

## MITIGATION OF CLIMATE CHANGE

### Background

Recognising the problem of potential global climate change the World Meteorological Organisation (WMO) and the United Nations Environment Programme (UNEP) established the Intergovernmental Panel on Climate Change (IPCC) in 1988. The role of the IPCC is to assess the scientific, technical and socio-economic information relevant for the understanding of the risk of human-induced climate change. Under IPCC there are three working groups focusing on different aspects of climate change:

- Working Group I: assesses the scientific aspects of the climate system and climate change;
- Working Group II: addresses the vulnerability of socio-economic and natural systems to climate change, negative and positive consequences of climate change, and options for adapting to it.
- Working Group III: assesses options for limiting greenhouse gas emissions and otherwise mitigating climate change.

IPCC does not carry out new research nor does it monitor climate-related data. It bases its assessment mainly on published and peer reviewed scientific technical literature. It completed its First Assessment Report in 1990, which played an important role in adopting the UN Framework Convention on Climate Change (UNFCCC) in 1992. Its Second Assessment Report, Climate Change 1995, provided key input to the negotiations, which led to the adoption of the Kyoto Protocol to the UNFCCC in 1997.

### Outline of the WG III Third Assessment Report

The Third Assessment Report (TAR) will be a comprehensive and up-to-date assessment of the policy-relevant scientific, technical, and socio-economic dimensions of climate change. It will concentrate on new findings since 1995, pay greater attention to the regional (in addition to the global) scale, and include non-English literature to the extent possible.

WG III is responsible for producing the Third Assessment Report on Mitigation of Climate Change, one of the three reports under preparation by the IPCC. Similar to the previous reports by WG III, this report is to focus on the following areas:

- Greenhouse gas emissions mitigation scenarios and implications
- Technological and economic potential of GHG emissions reduction
- Technological and economic potential of options to enhance, maintain and manage biological carbon reservoirs and geo-engineering
- Barriers, opportunities and market potential of technologies and practices
- Policies, measures and instruments

- Costing methodologies for mitigation
- Global, regional and national costs and ancillary benefits of mitigation
- Sector costs and ancillary benefits of mitigation
- Decision making frameworks

Based on the TAR, a Summary for Policy Makers (SPM) will be prepared for the mitigation report.

### **Major Features of Preparatory Process**

Like the previous assessment reports, the TAR is prepared by the writing teams, comprising co-ordinating lead authors, leader authors and contributing authors. As a continuation of the first and second assessment report, this report will first summarise the main conclusions contained in the second assessment report and provide an overview of progress in the area since the second assessment report. Due to the diversity of issues involved in the assessment of mitigation options, efforts have been made to ensure linkages and co-ordination between different areas in the report. Furthermore, assessment of mitigation must be based on the scientific understanding of climate change and the actual and potential impact of climate change. Therefore, arrangements have been made to work together with other working groups.

It is worthwhile to note that four issues have been identified as cross cutting across all three working groups and must be treated in a consistent manner. These issues are:

- Development, equity and sustainability
- Costing Methodologies
- Uncertainties, and
- Decision Making Frameworks

With the contributions from many experts around the world through their active participation in the process, guidance papers for each cross-cutting issue have been prepared for reference by the members of the writing teams of the reports.

In order to incorporate the latest scientific knowledge into the report, WG III Writing Teams have been trying to keep the preparation exercise as an open and dynamic process. In this connection, a number of mechanisms have been employed:

- Expert meetings: a series of expert meetings have been organised to address the key issues related to mitigation options;
- Open review process: invitation has been extended to the academic community, governmental focal points, international organisations, non-governmental organisations and industries for their participation in the review process of the report;
- Special Reports: WG III is currently co-ordinating the preparation of two special reports: emission scenarios and technology transfer in addition to active involvement in the preparation

of other two special reports (aviation and the global atmosphere and land-use change and forestry). The findings of these special reports are no doubt valuable input to the third assessment report. More importantly, the preparation of such special reports has been integrated into the TAR process.

### **Time Schedule**

Before the Third Assessment Report and the Summaries for Policy Makers are submitted to approval by the IPCC Working Group meeting in Plenary, they will be reviewed extensively by experts and governments. The Working Group III Plenary will approve the Summary for Policy Makers on line-by-line bases. The Summary for Policy Makers will be then accepted by the full IPCC Plenary.

The work started in 1998 and is scheduled for completion in 2001.

