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LIMITS

Low climate IMpact scenarios and the Implications of required Tight emission control Strategies

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Report on the 3rd Stakeholder Workshop regarding the regional analysis

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Report on the 3rd Stakeholder Workshop regarding the regional analysis

Name of all participants to the redaction of the report [a]

[a] National Development and Reform Commission Energy Research Institute, China (NDRC-ERI)

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1. Introduction

The LIMITS project aims at assessing climate policies that offer an effective response to mitigate climate change, namely that of restricting global warming to 2 degrees Centigrade.

The newly released 5th assessment report of the IPCC (WGIII) has shown that that transformation pathways leading to climate stabilization will have major co-benefits in terms of reduced air pollution. In the LIMITS project, the first multi model comparison exercise has been carried out, in which the interplay between climate change and air pollution has been examined by a set of integrated assessment models for the key major economies. The impacts of air pollution control have also been computed.

The third stakeholder meeting of the LIMITS project focused on the interplay between climate change policies with other high priority national objectives such as air pollution control. The meeting aimed at presenting the results of the second phase of the project, presenting the latest research on this topic and discussed the consequences for both air pollution and climate change policymaking, linking it to the UNFCCC policy debate. The meeting took place on June 3rd, 2014 in Beijing and was hosted by Energy Research Institute of National Development and Reform Commission (ERI-NDRC).

2. Co-linkages of climate change and integrated approaches to air pollution concerns

The first session was dedicated on the overview of research carried out in LIMITS. It began with the presentations about co-linkages of climate change (by Keywan Riahi, IIASA) and integrated approaches to air pollution concerns (by Shilpa Rao, IIASA; Rita van Dingenen, JRC).

2.1 Linkages between Climate Change Mitigation, Air Pollution and Energy Security

Keywan Riahi introduced the issues about co-linkages between climate change mitigation, air pollution and energy security. He underlined the importance to work globally on these issues. He showed some results about current air pollution policies to 2030 (see figure 1) and presented the modeling teams working on LIMITS and conducting the analysis presented in this workshop.

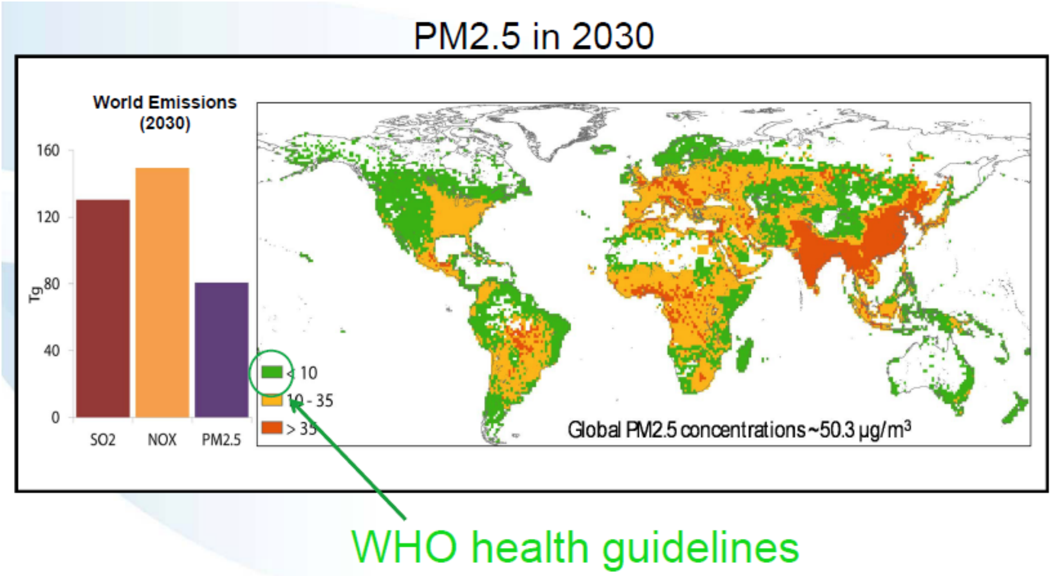

Figure 1 Current air pollution policies to 2030

He then showed three main model intercomparisons:

- detailed assessment of 2℃ target
  - Implications for major economies (regional costs, reductions, measures, etc…)
- energy security-climate linkage
  - Focus of energy independence & resilience
  - Assessment of the climate implications of energy security policies
  - Vice versa, can climate change mitigation help achieving energy security objectives?
- climate-air quality linkage
  - Focus on air quality co-benefits of mitigation
  - Human Health
  - Ecosystem impacts
  - Pollution control costs

Riahi then presented some energy security findings for China: mitigation can greatly reduce energy dependence of China by 2050; mitigation can also help electricity diversity in China; energy security policies lead to only small climate benefits.

