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**SCOPING PAPER - IPCC SPECIAL REPORT
RENEWABLE ENERGY SOURCES AND CLIMATE CHANGE MITIGATION**

(Submitted by the Co-Chairs and Mr Hohmeyer, Vice-Chair of WGIII)

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1. INTRODUCTION

At its 25th IPCC Session in Mauritius, April 2006, the IPCC considered the possible contribution of the use of renewable energy sources to the mitigation of climate change and agreed to hold a scoping meeting for a possible special report on renewable energy (SREN). In order not to interfere with the finalization of the Fourth Assessment Report (AR4), it was decided not to hold the scoping meeting until after the 27th Session of the IPCC in Valencia, November 2007. The outcome of the scoping meeting should be an expert advice to the Panel on whether to develop a Special Report on this topic. In the case that the experts recommend a Special Report, the meeting should deliver a scoping paper, timetable and detailed outline for a Special Report for decision by the Panel at its 28th Session in the first half of 2008. This scoping paper is the result of the scoping meeting.

2. SCOPING MEETING ON RENEWABLE ENERGY SOURCES AND CLIMATE CHANGE MITIGATION

From January 21st-25th, 2008, the IPCC workshop on Renewable Energy Sources and Climate Change Mitigation was held in Luebeck, Germany. A call for nominations was issued for the participation in this expert workshop and 63 countries of the IPCC nominated about 200 experts. Only very few nominations were made by organisations. Of all nominations, about 120 experts were nominated by developing countries and countries with economies in transition. Taking into consideration the strong interest in the issue the 27th Session of the IPCC raised the number of journeys for Trust Fund financed participation to 40.

Due to the broad nature of the subject including six major areas of renewable resource use, the question of complex system integration of renewable energy source, questions of environmental and social impacts as well as policies to further advance technology diffusion and due to the rather different regional application possibilities, about 120 experts were invited. The participants came from about 45 different countries.

Thirteen major presentations were given and discussions were held covering all major areas of concern for a possible Special Report. After a very intensive discussion of different possible approaches to structure a Special Report, unanimous agreement of the participating experts was reached on the basic structure presented in this document. This structure was elaborated by eleven working groups and discussed at length by all experts present.

3. WHY A SPECIAL REPORT?

The mandate of the meeting was to guide and support decision making by the IPCC on a possible Special Report on Renewable Energy Sources and Climate Change Mitigation or on the inclusion of this subject in the normal Assessment Report cycle. A Special Report could be finalised by end of 2010, while a fifth Assessment Report would probably not be available before 2013.

The participants concluded that a Special Report would be the appropriate choice for the following reasons:

The AR4 documented the accelerating rate of climate change and its impacts. It also described the much greater confidence of the scientific community in the role of human contributions.

As shown in the AR4 (SPM WG III IPCC, p. 17, Figure SPM 9), in association with energy efficiency measures, renewable energy sources can make a substantial contribution to climate change mitigation as early as 2030 (SPM WG III IPCC, p. 13) and an even larger contribution by 2100 (SPM WG III IPCC, p.17).

The AR4 had to cover the full range of mitigation options which necessarily limited its treatment of renewable energy sources. Since then, many Governments as well as important actors in civil society and the private sector have asked for more substantial information and broader coverage of all questions pertaining to the use of renewable energy sources. As expressed by the interventions of many Governments at the 25th Plenary Session of the IPCC at Mauritius, this is particularly true of certain countries and regions where specific information is lacking.

Within the constraints of time and space, the AR4 identified the economic potential for renewable energy to provide heat, electricity and transport fuels to meet in part the growing energy demand and to reduce greenhouse gas emissions.

Since the AR4, significant new information and analysis has been reported in the literature on technological development and deployment, regional assessments, environmental and socio-economic impacts, cost reductions as well as mounting practical experience with implementation.

Due to the dynamic development of markets and investment and the experience gained from enabling policy frameworks, substantial additional evidence has emerged since the AR4 and the experts at the Workshop expect further relevant information by 2009, the last date available for inclusion in the Special Report.

A Special Report on Renewable Energy would provide a better understanding of:

- resources by region and impacts of climate change on these resources;
- the mitigation potential of renewable energy sources;
- the linkages between renewable energy growth and co-benefits in achieving sustainable development by region;
- the impacts on global, regional and national energy security;
- the technology and market status, future developments and projected rates of deployment;
- the options and constraints for integration into the energy supply system and other markets, including energy storage options;
- the economic and environmental costs, benefits, risks and impacts of deployment;
- capacity building, technology transfer and financing in different regions;
- policy options, outcomes and conditions for effectiveness; and
- the accelerated deployment could be achieved in a sustainable manner.

