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INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

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REPORT OF THE SIXTH SESSION OF

OF THE

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

Geneva, 29-31 October 1991

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REPORT OF THE SIXTH SESSION OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

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1. OPENING OF THE SESSION (agenda item 1)

The sixth session of the Intergovernmental Panel on Climate Change (IPCC) was opened at 1010 hours on 29 October 1991, at the Palais des Nations, Geneva by the Chairman, Prof. B. Bolin.

The list of participants distributed during the session (29-31 October 1991) is Appendix A.

1.1 Remarks by Prof. G.O.P. Obasi, Secretary-General of the World Meteorological Organization

"Mr. Chairman, Distinguished Delegates, Ladies and Gentlemen,

It gives me great pleasure to address the Sixth Session of the Intergovernmental Panel on Climate Change. I especially want to acknowledge the presence here of Mr. William Mansfield, Deputy Director of UNEP, who is representing my good friend and colleague, Dr. Mustafa Tolba who is, unfortunately, unable to be present with us today. As you know, WMO and UNEP have worked closely together over the past few years as the parent organizations of the IPCC, and we both look forward with anticipation to your continued success over the next several years. I should also like to acknowledge the presence of Ambassador Jean Ripert, Chairman of the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change. His work with the Panel helped articulate the needs of developing countries regarding climate change issues, and established a firm basis for the participation of developing countries in the Panel's activities.

Mr. Chairman,

Since the Fifth Session of the IPCC in March this year, its progress has been the subject of review by both the Eleventh World Meteorological Congress and the Sixteenth Session of the UNEP Governing Council. In addition, the First Assessment Report of the IPCC has received world-wide acceptance, including the Intergovernmental Negotiating Committee and the Preparatory Committee for the U.N. Conference on Environment and Development. I am personally pleased that, during sessions of all these bodies, I have heard very favourable comments on IPCC achievements. The international reputation and scientific integrity of the IPCC is highly commendable and represents a challenge to us all to continue these high standards.

The Eleventh World Meteorological Congress in May of this year reviewed the IPCC organization and work programme for 1991 and beyond. In this connection, Congress endorsed the prior decisions of the WMO Executive Council for the continuation and support of the IPCC and endorsed, by resolution, the terms of reference of the Panel. These terms of reference are consistent with those approved by the UNEP Governing Council and previously endorsed by UNGA Resolutions 43/53 and 44/207.

Mr. Chairman,

Based upon the statements in the IPCC First Assessment Report regarding the need for improved data for all aspects of climate change studies, the Second World Climate Conference recommended a major international effort to build a coordinated system for collecting and making available global data related to climate. Acting upon this recommendation, the Eleventh Congress decided to establish the Global Climate Observing System (GCOS) "to provide essential support to all sub-programmes of the World Climate Programme", and endorsed the setting up of a Scientific and Technical Committee for GCOS as well as an inter-disciplinary planning office. In the first instance, GCOS will concentrate on building a network for geophysical data from existing systems, such as the World Weather Watch and the Global Atmosphere Watch, and from systems already being planned, such as the Global Ocean Observing System. To this end, I am pleased to announce that, on U.N. Day (24 October) this year, WMO, ICSU and IOC signed a Memorandum of Agreement at U.N. Headquarters in New York as initial sponsors of GCOS. UNEP will also become a co-sponsor soon.

As many of you are aware, the scientific findings from the most recent ozone assessment, made in support of the Montreal Protocol, were released last week. That assessment vividly illustrates the importance of a continuing assessment activity on global scientific issues. The results of that assessment are important not only for the fact that "for the first time, there is evidence of significant decreases in ozone during the spring and summer in both the northern and southern hemispheres at middle and high latitudes", but also because the scientists agreed that "changes in the global annual-average radiative forcing due to the observed ozone depletion are predicted to be comparable in magnitude, but opposite in sign, to those attributed to the CFCs over the last decade". This latter finding means that, at this time, "even the sign of the overall radiative effect of CFC increases on the climate system over the last decade is uncertain". The assessment report also stated that global warming potentials of indirect, short-lived gases, such as the nitrogen oxides, as contained in the IPCC First Assessment Report "are not only uncertain, but many are also likely to be incorrect". These results have important implications for your work in the IPCC and also the climate negotiations. Clearly, more research work, across many scientific disciplines, is needed in the area of man's effects on the global atmosphere. Equally clear is the fact that real commitments will be needed by all of us to reduce these anthropogenic effects long before any final results are available. The work which you are undertaking through this Panel is now having, and will continue to have, significant, long-term impact on all aspects of our lives.

