

The scope of the TPCCW would be an evaluation of the impacts of climate variability and change on hydrological processes and regimes, and on water resources - their use, quality and management. Relatively little on the hydrology dimension should be included except to highlight the most significant new scientific results. The TPCCW would focus on implications for water resources without and with planned adaptation.

Various arguments were summarised in Section 1 above for a Technical Paper based on the AR4. The present scoping note for a Technical Paper is being developed in connection with the AR4 outline which will include water as a cross-cutting theme (CCT). The future content of this latter initiative (coordinating water issues in the work of the three working groups on relevant chapters of AR4) should form the groundwork for the TPCCW. However, material relating to climate change and water will be contained within each of the three working group volumes of AR4. From the user's viewpoint, it is likely to be convenient to study one single document, where the essential water-related information from the AR4 is present. Such a role could be played by a Technical Paper. This follows the rule that IPCC Technical Papers are based on material contained in IPCC Assessment and Special Reports and should reflect the balance and objectivity of them.

Appendix 1 indicates the areas that a Technical Paper on Climate Change and Water could cover. Clearly though, a finalisation of the Technical Paper contents would have to be done at the end of the AR4 process.

3. Motivation and Timing

There is a solid and dynamically growing body of evidence demonstrating the significance of close coupling between climate change and water resources. Conclusions from the TAR also emphasize this point, but the specific issues and implications for decision making were not fully addressed. Both the current state of scientific knowledge, and the quantity and quality of relevant literature, as will be assessed in AR4, will make it possible to develop a multipurpose and useful TPCCW.

The inclusion in AR4 of material and references from the work of other international bodies dealing with water and, in particular, the momentum generated by such events as the World Summit on Sustainable Development (WSSD/Rio+10) held in Johannesburg in August 2002 and the Third World Water Forum (Kyoto, March 2003) as well as activities of the Dialogue on Water and Climate, and the WMO/UNESCO World Climate Programme – Water (WCP-Water), would provide a sound basis for this endeavor.

4. Target Audience

Primarily, the TPCCW will be aimed at decision makers engaged in all areas relevant to water resources management, climate change, strategic planning and socio-economic development. It will be addressed also to the scientific community working in the areas of water and climate change. Assessing the water issue within the sectoral and regional chapters of AR4 will include inputs from, and systematic consultations with UN agencies and representatives from relevant stakeholder communities (including civil society and the private sector), the TPWCC will benefit from their involvement and drawing on their experience.

5. Writing Team

An interdisciplinary writing team is suggested which will be drawn largely from the authors involved in the three AR4 working group volumes. A good regional balance among developing and developed countries, and countries with economies in transition would be maintained, through a flexible and transparent lead author selection process, according to the IPCC procedures. Greater involvement of the private sector and NGOs will be secured, through the consultative process and solicitation of written inputs.

All relevant disciplines need to be represented on the writing team, with special consideration given to hydrology, water management, climatology, meteorology, ecology, agriculture, spatial planning, economy, social sciences, and insurance. Experts with practical experience in the field should be also included. A consultation process with stakeholders and user community is envisaged which could begin during the latter stages of the AR4 process and which would help to adequately reflect their experiences and address their needs in the report. A number of contributing authors is envisaged, for case study material and other contributions.

6. Time Schedule

The work plan for the production of the TP has to be closely coordinated with the work plan for the AR4 since the TP is based on material contained in the water-related chapters of the three working groups.

3 rd quarter 2005	Compilation of lists of suggested CLAs and LAs.
3 rd quarter 2005	Begin consultation process with stakeholders and user community.
2 nd quarter 2006	Selection of LA team by appropriate Working Group Bureau.
3 rd quarter 2006	1st LA meeting – to prepare 1st draft.
4 th quarter 2006	Combined expert/review.
1 st quarter 2007	2nd LA meeting – to prepare 2nd draft.
2 nd quarter 2007	Final government review.
3 rd quarter 2007	Finalisation of Technical Paper in consultation with IPCC Bureau.
Early 2008	Publication..

In order to achieve a TP published soon after AR4, there is a need for initial but not committing action in 2005 with consultations taking place before AR4 is approved. However, authors would not start work until the AR4 is approved. Alternately, all stages in the process given in the table above could start one year later, to avoid any overlap with AR4. The disadvantage is that the TP would not be published until two and a half years after AR4 is approved, the information would be more dated, and IPCC would be well into its next cycle.

7. Resource Requirements and Management

The estimated costs (including two authors meetings, 12 journeys each, publication, translation into French and Spanish and Bureau session) would be around SF 400,000. The administrative costs such as copying, mailing, and organising meetings would be borne by the IPCC Secretariat and/or TSU(s).

Appendix A

POSSIBLE AREAS THAT COULD BE COVERED BY A TECHNICAL PAPER ON CLIMATE CHANGE AND WATER.