2.2 Co-Benefits of Climate Policy for Air Pollution

Shilpa Rao introduced the work done in LIMITS about air pollution, starting from its goal: analysis of the long term global 2C climate regime for air pollution emission and impacts in mid-term (2030-2050).

The methods used for the analysis and how it was designed were presented. Shilpa then showed some results: SO2, NOx, Black Carbon projections, both at world level and China level (see figure 2).

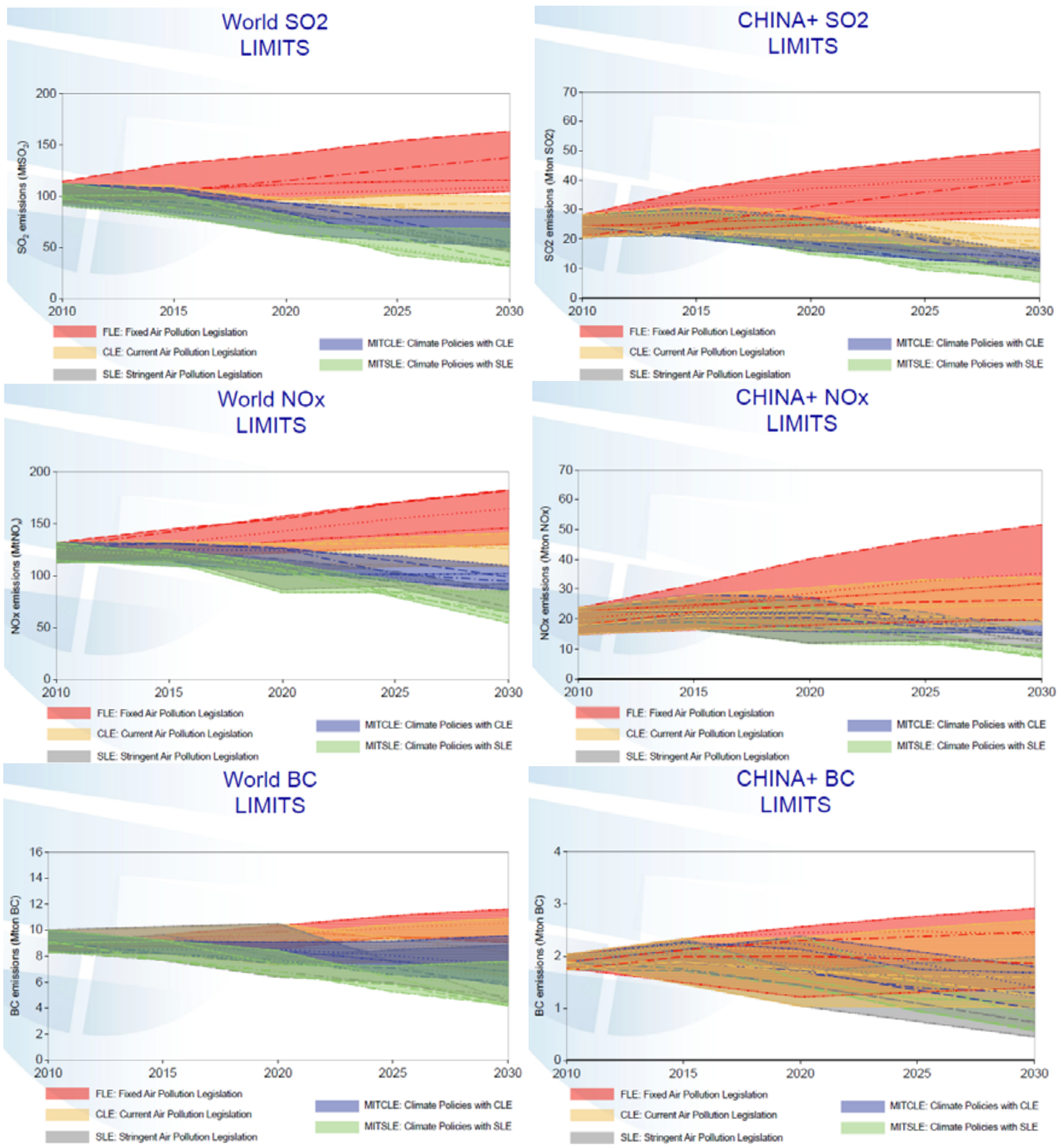

Figure 2 Co-benefits of climate policy for SO2, NOx, black carbon emissions at world level and China level

Then she showed some results in terms of integrated policies for SO2 and NOx. Then she presented starting from World results and China's ones. Policy costs were then presented.

Finally, she concluding presented some main points:

- Major reductions in air pollution can be achieved through an integrated approach.
- Such an approach could result in reductions of air pollutants of up to 50% globally compared to today's levels and simultaneously result in CO2 reductions of up to 60%.
- The largest potential and benefits from such action is in Asia, particularly China and India.