Mr. Chairman,

During this session, the Panel will have to make very important decisions on organizational matters, including election of its officers. With regard to the current officers of the Panel, let me express my warmest thanks to Prof. Bolin, Dr. Al-Gain and Dr. Adejokun for their excellent efforts and many long hours. I have been repeatedly impressed by their skill and initiative. Prof. Bolin, in particular, has been outstanding in his guidance of the Panel's conduct and work, and has also been an excellent representative of the Panel to other intergovernmental bodies. I hope that he, and the other officers, will consent to continue their excellent service to the Panel in whatever capacity that may be decided during your meeting this week.

Additionally, I am sure members of IPCC will all agree that the commendable achievements made by the Panel were also in part due to the able support of the IPCC Secretariat under the leadership of Dr. Sundararaman and his assistant, Mr. Tewungwa. I therefore also wish to commend these officers for their contribution.

Mr. Chairman,

This session will also consider the issue of more active participation of developing countries in the IPCC. As I noted in my remarks to the Fifth Session of the Panel, the results of the IPCC will be applied much more effectively if developing countries play a substantially increased role in the Panel's activities at all levels. While I recognize the significant contributions which several developed countries made by convening meetings of the IPCC subsidiary groups during the initial, hectic beginning months of the Panel, I also understand the need for a broader, more balanced composition to the IPCC Bureau. In this regard, it is my understanding that UNEP has some specific proposals to make. I should simply like to stress that there is a need to encourage those developing countries who wish to assume a more active role in the IPCC structure and, in general, to expand the participation of developing countries in all the work of the Panel.

At this session, you are also going to be dealing with the future work of the Panel, including the progress on the updated assessment due next year before UNCED. WMO attaches great significance to the fact that your findings are making an important contribution to the work of negotiators of a global convention (INC) and the outcome of an historic environmental conference (UNCED), both of which will have long-lasting effects. When the framework convention on climate change is signed at UNCED in Rio next June, the importance of climate variability and change will not diminish. The international community will still need a credible scientific and technical assessment activity. In a sense, Rio will not be an end, but yet another step in an ongoing process.

By UNGA Resolution 45/212, the INC was requested "to co-operate closely with the IPCC to ensure that the Panel can respond to the needs and requests for objective scientific and technical advice made during the negotiating process". I consider that the experience gained over the past three years by the IPCC during its assessment of climate change issues will be of immense value in the future. Hopefully, a relationship will continue between the IPCC and any bodies created through the negotiation process. What is important

is avoidance of duplication of efforts and the need for optimum utilization of existing mechanisms.

In conclusion, Mr. Chairman, I should like to thank each of the many contributors to the activities of the Panel for their support of its secretariat, its meetings, and its assessments. Your continued contributions are still vital to maintaining an active, effective Panel. I can assure you that the World Meteorological Organization is prepared to continue its own support to the IPCC for the benefit of all our Members. I wish you every success in the important decisions and tasks which lie ahead of you.

Thank you, Mr. Chairman."

1.2 Remarks of Dr. M.K. Tolba, Executive Director of the United Nations Environment Programme

The following statement of the Executive Director was delivered by Mr. William H. Mansfield III, the Deputy Executive Director of the United Nations Environment Programme.

"Mr. Chairman, Secretary-General Obasi, Distinguished Members of IPCC, Ladies and Gentlemen,

It is an honour and a pleasure for me to be able to address you on the occasion of the sixth session of IPCC. I extend my best regards to my dear friends and colleagues, Professor Obasi, Chairman Bolin and Chairman Ripert of the Intergovernmental Negotiating Committee (INC). Your relentless effort, Chairman Bolin, and that of your colleagues on the Bureau, have earned IPCC the excellent reputation it enjoys worldwide. That reputation is well earned. All of us should feel proud of your contribution to the success of the IPCC process.

Mr. Chairman, this sixth session of the Panel is uniquely important. The decisions you make today will have far- reaching consequences on the stability and credibility of IPCC. First of all, you must elect a chairman of the Panel, and his immediate deputies. I am not your campaign manager, Mr. Chairman, but I am confident that your constituents greatly appreciate the enormous contribution you have made to the success of IPCC during your first term in office. That contribution should be rewarded. I express similar sentiments in respect of your Vice-Chairman, Dr. Al-Gain, and your Rapporteur, Dr. Adejokun and the Secretariat.

Secondly, Mr. Chairman, I observe from the agenda that consideration will be given to the restructuring of the Bureau. On the occasion of the third session of INC in Nairobi, I referred to the concerns of the developing countries that the IPCC is overwhelmed by developed countries. These concerns that the Panel reflect global interests and commitment must be addressed, and I am confident opportunity will be taken in the restructuring exercise to remedy that situation.

