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# 1. INTRODUCTION

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## 1.1 ESTABLISHMENT OF THE RESPONSE STRATEGIES WORKING GROUP

The Intergovernmental Panel on Climate Change (IPCC) was established under the auspices of the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP) to address the need for an international organization that could deal with the issue of climate change. As summarized in WMO Executive Council resolution 4 (EC-XL) of 1987, the organization's objectives are to address climate change by:

- (i) Assessing the scientific information that is related to the various components of the climate change issue, such as emissions of major greenhouse gases and modification of the Earth's radiation balance resulting therefrom, and that are needed to enable the environmental and socio-economic consequences of climate change to be evaluated; and
- (ii) Formulating realistic response strategies for the management of the climate change issue.

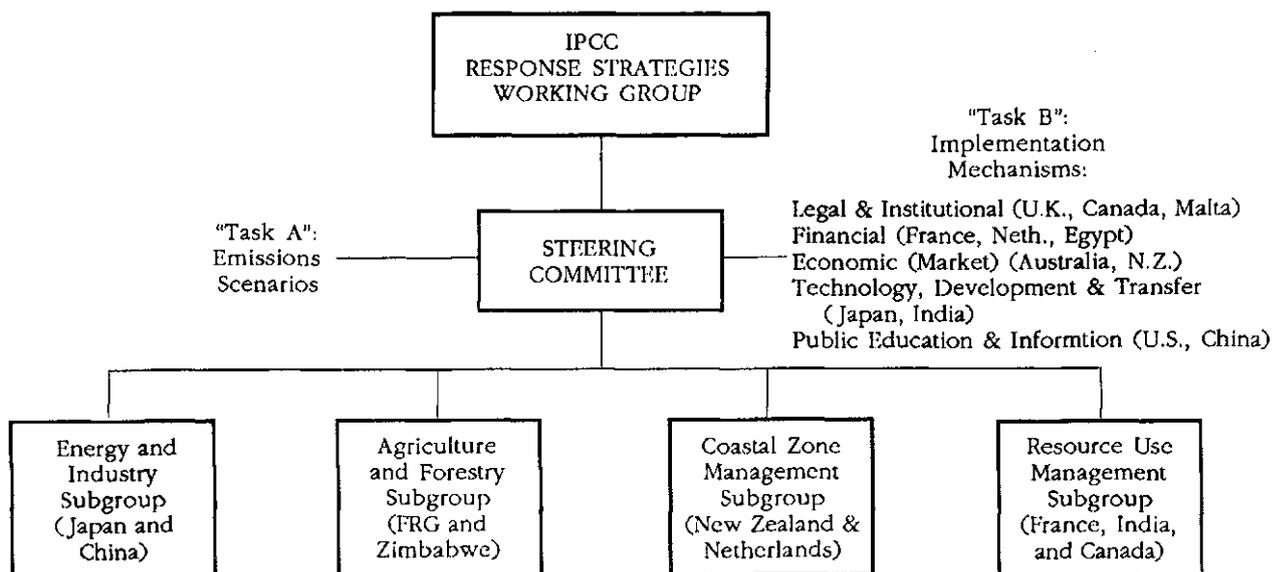
At the IPCC's first meeting in Geneva in November 1988, the Panel agreed that its work included three main tasks:

- (i) Assessment of available scientific information on climate change;
- (ii) Assessment of environmental and socio-economic impacts of climate change; and
- (iii) Formulation of response strategies.

To accomplish these tasks in the most efficient and expeditious manner possible, the IPCC decided to establish three Working Groups to deal with each of the tasks identified above. The IPCC agreed that the three working groups, on science, impacts, and response strategies, would be chaired, respectively, by the United Kingdom, Soviet Union, and United States.

The latter of these Working Groups, the Response Strategies Working Group (RSWG), held its first meeting in Washington in January 1989 under the chairmanship of Dr. Frederick M. Bernthal of the United States. RSWG Vice-Chairs were also named from Canada, China, Malta, the Netherlands, and Zimbabwe. At that first meeting, the RSWG established a Steering Committee and four Subgroups to carry out a work plan for formulating response strategies (see Figure 1.1). The RSWG Steering Committee was given responsibility for coordinating the Working Group's activities in general and for specifically addressing two cross-cutting tasks: (1) the development of greenhouse gas emissions scenarios; and (2) the development of a strategy for considering implementation mechanisms. The four RSWG Subgroups were tasked with developing a range of climate change response strategies in the areas of: (1) Energy and Industry; (2) Agriculture and Forestry; (3) Coastal Zone Management; and (4) Resource Use and Management. It was agreed that the first two subgroups would consider measures for limiting net greenhouse gas emissions from the energy, industry, agriculture, and forestry sectors, and that the latter two subgroups would deal with measures for adapting to the impacts of climate change on coastal regions and natural resources.