A Special Report on Renewable Energy Sources and Climate Change Mitigation would address the information needs of policy makers, private sector and civil society in a comprehensive way and would provide valuable information for further IPCC publications. Ideally it should be finalized in time to allow integration of its findings into the next comprehensive IPCC assessment of mitigation of climate change.

The vast majority of the more than one hundred experts participating in the workshop indicated that they would be available as lead authors for such a special report. Furthermore, there has been substantial additional interest shown by experts not present at the workshop to become involved in the writing process. Thus, there should not be any problem of recruiting the necessary expertise for an IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation.

4. PROPOSED STRUCTURE AND CONTENT OF A SPECIAL REPORT

4.1 Contents

The following structure was felt to ensure the best possible treatment of the issue. Indicative values for length of chapters as percentage of the total report given in parentheses (). These values were unanimously agreed by the experts at the workshop.

The technology chapters are in alphabetical order to avoid the impression that some technologies may be more important than others. Although the structures of the technology chapters do look similar, there are important differences in the details of the structures and the additional points raised in parenthesis.

Thus, the full structure of each chapter is given here, although this may look repetitive at first sight. The experts stressed that the technology chapters (2 –7) have to feed into the overarching chapters (8 – 11) and that the system integration chapter (8) will be a key chapter bringing all different aspects of energy demand and supply together, pointing out how renewable energy sources can be utilized in the larger context of future energy systems.

Points added in parenthesis refer to major issues considered for inclusion at the third level of the structure. They are meant to give some additional guidance to the later authors. The experts compiled a far more detailed structure for each chapter at the Luebeck meeting, which can be made available to the later authors on request, if these authors feel that they would like to have more detailed input into the writing process. As this more detailed structure can only be indicative of one possible way to structure the final report, the experts deliberately abstained from recommending any more detailed structure. If asked, they will supply this indicative detailed structure to the later authors.

4.2 Suggested structure of the report

1. Renewable Energy and Climate Change (5%)

- 1.1 Background
- 1.2 Summary of renewable energy resources
- 1.3 Meeting energy service needs and current status
- 1.4 Barriers and issues (*in using renewable energy for climate change mitigation and sustainable development*)
- 1.5 Role of policy, R&D, deployment, scaling up and implementation strategies
- 1.6 Methodology (*resource assessment, life-cycle assessment, setting boundaries for analysis, measures of sustainability, definitions, units, etc.*)

2. Bioenergy (15%)

- 2.1 Introduction (*traditional and modern use*)
- 2.2 Resource potential (*including impact of climate change on resource potential*)
- 2.3 Technology (*e.g. biological and thermochemical conversion*) and applications (*electricity, heat, transport and cooking*)
- 2.4 Global and regional status of market and industry development
- 2.5 Environmental and social impacts (*e.g. competition with food, fodder, fiber, and land use*)
- 2.6 Prospects for technology improvement, innovation and integration
- 2.7 Cost trends
- 2.8 Potential deployment (*based on 2.7*)

3. Direct Solar Energy (10%)

- 3.1 Introduction
- 3.2 Resource potential (*including impact of climate change on resource potential*)
- 3.3 Technology (*e.g. solar thermal, photovoltaics, concentrating solar power*) and applications (*heating and cooling, lighting, cooking, electricity, fuel*)
- 3.4 Global and regional status of market and industry development
- 3.5 Integration into broader energy system
- 3.6 Environmental and social impacts
- 3.7 Prospects for technology improvement and innovation
- 3.8 Cost trends
- 3.9 Potential deployment (*based on 3.8*)

4. Geothermal Energy (5%)

- 4.1 Introduction
- 4.2 Resource potential
- 4.3 Technology and applications (*electricity, heating, cooling*)
- 4.4 Global and regional status of market and industry development
- 4.5 Environmental and social impacts
- 4.6 Prospects for technology improvement, innovation and integration
- 4.7 Cost trends
- 4.8 Potential deployment (*based on 4.7*)

5. Hydropower (5%)

- 5.1 Introduction (*large and small hydro*)
- 5.2 Resource potential (*including impact of climate change on resource potential*)
- 5.3 Technology and applications (*run-of-river, storage, multi-purpose*)
- 5.4 Global and regional status of market and industry development
- 5.5 Integration into broader energy system
- 5.6 Environmental and social impacts
- 5.7 Prospects for technology improvement and innovation, and multi-purpose use of reservoirs
- 5.8 Cost trends
- 5.9 Potential deployment (*based on 5.8*)

6 Ocean Energy (5%)

- 6.1 Introduction
- 6.2 Resource potential (*including impact of climate change on resource potential*)
- 6.3 Technology (*wave, tidal, ocean thermal, osmotic*) and applications
- 6.4 Global and regional status of market and industry development
- 6.5 Environmental and social impacts
- 6.6 Prospects for technology improvement, innovation and integration
- 6.7 Cost trends
- 6.8 Potential deployment (*based on 6.7*)

