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PROGRESS REPORT

**Special Report on Renewable Energy Sources and Climate Change
Mitigation (SRREN)**

(Submitted by the Co-Chairs of Working Group III)

PROGRESS REPORT

Special Report on Renewable Energy Sources and Climate Change Mitigation

1. Background

At the 25th Session of the IPCC, held in Mauritius from 26 to 28 April 2006, it was decided to carry out a scoping meeting for a possible special report on the contribution of the use of renewable energy sources to the mitigation of climate change. At the 28th IPCC Plenary in Budapest, 9/10 April 2008, the Scoping Paper for the Special Report was accepted with modifications and the Plenary approved the development of a Special Report on Renewable Energy Sources and Climate Change Mitigation (SRREN) by Working Group III. The goal of the Special Report is to assess existing literature on the future potential of renewable energy for the mitigation of climate change. The report covers the six most important renewable energy technologies, as well as their integration into present and future energy systems, the environmental and social consequences associated with them, cost considerations, and strategies to overcome technical as well as non-technical obstacles to their application and diffusion.

Subsequent to the 28th IPCC Plenary, a full nomination process was carried out in accordance with the IPCC Principles and Procedures and the Bureau of Working Group III selected Coordinating Lead Authors (CLAs) and Lead Authors (LAs) for the report.

2. Progress to Date

2.1 1st Lead Author Meeting and Zero Order Draft

From 26 to 30 January 2009, the first SRREN Lead Author Meeting (LA1) took place in São José dos Campos, Brazil where the process of writing the Special Report was successfully initiated, as reported to the 30th Session of the IPCC in Antalya, 21 to 23 April (IPCC-XXX/Doc.7).

On June 8th, 2009 the author teams submitted excellent chapters of the Zero Order Draft (ZOD) to the Technical Support Unit (TSU). The TSU, in turn, compiled the submissions and circulated the ZOD of the SRREN for internal review among all authors. The internal review was completed on July 6th, 2009 and comments were considered by SRREN authors in advance of the 2nd Lead Author Meeting.

2.2 IPCC Expert Meeting on Modeling Renewable Energies: Coherence between Model Assumptions and Latest Technological Knowledge

It was reported and agreed in the 30th Session of the IPCC in Antalya, 21 to 23 April 2009 (IPCC-XXX/Doc.7), to hold one or two additional expert meetings on 'Modeling Renewable Energies' during the drafting period of the SRREN in order to strengthen the coherence between the different mitigation scenarios and the technology chapters. The meetings should comprise relevant CLAs, LAs and additional experts from the economic modeling community. That is, the meetings are aimed at improving the alignment between the assumptions of the models (top-down approaches) and the results of the respective technology chapters (bottom-up approach) by bringing the different research communities together. Furthermore, it was agreed that it would be desirable to assess scenarios exploring the effect of limited availability of different technologies on the cost and the portfolio of mitigation options.

The first of these expert meetings was held on 30/31 August, 2009, back-to-back with the 2nd Lead Author Meeting in Oslo, 1 to 4 September, 2009, and provided a valuable starting point. During this meeting, the scenarios modeling community and the technology experts agreed to work closely together to provide high-quality input to the SRREN and the AR5. The combined group agreed on a work plan in a memorandum that is currently under discussion with the Integrated Assessment Modeling Consortium (IAMC). To build on this successful process, the second meeting is planned for spring 2010 to expand on different view points and unresolved issues (See 4.2 *Information Note*

on the IPCC WG III Follow-up Expert Meeting 'Modeling Renewable Energies' for the Special Report on Renewable Energy Sources and Climate Change Mitigation (SRREN)).

2.3 2nd Lead Author Meeting

Directly following the IPCC Expert Meeting on Modeling Renewable Energies, the second Lead Author Meeting (LA2) of the SRREN was held in Oslo, Norway from 1 to 4 September, 2009, hosted by the Norwegian Pollution Control Authority. The meeting followed the compilation of the ZOD and the subsequent internal commenting period. The purpose of the meeting was (1) to discuss how internal comments on the ZOD were to be taken into account to produce the First Order Draft (FOD); (2) to discuss how the chapters will deal with cross-cutting issues and to assign responsibility for their treatment; (3) to assure that the information transfer from technology chapters to summarizing chapters functions smoothly; and (4) to discuss how chapters will write their executive summaries.