- Integrated action if carefully designed can be cost-effective in terms of achieving both air pollution and climate goals simultaneously.

2.3 Air quality co-benefit and trade-offs of LIMITS climate change mitigation scenarios – A multi-model evaluation

Rita van Dingenen presented the model analysis done and, in particular the TM5-FASST model.

She then showed some first results and projections on PM2.5 concentrations (man-made + natural: dust + sea-salt) at world and China levels (see figure 3), and some projections on premature mortalities from air pollution (see table 1).

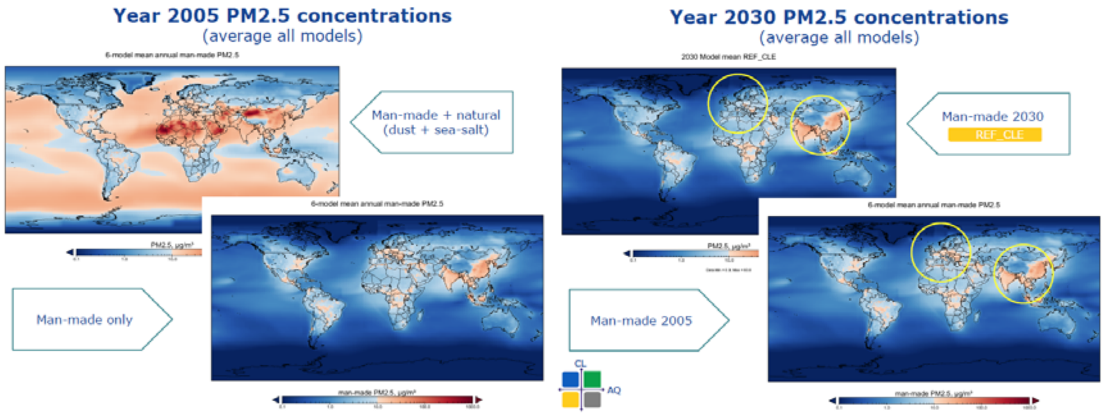

Figure 3 PM2.5 concentrations in year 2005 and 2030

Table 1 Premature mortalities from air pollution in 2030 (thousands)

	REF_CLE	FROZEN	REF_SLE	MIT_CLE	MIT_SLE
AFRICA	596	+27	-45	-23	-56
CHINA+	1918	+273	-375	-205	-522
EUROPE	261	+81	-38	-27	-57
INDIA+	1777	+129	-489	-270	-668
NORTH_AM	97	+21	-12	-7	-16
LATIN_AM	134	+16	-14	-11	-22
REST_ASIA	989	+70	-224	-132	-307
GLOBAL	6152	+660	-1237	-689	-1696

Then she presented the benefits from mitigation under CLE on ozone and the crop loss due to O3.