7 Wind Energy (5%)

- 7.1 Introduction
- 7.2 Resource potential (*including impact of climate change on resource potential*)
- 7.3 Technology and applications (*onshore, offshore, distributed*)
- 7.4 Global and regional status of market and industry development
- 7.5 Near-term grid integration issues
- 7.6 Environmental and social impacts
- 7.7 Prospects for technology improvement and innovation
- 7.8 Cost trends
- 7.9 Potential deployment (*based on 7.8*)

8 Integration of Renewable Energy into Present and Future Energy Systems (15%)

- 8.1 Introduction (*potential role of renewable energy in future energy systems*)
- 8.2 Integration of renewable energy into supply systems (*electricity grids, heat distribution networks, gas distribution networks, liquid fuels; load management, grid management, energy transport, storage, interactions with conventional systems*)
- 8.3 Strategic elements for transition (*transportation, buildings and households, industry, agriculture, interactions among demand sectors*)

9 Renewable Energy in the Context of Sustainable Development (10%)

- 9.1 Introduction
- 9.2 Environmental impacts: global and regional assessment
- 9.3 Socio-economic impacts: global and regional assessment
- 9.4 Implications of (sustainable) development pathways for renewable energy
- 9.5 Synthesis (*consequences of including environmental and socio-economic considerations on the potential for renewable energy*)
- 9.6 Gaps in knowledge and future research needs

10 Mitigation Potential and Costs (10%)

- 10.1 Introduction
- 10.2 Methodological issues
- 10.3 Assessment and synthesis of scenarios for different renewable energy strategies (*top-down and bottom-up*)
- 10.4 Cost curves for mitigation with renewable energy (*regional, sectoral, temporal; impacts of climate change on mitigation potential*)
- 10.5 Costs of commercialization and deployment (*investments, variable costs, market support, RDD&D*)
- 10.6 Social, environmental costs and benefits (*synthesis and discussion on total costs, and impacts of renewable energy in relation to sustainable development*)
- 10.7 Gaps in knowledge and uncertainties

11 Policy, Financing and Implementation (15%)

- 11.1 Introduction
- 11.2 Current trends: Policies, financing and investment
- 11.3 Key drivers, opportunities and benefits
- 11.4 Barriers to renewable energy implementation
- 11.5 Enabling environment and regional issues (*Technology transfer, capacity building, finance & investment*)
- 11.6 Experience with and assessment of policy options (*local, national, regional; innovation and deployment*)
- 11.7 Policy frameworks for innovation, systems integration and deployment of renewable energy

5. TIME SCHEDULE AND PROVISIONAL BUDGET ESTIMATE

If the 28th Session of the IPCC in April 2008 decides to go ahead with the preparation of a Special Report and a call for nominations of Lead Authors were to be issued no later than May 2008. Approval and acceptance of the Special Report would be planned for the second half of 2010. One Lead Author meeting in 2008, two Lead Author meetings in 2009 and one Lead Author meeting in the first half of 2010 are foreseen. The planning would be made to properly synchronise with the preparation of an AR5.

Budget 2008: assuming 1 Lead Author meeting, assuming 40 journeys of DC and EIT Lead Authors per meeting at 4,500 CHF per journey, plus 13% for other meeting costs, *203,400 CHF* will be needed from the IPCC Trust fund.

Budget 2009: 80 journeys of DC and EIT Lead Authors = approx. 406,800 CHF. In addition, 4 review editors from DC and EIT will be invited to the third LA-meeting, which corresponds to another 20,340 CHF. The total budget for 2009 will then amount up to *427.140 CHF*.

Budget 2010: 40 journeys of DC and EIT Lead Authors = approx. 203,400 CHF plus 4 review editors from DC and EIT = 20,340 CHF. WG III Plenary Session: assuming 4 days for the Summary for Policy Makers on this subject will cost approx. 748,000 CHF plus 76,275 for a preparatory meeting with 15 Lead Authors and their participation in the WG Sessions . The total budget for 2010 will then amount to up to *1,048,015 CHF*.

The experts expressed strong support for an additional expert workshop with the respective industry to draw on relevant information from the industry, which is not published in peer reviewed journals. To facilitate the inclusion of regional expertise, workshops with experts in Africa, Asia and Latin America might be considered. The funding of such meetings is not included in this budget estimate. The meetings would most likely be held in 2009.

Costs for translation and purchasing of the Special Report, shipping costs and outreach are to be included later.

6. LEAD AUTHOR SELECTION PROCESS

Nominations can be called for in a letter to governments, no later than May 2008. Based on the nominations, the newly elected IPCC Bureau (September 2008) can select the Co-ordinating Lead Authors, Lead Authors, and Review Editors.