Prior to the meeting, there was extensive dialogue and cooperation with several SRREN (C)LAAs to organize the content of the cross-cutting sessions (X-cuts). There were seven X-cuts during LA2 including the following: (1) Metrics & Concepts; (2) Barriers and Potentials; (3) Technology Chapters; (4) Supply Curves (5) Sustainable Development; (6) Integration; and (7) Key Messages. Amongst plenary sessions, chapter team meetings, management team meetings and X-cut sessions, LA2 was exceptionally productive – one noteworthy achievement being the coordination and cooperation across chapters – and all parties left with a clear understanding of the work-flow leading to the successful transition to the FOD.

During the discussions in Oslo it became evident that several amendments to the approved structure are necessary for a number of chapters in order to improve the logical flow and readability of the SRREN. Furthermore, it proved necessary to appoint three additional CLAs for chapter 11. The details, listed by chapter, are as follows:

Chapter 5 (Hydropower)

A sub-chapter on integration into water management systems is proposed to be included in the structure of Chapter 5. This would be included as an own sub-chapter for the following reasons:

- Integration into water management systems is a highly relevant policy issue;
- Multipurpose projects, which encompass integration into management system issues, are likely to become more standard in their application (i.e. becoming the rule rather than the exception);
- The current SRREN Chapter 5 structure does not provide sufficient opportunity to present this issue (the topic is currently listed under 'technology improvement and innovation' although this does not sufficiently address 'multi-purpose use of reservoirs'); and
- In the ZOD, this issue is addressed in three separate sub-chapters, causing redundancy and a lack of clarity and focus for the reader, which could be much improved with one coherent sub-chapter on the topic.

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

The title of sub-chapter 8.3 is proposed to be amended from the existing title 'Strategic sectors and elements for transition' to read 'Strategic elements for transition pathways'.

This is due to the fact that the existing title is misleading in the sense that the chapter does not look at 'strategic sectors' (which do not exist), but at *all* demand sectors (residential, industry, transport, agriculture). The focus of the section is rather on various strategic elements within all these sectors that influence possible transition pathways towards an uptake of renewable energy. Therefore it would be much more comprehensive to the reader to amend the title accordingly.

Chapter 9 (Renewable Energy in the Context of Sustainable Development)

A separate sub-chapter on the 'Interactions of sustainable development and renewable energies' is proposed to be inserted in the structure of Chapter 9. This new section (9.2) would be inserted, shifting all other sub-chapter headings one sub-chapter down:

The *current* relevant existing sub-chapter headings read:

- 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 energies

The *amended* relevant sub-chapter headings read:

- 9.2 Interactions between sustainable development and renewable energies
- 9.3 Environmental impacts: global and regional assessment
- 9.4 Socio-economic impacts: global and regional assessment
- 9.5 Implications of (sustainable) development pathways for renewable energies

Following a short discussion in the introduction on the two-way relationship between sustainable development and renewable energy, the new sub-chapter 9.2 will assess this issue in more depth by focusing on 'Human settlements and energy access', 'Leapfrogging and microenergy', and 'Energy security'. Sub-chapters 9.3 and 9.4 will then assess the environmental and socio-economic impacts of renewable energies on sustainable development, which will be followed by sub-chapter 9.5 [assessing the 'Implications of \(sustainable\) development pathways on renewable energies'](#). [The introduction of the new sub-chapter 9.2 will thus enable an examination of](#) topic areas marked by and representative of the multiple interactions between renewable energies and sustainable development before moving the focus on the one-directional discussion of the respective impacts.

Chapter 11 (Policy, Financing and Implementation)

Three Lead Authors (LAs) from Chapter 11 (Catherine Mitchell, Govind Pokharel and Janet Sawin) have taken on the role of Coordinating Lead Authors (CLAs) in addition to Daniel Kammen and Zhongying Wang.