Executive Summary

1. Introduction to Climate Change and Water (~15-pages)

The first part of the report would seek to introduce basic concepts and issues involving climate change and water in the context of interlinkages with Agenda 21, WEHAB and the World Water Conference and global environmental change issues.

It would also describe the boundary conditions – observed and projected change in climate and socio-economic and environmental conditions.

- Background

This section would give a brief overview of relevant IPCC work, drawing especially on the findings of the TAR and AR4. It would continue with a review of how water resources issues have been addressed in climate change analyses and their relevance to policy formulation, and conversely, how climate change problems have been dealt with in water resources analysis and policy formulation. The section would conclude with the main rationale for writing the report and identify the target audience. The objectives would be described in detail in relation to the context and content of the technical paper.

- Observed and Projected Changes in Climate.

Observed changes in precipitation, temperature, vapor pressure, including palaeodata and projections of precipitation and temperatures.

- Observed and Projected Changes in Socio-economic and Environmental Conditions.

The subject of integrated scenarios for future socio-economic development would be introduced. Key sources of uncertainties, vulnerabilities and the issue of multiple baselines would be discussed. Implications of critical processes (multiple stresses) for climate change and water resources would be analyzed (e.g., globalization, urbanization, deforestation, land use and land cover changes, environmental pollution, desertification, biodiversity loss, etc.), taking into account regional differences where appropriate, as stemming from the IPCC Working Groups' contributions to TAR and AR4

2. Linking Climate Change and Water Resources (~100pages)

This part would constitute the main body of the report. Broadly, it would provide an assessment of the implications of climate change and climate change policies (adaptation and mitigation) for water resources (including links to other WEHAB sectors) and how they could affect the vulnerability of socio-economic and environmental systems to climate change.

Conversely, it should also assess the implications of changes in water resources on climate change and climate change policies.

Synergies and tradeoffs for achieving climate change and water management objectives would be analysed.

The main substantive points would be illustrated throughout with case studies and boxes, including lessons learned from - success stories as well as failures. Both successes and failures would be evaluated for

both short and long term effectiveness. Each topic would be articulated in line with global, regional, national and local priorities, as appropriate.

- Observed Change and Variability in Hydrology and Water Resources

Detection of change in physical variables: runoff volume and timing, characteristics of floods and droughts, lake levels, groundwater, evapotranspiration, soil moisture, glaciers, snow cover, water quality, etc. Detection in managed variables (trends in flood damages, water supply crisis, etc).

- Climate Change Impact on Hydrological Cycle and Water Resources - Projections

Projected impacts of changes in mean climate and extreme climatic events on hydrological cycle (precipitation, evapotranspiration, streamflow, lake storage, infiltration, soil moisture, groundwater, aquifer recharge, snow cover, glaciers) and water resources. Water availability (e.g., water stress, region criticality). Water quality: potential impacts on surface waters (rivers, lakes and reservoirs) and groundwater. Coastal hydrology; sea water intrusion into deltas, estuaries and aquifers due to sea-level rise. Water-related consequences of CO₂ fertilization effect.

- Extreme Hydrometeorological Events – Floods and Droughts

What may happen with hydrometeorological extremes under climate change (i.e., changes in floods and droughts and their frequency, intensity, duration). ENSO and AO/NAO and other related events would also be considered.

- Feedback mechanisms in climate involving water

- Adaptation to Climate Change – Water Management

The essence of water resources management has always been – adaptation to changing conditions, e.g. natural variability of available water, or changes in water demand. Yet, adaptation to climate variability and change, might be very difficult, in particular in areas currently under multiple stresses, including water stress. Effects of climate change on water demand (e.g., its relation to population growth and economic development, impacts on agricultural, domestic, municipal and industrial demand, effect on irrigation withdrawals). Climate change and water resources planning and operation. Climate change scenarios for water resources management. Implication of non-linear climate induced effects for water management (i.e., critical thresholds, carrying capacity). Review of adaptation strategies applicable in water resources practice as well as elements affecting adaptive capacity. Adaptation options at different temporal and organizational scales (strategic, tactical, operational). - New decision support tools affecting adaptive capacity. Allocation of water among multiple competing uses. Stressing importance of institutional issues. Adaptation options cannot be seen in isolation but must be viewed within the context of Integrated Water Resources Management, and the other climate adaptation strategies, and sustainable development. Due care would be taken to include these issues in the AR4 undertaking.

- Climate Change Mitigation and Water

The effects of mitigation options (e.g., sequestration - reforestation) on quantity and quality of water in the different phases of the hydrological cycle (e.g. acid rain). Opportunities for energy use reduction in water sector (i.e., scope for energy efficiency gains, curbing emission from the water sector). Opportunities for increased contribution of hydropower to meeting energy demands. All of them would be compiled from the IPCC WG contributions to AR4.

- Analysing Implications of Interlinkages between Climate Change and Water Resources in Critical Areas (Systems and Sectors)

Water availability is indispensable to sustain life on Earth. It is needed, in large volumes, in every human activity. In this section, a number of critical areas (sectors and systems) would be reviewed in depth.