Finally she presented some main conclusions of the analysis:

- For the first time, a multi – integrated assessment model ensemble has been used to evaluate in a consistent and coherent way benefits and trade-offs of climate and air quality policies
- Climate mitigation policies offer substantial co-benefits for air quality. Compared to CLE without mitigation:
  - Additional (man-made) PM2.5 reduction of 30-50% in Asia
  - Globally reduction of 700,000 premature mortalities annually
  - Global crop yield gain of >20 metric Mtonnes/year (4 major crops)
- A combination of climate mitigation and stringent air quality policies can bring 70% of the global population to an annual (man-made) PM2.5 exposure of less than 10 ug/m3, and 98% below 25ug/m3 by 2030
- Some climate mitigation measures lead to a trade-off and a worsening of air quality (wood burning) need for coordinated design and implementation of climate and air quality policies.
- Although mitigation scenarios have a long time horizon (reduction of CO2), the air quality benefits are immediate and local and are an incentive for non-delaying implementation.

2.4 Discussion

A short discussion among the participants followed and some questions were proposed to the LIMITS consortium.

Tao Hu asked some questions: first of all, what is the difference in climate policy and air quality policy? Reducing SO2 implies growth of CO2. Where are the co-benefits? In China there is not great difference; what are the limits of the LIMITS models?

Yun Gao: What are the projections of PM2.5 in 2040?

LIMITS models have a lot of problems, but LIMITS have worked with a lot of models, different models, which have found a big range of uncertainties, but also a big range of agreements. However the models can be improved.

LIMITS work is quite relevant, stressing on integration, even though there are some limits.

Jiang Kejun invited his colleagues from China to think at the 2C target as feasible.

3. Air pollution control and climate change mitigation: connected problems

The second section was devoted to the connected problems of air pollution control and climate change mitigation. It stated with a presentation of P.R. Shukla (IIM) on the co-Linkages of climate change and air pollution policies in India, followed by a presentation of Jiang Kejun (NDRC-ERI) on air pollution in China.

3.1 Air pollution in India: science/policy

Professor Shukla introduced the Soft-Integrated Model Systems (SLIMS), with a special focus on India, and its main results in LIMITS scenarios on: GDP and population, CO2 Emissions, SO2 Emissions, NOx emissions, Black Carbon Emissions.

He then showed some slides on electricity, transport and industry. In particular, he showed some slides on electricity supply, on location of high emissions plants, on transport infrastructures (e.g. freight corridors), energy mix for transport, CO2 mitigation, air pollution co-benefits of CO2 mitigation (see figure 4).

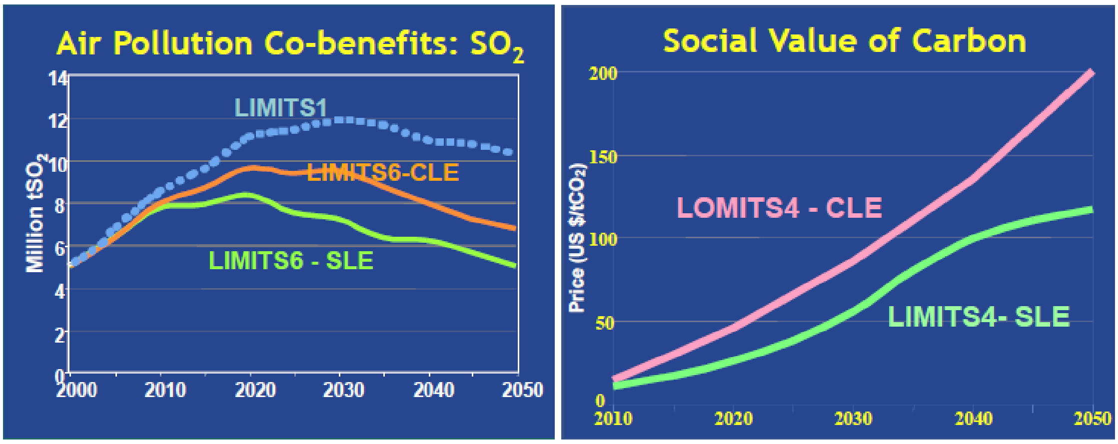

Figure 4 Air Pollution Co-benefits of CO2 Mitigation

Then he presented the transport policies in India, the estimated PM2.5 concentrations under different scenarios and by aggregated sector, the estimate all-cause mortality due to air pollution to Delhi in 2030.