This is based upon the experience of both the TSU and of Chapter 11 LAs in the preparation of the ZOD. Chapter 11 is exceptionally broad and complex, and at the same time has the highest policy relevance. Because of its breadth, the content of Chapter 11 was originally spread among three different chapters – which were merged into one chapter at the scoping meeting. In order to successfully manage this large task, Janet Sawin, Catherine Mitchell and Govind Pokharel were asked to act as additional CLAs. They have designed a work-flow and schedule for the transition to the FOD that is believed to be crucial to the success of the chapter. Furthermore, their leadership was well-received by the rest of the chapter team in LA2 and their continuing contribution as CLAs is necessary to assure that this important chapter delivers the high quality that is expected of the IPCC. The IPCC WG III Bureau supports this change as agreed during the 40th session of the IPCC Bureau on 18 September, 2009 in Geneva, Switzerland.

In addition, it is proposed that the sub-chapter structure of Chapter 11 will be reordered as follows:

The *current* relevant existing sub-chapter headings read:

- 11.5 Enabling environment and regional issues
- 11.6 Experience with and assessment of policy options
- 11.7 Policy frameworks for innovation, systems integration and deployment of renewable energy

The *amended* relevant sub-chapter headings would read:

- 11.5 Experience with and assessment of policy options
- 11.6 Enabling environment and regional issues
- 11.7 A structural shift

In summary, the order of section 11.5 and 11.6 would simply be shifted and the title of 11.7 would be amended. All of the content of the sub-chapter headings (11.X level) would be retained and would remain unchanged.

The reordering (11.5 and 11.6) and renaming (11.7) of these sub-chapters is proposed for the following reasons: the focus of the chapter is policy, although it includes an analysis of financing the policies (finance) and the implications of policies (implementation). The existing structure presents the review of policies very late in the chapter, which is confusing to the reader. The proposed

structure enables the review of policies related specifically to renewable energies earlier in the chapter, then moves on to 11.6 to discuss 'enabling environments' which complement or potentially inhibit those policies. In 11.7, discussions surrounding what must come together to enable a structural shift to renewable energy as a standard energy provider in a low-carbon economy would be presented. This would contain the existing content, but the new title would provide more clarity to the reader in terms of what to expect from the sub-chapter.

To summarize, the reordering of sub-chapters 11.5 and 11.6 enables the authors to bring the policy discussion forward in the chapter, and shift to a more logical flow of the text. Re-titling 11.7 will not change the content of the sub-chapter, but will allow the reader to more clearly understand the discussions expected therein.

3. Future Work

The 31st Session of the IPCC Plenary is held during the preparations of the FOD of the SRREN. The FOD will be delivered to the WG III TSU on 14 December, 2009 at the latest, at which time it will be compiled into one document and sent out for external expert review. The FOD expert review period will end on 8 February, 2010. The 3rd LA Meeting will then be held in March, 2010. Other SRREN milestones include: preparation of the Second Order Draft (SOD) (due 3 May, 2010), SOD government and expert review (8 week period ending 28 June, 2010), the 4th LA Meeting (July, 2010), finalization of the report (due 20 September, 2010), final government distribution (8 week period ending 15 November, 2010), CLA preparatory meeting (December 2010), and the WG III Plenary for approval of the Summary for Policymakers (SPM) and the full report (December 2010), at which time the report will be ready for publication.

Furthermore, it is intended to hold two additional expert meetings to further improve the SRREN. Apart from the aforementioned 2nd meeting on modeling renewable energies (section 2.2. and 4.2), WG III intends to hold an IPCC Expert Meeting for the review of the FOD, primarily with the business community (section 4.1).

4. Future SRREN Activities

4.1 Proposal for an IPCC WG III Expert Meeting on the FOD Expert Review of the SRREN

Background: It is the aim of the SRREN to supplement the AR4 and upcoming AR5 by providing substantial new information, analyses and evidence not only reported in the peer reviewed literature but also to get access to literature and expert knowledge of stakeholder groups such as the business community and NGOs on the technical development, deployment, cost reductions and up-scaling of the implementation of renewable energies. Building on the successful processes of the AR4, which incorporated three expert meetings (Tokyo, Paris and Cape Town), WG III proposes an expert meeting within the framework of the SRREN First Order Draft (FOD) expert review period in which expert reviewers largely from the business community are able to meet with SRREN CLAs to discuss renewable energies in the power, heat and transport sectors and to comment on the FOD.