FIGURE 1.1: Organization of Working Group III



## 1.2 RSWG STEERING COMMITTEE

The RSWG Steering Committee was established to provide for overall coordination and direction of the RSWG's work. It was also agreed that the Steering Committee would undertake cross-cutting tasks relevant to the work of all the RSWG Subgroups or to the activities of the other two IPCC Working Groups.

### 1.2.1 EMISSIONS SCENARIOS

At its first meeting the RSWG requested that, as its first task, or "Task A," the Steering Committee conduct an analysis of possible future scenarios of global emissions of greenhouse gases. The purpose of these scenarios was to provide the four RSWG subgroups and the IPCC Science and Impacts Working Groups with a preliminary basis for conducting long-range analyses. By April 1989 a United States-Netherlands team of experts developed three possible scenarios of future emissions corresponding to: (1) the equivalent of a CO<sub>2</sub> doubling from pre-industrial levels by about the year 2030; (2) a CO<sub>2</sub> equivalent doubling by approximately 2060; and (3) a doubling by about 2090 with stabilization thereafter. The group subsequently

developed two additional emissions scenarios corresponding to emissions projections in which atmospheric concentrations of greenhouse gases are stabilized at a level less than a CO<sub>2</sub> equivalent doubling. In addition, the Steering Committee's emissions projections have been complemented by more recent work developed by the Energy and Industry and Agriculture and Forestry Subgroups based on individual country studies of likely long-term greenhouse gas emissions trends.

### 1.2.2 IMPLEMENTATION MECHANISMS

The Steering Committee's second task, or "Task B," was to develop a plan for identifying "implementation mechanisms," or, in other words, the specific means through which response strategies can be brought into force in an effective manner. The Steering Committee agreed that it would consider five categories of implementation mechanism and named two or three countries to act as co-coordinators for each topic area:

- *Public education and information*, which comprises those mechanisms designed to stimulate global awareness of the climate change issue and possible response strategies (co-coordinators: United States and China).

- *Economic (market) measures*, or those mechanisms that ensure that response strategies are designed in the most cost-effective and economically viable manner possible (co-coordinators: Australia and New Zealand).
- *Technology development and transfer*, which relates both to mechanisms for promoting the development of new technologies to limit or adapt to climate change and to those that encourage the transfer of climate change related technologies internationally (co-coordinators: Japan and India).
- *Financial measures*, or those mechanisms that assist in the ability of countries, in particular developing countries, to address climate change (co-coordinators: Netherlands, France, and Egypt).
- *Legal and institutional measures*, which deal with assessing legal and institutional mechanisms for addressing climate change, including the possible development of a framework convention on climate change (co-coordinators: United Kingdom, Canada, and Malta).

The RSWG held a special workshop on these implementation mechanisms in October 1989 in Geneva. The workshop was attended by forty-three countries and eight international organizations and provided an opportunity for a broad exchange of views on these important mechanisms for addressing climate change.

### 1.3 RSWG SUBGROUPS

The RSWG agreed that consideration of specific response strategies would be conducted by four subgroups in the areas of: (1) Energy and Industry; (2) Agriculture, Forestry, and Other Human Activities; (3) Coastal Zone Management; and (4) Resource Use and Management. The first two subgroups were designed to address "limitation" issues, e.g., measures to limit net greenhouse gas emissions from the energy, industry, agriculture, and forestry sectors. The latter two subgroups were set up to consider measures for adapting to the impacts of climate change, e.g., the impacts of sea level rise on coastal regions or of changing temperature and precipitation patterns on natural resources.

#### 1.3.1 ENERGY AND INDUSTRY SUBGROUP

The Energy and Industry Subgroup (EIS), co-chaired by Japan and China, was tasked with defining policy options for climate change response strategies related to greenhouse gas emissions produced by energy production, conversion, and use, as well as emissions from industrial sources not related to energy use. The EIS considered energy uses in the industrial, transportation, and residential sectors that produce carbon dioxide, methane, nitrous oxide, and other gases, and defined technological and policy options to reduce emissions of these gases. The EIS also developed estimates of future greenhouse gas emissions from the energy and industry sector.