Finally he showed some main conclusions underling the importance of coordination between institutions & finance for co-benefits.

3.2 Air pollution in China: science/policy

Professor Kejun introduced his presentation explaining Chinese vision on Low Carbon and Green Future. Then he showed the key questions of the recent scenario studies: energy, climate change and local environment. He invited all the stakeholders to look at all the results their provided on these issues.

Jiang Kejun then presented the framework of integrated policy model for China (IPAC). Talking about CO2 emissions in China, he underlined that after Copenhagen and the IPCC report, China should follow the lower projection of the bottom up analysis, trying to make a significant change in the next years to reach the 2C target in 2050 (see figure 5).

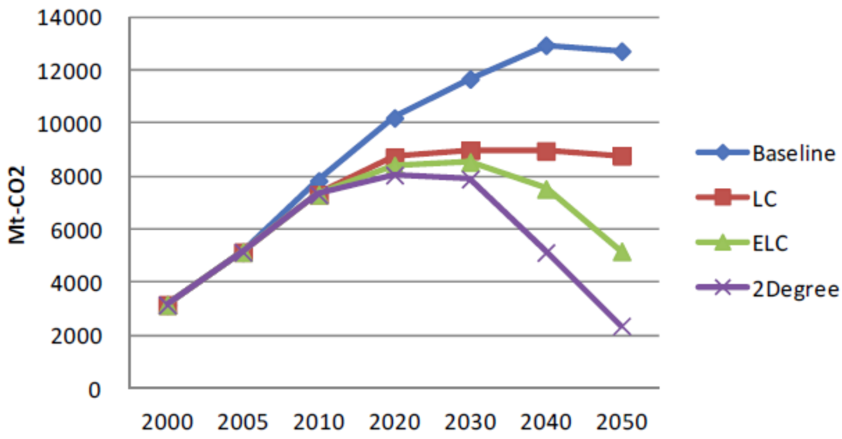

Figure 5 Rapid change of CO2 emission in China

In LIMITS also some projections on costs/investments for pollution control have been conducted. From IPCC report, in 2030 China will occupy the 29% of CO2 emissions. He then showed some projections in terms of GDP and population, investment by industrial sectors and products outputs in major sectors, low carbon and ELC. To understand if the CO2 target is feasible we should understand what sector could be reset; the Chinese report says that by 2030 China could reach this target.

3.3 Round Table: Air pollution control and climate change mitigation: connected problems – reflections on China and the world major economies

Jiang Kejun introduced the discussion inviting the participants to make questions to the LIMITS partners.

In particular, JRC's air pollution presentation is really interesting for China government and some more discussion could be useful.

Ying Fan asked the source of costs data. Why low cost technologies cannot be used if they are really so low? The GDP losses are a sort of invisible costs which are difficult to estimate, which are different from direct costs.

Keywan Riahi underlined that all the information on costs of technologies come from the GAINS models; these costs have been integrated in IAM models. The technology costs come from very detailed bottom up analysis. The GDP losses are calculated by the IAM models.

Tao Hu asked why these low cost technologies are not implemented if really they are low costs? He then underlined that the supply chain in China has not yet so well studied to permit us to understand what to do.

Bin Li asked again while the low costs technologies are not adopted? It is not due to the government in China: they are aware that the costs are minor, but the organisations in China do not want to change. The government wants to maximize the quality of life of people, but now it is difficult to understand that at the end this will happen if something will change.

Ying Fan underlined that the transition should be income neutral, but Jiang underlined that at the end the GDP will growth. Ying Fan replied that the producers are worried to lose money and this is why they do not adopt low cost technologies.

Bofeng Cai said that too much attention is dedicated to CO2, but there are also short life pollutants, which can be very dangerous. Rita underlined that also the secondary pollutants are included in the calculations.

How much models are really useful? Elmar answered that models if well done are a sort of a map to policy makers.

Jiang Kejun said that the models try to consider as much as possible all the detailed information and parametres.

Massimo Tavoni explained as the carbon costs grows as more with the decarbonisation stages, because the decarbonisation becomes more difficult, but this will apply only to a little part of the economy, because in China most of the decarbonisation will be done in the first stage.