- First Order Draft 1 November 1999
- Expert Review 15 November – 30 December 1999
- Second Order Draft 30 April 2000
- Expert and government Review 14 May - 9 July 2000
- Final draft and Summary for Policy makers 20 October 2000
- WG III Plenary Approval 28 February – 2 March 2001
- IPCC Plenary July 2000

More information on IPCC Working Group III activities can be found in the website as given below:

**<http://www.rivm.nl/env/int/ipcc/>**

## **Special Report on Methodological and Technological Issues in Technology Transfer**

### **Background**

The Subsidiary Body for Scientific and Technological Advice (SBSTA) requested that the IPCC produce a Technical Paper on issues related to the transfer of technology; this Technical Paper later was reformulated into a Special Report to allow the authors to bring in information that has been published since the Second Assessment Report. The report is being coordinated jointly by Working Group II and Working Group III.

Most broadly, the phrase "transfer of technology" is shorthand for a broad set of phenomena that include the development/demonstration of technology, availability of information, financial flows and resources, investments in infrastructure and capital, property rights, management structures, and habits of human behavior -- all of which influence the availability and choice of technologies employed in production and consumption.

The Special Report is intended to identify, describe, and assess potential effectiveness of options to accelerate the development and diffusion of technology for reducing greenhouse gas emissions and adapting to climate change through various mechanisms, including technology cooperation. The report will assess the current environment for technology transfer, including a discussion of the current flows of technology and the enabling factors affecting these flows. Options for accelerating those flows will be discussed on a sector-by-sector basis.

SBSTA requested that the report focus on available equipment, infrastructure, and processes in energy demand and supply, agriculture, and forestry; as well as practices related to capacity building, information networks, and training which are designed to facilitate the application of technologies. The report also will assess experience with a variety of arrangements which have brought about transfer of technology, from commercial agreements among private-sector firms to transfers facilitated through support from government or multilateral institutions. The paper will analyze obstacles to successful transfer and application, as well as promising approaches for overcoming these obstacles.

### **The Major Content**

The Special Report will assess the current environment for technology transfer, including discussion of the current technology flows, the enabling factors and options for accelerating these flows. Options for accelerating those flows will be discussed on a sector-by-sector basis. Case studies of practical experience with technology transfer will be used through the report to illustrate the effectiveness of options to accelerate the transfer of GHG control technologies.

The main issues dealt with in the Special Report are as follows:

- Managing technological change in support of the Climate Change Convention
- Trends in technology transfer
- International agreements and legal structures

- An enabling environment for technology transfer
- Financing and partnership for technology transfer
- Sectoral analysis

In the sectoral analysis part, the following sectors are examined:

- Residential, commercial and industrial buildings sector
- Transportation,
- Industry
- Energy supply
- Agriculture
- Forestry
- Solid waste management and waste water treatment
- Human health
- Coastal adaptation technologies

Some 30 individual case studies are included in the report..

### **The Schedule**

The initial scoping meeting for this Special Report was held on June 30-July 1 1997, in Washington, DC. The report will be completed early in the year 2000. The second draft is now under expert and government review. According to the latest IPCC schedule:

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|---|----------------------|
| • Expert and Government Review                        | up to 30 June 1999   |
| • Preparation of the Final Draft by Lead Authors      | July to October 1999 |
| • Final Draft and Summary for Policy Makers (SPM)     | 1 November 1999      |
| • Final Draft to Governments                          | 15 December 1999     |
| • WG-III Approval of SPM and Acceptance of the Report | 8-10 March 2000      |
| • Acceptance of SPM by IPCC Plenary                   | May 2000             |
| • Publication   | July 2000            |

## **Special Report on Emission Scenarios**

### **Background**

Emission scenarios are a central component of any assessment of climate change. Scenarios facilitates assessments of future developments in complex systems that are either inherently unpredictable or have high scientific uncertainties, and the assessment of future emissions is an essential component of the overall assessment of global climate change by the IPCC.

The IPCC developed sets of emissions scenarios in 1990 and 1992. In 1994, IPCC conducted a review of the IS92 scenarios and conclusions are drawn that new scenarios, if developed, should include the following improvements:

- In the estimation of emission emissions baselines and future non-CO<sub>2</sub> emissions, particularly from land use;
- In incorporating the latest information on economic restructuring throughout the world;
- In expanding the range of economic development pathways, including a narrowing of the income gap between developing and industrialised countries;
- In examining different trends in and rates of technological change; and
- In evaluating possible consequences of trade and market liberalisation and privatisation.

In 1996, the plenary session of the Intergovernmental Panel on Climate Change (IPCC) charged Working Group III of the Panel to develop a Special Report on Emissions Scenarios, including a new set of scenarios for the emissions of greenhouse gases. The scenarios are "non-intervention scenarios", implying that no explicit additional climate policies are to be assumed.