#### 1.3.2 AGRICULTURE, FORESTRY, AND OTHER HUMAN ACTIVITIES SUBGROUP

The Agriculture, Forestry, and Other Human Activities Subgroup (AFOS), co-chaired by the Federal Republic of Germany and Zimbabwe, was given the mandate of dealing with issues related to the limitation of greenhouse gas emissions from the agriculture, forestry, and other sectors not related to the production or use of energy or industrial activities. The AFOS reviewed in particular methane emissions from livestock, rice, biomass, and waste sources, carbon dioxide emissions from deforestation or CO<sub>2</sub> uptake from reforestation, and nitrous oxide emissions from the use of fertilizers. The AFOS also developed estimates of future greenhouse gas emissions from the agriculture, forestry, and other sectors.

#### 1.3.3 COASTAL ZONE MANAGEMENT SUBGROUP

The Coastal Zone Management Subgroup (CZMS), co-chaired by New Zealand and the Netherlands, was tasked with considering response strategies for dealing with the impacts of sea level rise and the increased incidence of storms and other extreme events on coastal regions. The CZMS reviewed information from governments, institutions, and non-governmental organizations on technologies,

practices, and other relevant activities for the coastal zone and held workshops on technologies and practices in both the Southern and Northern hemispheres. Based on this work, the CZMS developed a series of options for dealing with potential climate change impacts on coastal regions.

### 1.3.4 RESOURCE USE AND MANAGEMENT SUBGROUP

The Resource Use and Management Subgroup (RUMS), co-chaired by Canada, France, and India, was tasked with considering measures for adapting to the impacts of climate change on agriculture, fisheries, animal husbandry, water resources, forests, wildlife and biological diversity, and other natural resources. The RUMS considered possible strategies for either reducing the potential negative impacts or taking advantage of possible positive impacts of climate change on food security, water availability, and natural ecosystems in general.

## 1.4 OTHER FACTORS

In conducting its activities, the RSWG recognized that the task of developing response strategies was both complex and difficult, particularly because its work would depend on analyses being developed simultaneously in the IPCC Science and Impacts Working Groups. The RSWG was also faced with the need to complete an interim assessment report by the summer of 1990 to form part of the IPCC's first assessment report. Given these constraints, the RSWG agreed that it should concentrate on a short-term (18-month) work plan that would focus on the following elements:

- development and distribution of preliminary emissions scenarios;
- refinement of a strategy for considering implementation mechanisms;
- carrying out of short-term work plans of the

- four RSWG subgroups for integration into an overall RSWG report; and
- development of longer-term work plans.

The report of the Energy and Industry Subgroup (EIS) was so voluminous that, for space reasons, only the Executive Summary is included in this volume.

This RSWG report represents the analysis it was considered feasible to complete in the time available from the first RSWG meeting in January 1989 to the adoption of this report by the RSWG in June 1990. This report identifies a wide range of possible response strategies for limiting or adapting to climate change and reviews available mechanisms for implementing these strategies. It is recognized, however, that there is considerable work to be done in further defining and assessing the response strategies. The RSWG has thus developed a work plan for the next 18-month period and thereafter, with an emphasis on areas where further information is needed to develop response strategies, so that future efforts can be directed in the most effective manner possible.

It must also be emphasized that the RSWG's task is to identify and evaluate response strategies, not to determine which actions should be undertaken by the international community to deal with climate change. The response strategies that have been identified therefore represent options rather than recommendations. While the RSWG has sought to provide useful guidance for policymakers, the determination of what actions should be undertaken is a subject for formal international negotiations.

Finally, the RSWG, and the IPCC as a whole, have had to deal with the difficulties presented by the relatively limited participation by the international community in some aspects of the Working Group's activities. The participation of centrally planned and developing countries, in particular, has not been as extensive in some of the RSWG's technical work as would be ideal for an exercise of this nature. The RSWG has made great efforts to increase the participation of all countries, in particular developing countries, in its work program. This remains an issue that needs continued attention.

—FREDERICK M. BERNTHAL  
Chairman  
Response Strategies Working Group