Title: IPCC WG III Special Report on Renewable Energy Sources and Climate Change Mitigation (SRREN) Expert Review Meeting

Aims of the IPCC Expert Meeting:

- 1) improve the quality of the SRREN FOD, by gathering comments from expert reviewers largely from the business community and allowing a face-to-face discussion with SRREN CLAs on the FOD text;
- 2) increase understanding by both authors and expert reviewers on the nature of the comments within the framework of the IPCC assessment process;
- 3) provide the opportunity for direct in-depth discussion of key issues focused on renewable energies in the power, heat and transport sectors; and

4) identify and gain access to additional literature pertinent to the SRREN, to which ready access might not be otherwise available.

Timing: The meeting would be held within the Expert Review period of the SRREN FOD.

Duration: 2 days

Location: Washington D.C., USA.

Number of Participants: An estimated 60-70 participants in total, with broad international representation.

Trust Fund: It is proposed that 16 journeys (11 SRREN CLAs and 5 WG III Bureau Members from developing countries and economies in transition) will be allocated as part of the IPCC Trust Fund budget for 2010.

Other Logistical and Funding Information: The United States government has confirmed their willingness to facilitate the meeting. In addition, WG III has been working closely with the business community, who has kindly confirmed their intention to offer US\$ 50,000.00 toward the costs of the meeting.

4.2 Informational Note on the 2nd IPCC WG III Expert Meeting on 'Modeling Renewable Energies' for the SRREN

Background: It was reported and agreed in the 30th Session of the IPCC Plenary in Antalya, 21 to 23 April 2009, to hold one or two additional expert meetings on 'Modeling Renewable Energies' during the drafting period of the SRREN. The meetings should comprise relevant CLAs, LAs and additional experts from the economic modeling community, in order to improve the coherence of the special report (IPCC-XXX/Doc.7). That is, the meetings shall improve the alignment between the assumptions of the models (top-down approaches) and the results of the respective technology chapters (bottom-up approach) by bringing the different research communities together. Furthermore, it was agreed that it would be desirable to assess scenarios exploring the effect of limited availability of different technologies on the cost and the portfolio of mitigation options. The first of these expert meetings was held on 30/31 August 2009 back-to-back to the 2nd Lead Author Meeting in Oslo, 1 to 4 September 2009, and provided a valuable starting point. During this meeting, the scenarios modeling community and the technology experts agreed to work closely together to provide high-quality input to the SRREN and the AR5. The combined group agreed on a work-plan in a memorandum that is currently under discussion with the Integrated Assessment Modeling Consortium (IAMC). To build on this successful process, it is planned to hold the follow-up meeting back-to-back with the 3rd Lead Author Meeting to expand on different view points and unresolved issues.

Title: IPCC WG III Special Report on Renewable Energy Sources and Climate Change Mitigation (SRREN) Follow-up Expert Meeting on 'Modeling Renewable Energies'

Aims of the IPCC Expert Meeting:

- Further strengthen the coherence and realism of the SRREN by advancing the understanding between the modeling and technology communities;
- Build on the successful and trust-building process established during the first expert meeting and facilitate continuing discussions on open questions;
- Follow-up on the results and discussion based on the scenario survey carried out for and presented during the first meeting;
- Develop on participants' respective insights gained during the first meeting to further enhance comparability of model representation (i) with each other and (ii) with the insights of the technology community;

- Continue the analysis of 2nd best approaches outlined in the first meeting (e.g. non-optimal climate policy regimes with delayed participation of some countries, market and technology failures);
- Continue to improve the understanding for technology representation in economic models (description of models and modeling approaches, inclusion of policy scenarios and modeled technologies);
- Reassess the results of the technology appraisal and discuss approaches for a more coherent model representation of technologies;
- Further discuss the underlying assumptions and reasons for diverging assessments of the contributions of the respective technologies.

Timing: 28 February – 1 March 2010, back-to-back with SRREN LA3.

Duration: 2 days

Location: Oxford, UK.

Number of Participants: An estimated 40 participants in total, with broad international representation.

IPCC Trust Fund: It is proposed that 16 journeys for experts from developing countries and economies in transition (including WG III Co-Chairs and Vice-Chairs) will be allocated as part of the IPCC Trust Fund budget for 2010.