Shilpa Rao explained that the air pollution model is a very detailed model.

Chen asked how China could improve energy efficiency. Jiang answered that a lot of different technologies have been considered in the models and a unique parameter should be used, even if the costs are different to control. Sometime models do not work because too difficult and costly to implement.

Xu Xiangyang stressed the fact that the sectors could be more directly linked in the models. Shilpa Rao underlined that the models are very details, but that could be very interesting to apply the models to some case studies. Rita van Dingenen agreed that sectors specific concentration is missing in the model and that could be more considered in the future.

Jiang Kejun underlined as such panel discussion could be very important to understand how modelling could be used in China.

4. List of Participants

List of Participants		
Participant	**Affiliation**	**Country**
Lara Aleluia Reis	Fondazione Eni Enrico Mattei (FEEM)	Italy
Nico Bauer	Potsdam Institute for Climate Impact Research (PIK)	Germany
Alex Bowen	London School of Economics and Political Science (LSE)	United Kingdom
Emanuele Campiglio	London School of Economics and Political Science (LSE)	United Kingdom
Bofeng Cai	Chinese Academy of Environment Science	China
Qingchen Cao	National Metrological Bureau	China
Mariaester Cassinelli	Fondazione Eni Enrico Mattei (FEEM)	Italy
Sha Chen	Beijing Industry University	China
Aart de Zeeuw	Tilburg University	Netherlands
Laurent Drouet	Fondazione Eni Enrico Mattei (FEEM)	Italy
Jae Edmonds	Pacific Northwest National Laboratory (PNNL)	USA
Johannes Emmerling	Fondazione Eni Enrico Mattei (FEEM)	Italy
Ying Fan	Chinese Academy of Science	China
Shinichiro Fujimori	National Institute for Environmental Studies (NIES)	Japan
Qingxian Gao	Chinese Academy of Environment Science	China
Jiangang Gao	Ministry of Transport	China
Yun Gao	National Metrological Bureau	China
David Gernaat	Utrecht University (UU)	Netherlands
Jérôme Hilaire	Potsdam Institute for Climate Impact Research (PIK)	Germany
Tao Hu	Environment Policy Research Institute	China

Jiang Kejun	Energy Research Institute of the National Development and Reform Commission (NDRC-ERI)	China
Tom Kober	Energy Research Centre of the Netherlands (ECN)	Netherlands
Elmar Kriegler	Potsdam Institute for Climate Impact Research (PIK)	Germany
Joana Leitao Alexandre	Joint Research Centre, Institute for Environment and Sustainability, European Commission (JRC-IES)	Italy
Kai Lessmann	Potsdam Institute for Climate Impact Research (PIK)	Germany
Bin Lin	Beijing Development and Reform Commission	China
Erda Lin	Chinese Academy of Agriculture	China
David McCollum	International Institute for Applied Systems Analysis (IIASA)	Austria
Shilpa Rao	International Institute for Applied Systems Analysis (IIASA)	Austria
Keywan Riahi	International Institute for Applied Systems Analysis (IIASA)	Austria
Holger Rogner	International Institute for Applied Systems Analysis (IIASA) and Royal Institute of Technology (KTH)	Austria
Priyadarshi Shukla	Indian Institute of Management (IIM)	India
Iris Staub-Kaminski	Potsdam Institute for Climate Impact Research (PIK)	Germany
Massimo Tavoni	Fondazione Eni Enrico Mattei (FEEM)	Italy
Tera-Louise Tideman	EEAS Beijing	China
Bob Van der Zwaan	Energy Research Centre of the Netherlands (ECN)	Netherlands
Rita Van Dingenen	Joint Research Centre, Institute for Environment and Sustainability, European Commission (JRC-IES)	Italy
Hong Shen	National Tax Bureau	China
Mariësse van Sluisveld	Utrecht University (UU)	Netherlands
Zhen Sun	NDRC	China
Detlef van Vuuren	Utrecht University (UU)	Netherlands
Haiqin Wang	Development Research Center	China

Shu Wang	NDRC	China
Xiangyang Xu	University of Mining Technology, Beijing	China
Fuqiang Yang	NRDC	China
Lijian Zhao	Energy Foundation	China
Songli Zhu	ERI	China