The set of new Emission Scenarios is based on an extensive assessment of the literature, six alternative modelling approaches, and an "open process" that solicited wide participation and feedback from many groups and individuals. The set of scenarios includes all relevant species of GHGs plus emissions of sulphur. It covers most of the range of GHG emissions in the published scenario literature.

### **The Six Models Used in the Generation of Emission Scenarios**

In the writing team, there are 42 scientists. Together they represent a broad range of scientific disciplines, regional background and non-governmental organisations. In particular, the team includes representatives from six leading groups with extensive expertise in modelling alternative emissions scenarios. The six models used to generate the emissions scenarios are:

- Asian Pacific Integrated Model (AIM) from the National Institute of Environmental Studies in Japan;
- Atmospheric Stabilisation Framework Model (ASF) from ICF in the United States;
- Integrated Model to Assess the Greenhouse Effect (IMAGE) from RIVM in the Netherlands;
- Multiregional Approach for Resource and Industry allocation (MARIA) from University of Tokyo in Japan;

- Model for Energy Supply Strategy Alternatives and their General Environmental Impact (MESSAGE) from IIASA in Austria; and
- The Mini Climate Assessment Model (Mini CAM) from PNNL in the United States.

The above models are representative of emissions scenario modelling approaches and different integrated assessment frameworks in the literature and includes so-called top-down and bottom-up models.

### **The Open Process**

In the preparation of the report, an “open process” was included to stimulate input from a community of experts much broader than the writing team, especially from different regions and societal sectors. To facilitate the open process, a SRES website was created ([sres.ciesin.org](http://sres.ciesin.org)). The web site includes a description of SRES activities and the scenario development process; it provides detailed information on the four marker scenarios and their storylines, and it offers facilities for receiving the feedback from the open process. The open process lasted from June 1988 to January 1999 and was open until April 1999.

Three Categories of submissions were invited through the open process and the web site:

- General suggestions for improving SRES scenarios and the work of the writing team;
- Additional scenarios published in the reviewed literature that had not been included in the scenario data base; and
- New scenario variants based on the SRES marker scenarios.

Altogether, more than 34,000 accesses to the SRES web site have been registered from some 3,000 unique hosts that were connected.

### **The Storylines**

The storylines identify particular dynamics, visible in the world today, that might have important influences on future GHG emissions. They deliberately explore what might happen if political, economic, technical and social developments took a particular alternative direction at the global level; they also pay attention to regional differences and interactions, especially between developing and industrialised countries.

The writing team decided on four storylines, describing developments in many different economic, technical, environmental and social dimensions. The titles of the storylines have been kept simple: A1, A2, B1 and B2.

- [A1 storyline and scenario family](#) describes a future world with very rapid economic growth, low population growth and rapid introduction of new and more efficient technologies. Major underlying themes are economic and cultural convergence, capacity building and increased cultural and social interactions, with a substantial reduction in regional differences in per capita income.

- [A2 storyline and scenario family](#) describes a very heterogeneous world. The underlying theme is an emphasis on self-reliance and local identities, with an emphasis on local traditions. Population growth is high, economic development regionally oriented, and technological change relatively slow.
- [B1 storyline and scenario family](#) describes a convergent world with rapid change in economic structures, "dematerialization" and introduction of clean technologies. The emphasis is on global solutions to environmental and social sustainability, including concerted efforts for rapid technology development, dematerialization of the economy, and improving equity.
- [B2 storyline and scenario family](#) describes a world emphasising local solutions to economic, social, and environmental sustainability. It is again a heterogeneous world with less rapid and more diverse technological change but a strong emphasis on community initiative and social innovation to find local, rather than global solutions.

### The Schedule

The first draft was completed in April 1999 and is currently under expert review. With the comments and suggestions from reviewers, the writing teams will set to prepare the second draft. The timetable for its completion is as follows:

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| • First Draft                                | April 1999             |
| • Expert Review of First Draft               | May to July 1999       |
| • Second Draft and Summary for Policy makers | 8 August 1999          |
| • Expert and Government Review               | September-October 1999 |
| • Final Drafts                               | 13 December 1999       |
| • Final Draft to Governments                 | 15 January 2000        |
| • WG III Plenary Approval                    | 12-14 March 2000       |
| • IPCC Plenary Acceptance                    | May 2000               |
| • Publication                                | July 2000              |

For more information, please visit the webpage at:

**<http://sres.ciesin.org/>**