The relevance of the report for practical policymaking would be enhanced, by focusing specifically on these key sectors and vulnerable systems. The main sectors and vulnerable systems identified include:

- agriculture and food security
- human health and sanitation (e.g., water-related ill health)
- arid, semi-arid and desert regions
- settlements
- land use and forestry
- natural ecosystems (both aquatic and terrestrial)
- coastal systems
- energy
- financial services and insurance
- industry
- transportation

Sample of problem areas: Water availability and demands in different sectors. Water for food security in the changing climate. Water and natural ecosystems (e.g. biodiversity, wetlands). Opportunities for increased contribution of hydropower to meeting energy demands. Extreme events and insurance.

- Analysing Regional Implications of Interlinkages between Climate Change and Water Resources
 - Africa
 - Asia
 - Australia and New Zealand
 - Europe
 - Latin America
 - North America
 - Polar Regions
 - Small Islands

Highlighting a few hotspots, that need priority attention due to severe vulnerability and multiple stresses.

3. Policy-relevant implications and suggestion for further work (~10 pages)

The final part of the report would summarize the main findings and draw appropriate, policy relevant, but not policy-prescriptive conclusions, as developed in AR4.

- Policy Relevant Implications

This section would begin with a discussion of timing issues, synergies, and trade-offs between climate change, mitigation and adaptation and water management objectives. By explicitly examining the interactions between climate change and water, the potential for developing integrated policy packages would be assessed. Analysis of the sustainable development context of climate change and water would be given.

- Gaps in knowledge and Suggestions for Future Work

The TPCCW would present in simple, accessible language for decision making - the suggestions for further work, based on the analysis of the information on gaps in scientific knowledge, weaknesses in the interaction between science and policy, and shortcomings in the dissemination of knowledge to stakeholders, as indicated in AR4.

Appendix B

Attendees at the IPCC Consultative Meeting on Climate Change and Water, 11-12 November 2002, WMO, Geneva.

International Organisations

Harry F	Lins	World Climate Programme - Water	USA
Wolfgang	Grabs	World Meteorological Organization	Switzerland
Jean-Marie	Fritsch	World Meteorological Organization	Switzerland
Michael J.	Coughlan	World Meteorological Organization	Switzerland
David	Carson	World Climate Research Programme	Switzerland
Pavel	Kabat	Dialogue on Water and Climate	Netherlands
Ulla Li	Zweifel	Global International Waters Assessment (GIWA)	Sweden
Jake	Burke	FAO	Italy
Carlos	Corvalan	World Health Organization	Switzerland
Mark	Henderson	UNICEF	USA
Richard	Robarts	UNEP/GEMS/Water Programme	Canada
Luc	Gagnon	International Hydropower Association	Canada
Brett	Orlando	IUCN - The World Conservation Union	Switzerland
Lalji	Mandalia	UNESCO	France
Salvano	Briceno	UN ISDR	Switzerland
John	Harding	UN ISDR	Switzerland
Haris	Sanahuja	UN ISDR	Switzerland
Pierre	Hubert	International Association of Hydrological Sciences	France

Regional experts

Chris	Magadza	University of Zimbabwe	Zimbabwe
Chunzhen	Liu	Hydrological Forecasting & Water Control Center	China
Bruce	Stewart	Bureau of Meteorology	Australia
Luis Jose	Mata	ZEF, University of Bonn	Germany

Topic experts

Nigel	Arnell	University of Southampton	UK
Zbyszek	Kundzewicz	Polish Academy of Sciences	Poland
Ian	Smout	Loughborough University	UK
James	Shortle	The Pennsylvania State University	USA
Paul	Wilkinson	London School of Hygiene & Tropical Medicine	UK
Ulrich	Cubasch	Meteorological Institute, University of Berlin	Germany
David	Griggs	Met Office	UK
Thomas	Stocker	Physics Institute, University of Bern	Switzerland

IPCC

Rajendra K.	Pachauri	IPCC Chairman	India
Mohan	Munasinghe	IPCC Vice-Chair	Sri Lanka
Osvaldo F.	Canziani	Co-Chair, WGII	Argentina
Martin	Parry	Co-Chair, WGII	UK
Geoff	Love	IPCC Secretary	Switzerland
Renate	Christ	IPCC Deputy Secretary	Switzerland
Martin	Manning	Head IPCC WG1 TSU	USA
Mike	Harrison	Head IPCC WG2 TSU	UK
Kathy	Maskell	Deputy Head (Science) IPCC WG2 TSU	UK

International Organisations invited but unable to attend:

International Human Dimensions Programme	- Joint Water Project of IGBP/WCRP/IHDP
Dams and Development Projects	- UNDP
Int. Research Inst. for Climate Prediction	- UNEP
Global Water Partnership	- World Water Council
IGBP	- IWRA
World Water Assessment Programme	- IAHR