Let me share, Mr. Chairman, my views with you on this issue. It is my conviction that your present Bureau, consisting of the Chairman, the Deputy and a Rapporteur, needs

to be expanded by an additional two Vice-Chairmen. It is also my conviction that the leadership of each of the three Working Groups and the Special Committee should consist of a Chairman, three Vice-Chairmen and a Rapporteur. This would mean an expanded Bureau of 25 members, five from each of the UN regional groups, Africa, Asia and Pacific, Latin America and the Caribbean, Eastern Europe and Western Europe and others. Additionally, it is important that full consideration be given to the issue of support of the Panel in scientific, technological and financial issues. In that respect I feel five more members from Western Europe and others should be added to the expanded Bureau, ultimately heading towards the establishment of a full Bureau of 30 members, half of them from developing and half from developed countries. This arrangement, I believe, would ensure that each of the five geographical groups within the UN system has a voice in the IPCC process at the level of decision-making.

Mr. Chairman, I do not wish to pre-judge your decisions on these matters. In airing my views openly, my main consideration is that the sterling job accomplished by the Panel should not be jeopardized by possible dissatisfaction from any of the actors. It is my view also that when taking these decisions, the scientific integrity of the Panel will not be compromised.

Ladies and Gentlemen, during its sixteenth session in May this year, the UNEP Governing Council addressed the issues of climate change. In one of its decisions the Council expressed its gratitude to Governments and Organizations for their support of the Panel's activities. I wish to echo the Council's appreciation of that support. Ever since the inception of the Panel in 1988, a total of more than 3,000,000 Swiss Francs has been contributed to the IPCC Trust Fund by various Governments. We have all seen the products of that investment. Governments, international organizations and educational institutions the world over are using the IPCC First Assessment Report. Indeed in the relatively short period of three years, we have created a forum in which all Members of the United Nations and WMO act co-operatively in assessing one of the most taxing environmental problems of this and the next century.

But this investment creates additional responsibilities for us, and we must do more. By nature, an assessment process is a continuous one. In fact, the Governing Council's decision I have just referred to saw the need for this additional work and hence it urged Governments and Organizations to continue to increase cash contributions to the IPCC Trust Fund.

In the wisdom of the Panel, your fifth session in March this year decided on short and long-term strategies for your work. No doubt, the results of the short-term studies will be of immense value to the negotiation process for the framework convention on climate change. In this connection, your plans to produce a supplement to the First Assessment Report are very pertinent.

However, the long-term studies, which are a continuation of your assessment process, do call for additional work through the mid-nineties and beyond. Climate change is with us to stay. Hence, we must assure that IPCC continues to assess its scientific ramifications. It is also important that continued examination of climate change's social and environmental effects must be maintained and strengthened; and Governments must continue

receiving proposals on how to formulate their limitation and adaptation strategies. UNEP is determined to provide the strong support these activities deserve.

UNEP is also prepared to continue to cooperate fully with WMO in all efforts to support the Panel's work. One of the major uncertainties stressed in the first IPCC Assessment Report was the limited knowledge of what is actually occurring at the national and regional levels. We lack information on the sources, sinks and on the net emissions of greenhouse gases. We know little of the potential regional impacts of climate change and rising sea levels and we have widely differing opinions on the costs of greenhouse gas emission abatement or of adapting to climate change.

I am pleased that IPCC Working Groups have recognized these deficiencies and have recommended national studies in all these areas with a view to reducing the uncertainties.

UNEP's own programme will give high priority to implementing the IPCC recommendations. It will assist Working Group I to meet the costs of a country study methodological workshop and to seek funds from the Global Environmental Facility (GEF) to carry out pilot studies to develop national data bases on sources and sinks.

UNEP has carried out impact assessment studies in Asia and in Latin America and will undertake additional studies in Africa and Eastern Europe. The results of these studies will be made available to IPCC and INC. We will also assist Working Group II in identifying other national and regional impact studies. A six-country study of the economic implications of greenhouse gas abatement strategies begins on 1 November and will be completed in fourteen months. The results of these studies on the methodology will also be made widely available. It is my hope that all countries will undertake similar studies. I have written on this matter to all governments asking them to let UNEP know what climate-change-related studies their countries have undertaken, are implementing or are planning. I want to know what are the developing country needs with regard to the carrying out of appropriate studies, and whether or not they are constrained by lack of funds or technical advice. I also want to know what assistance developed countries are prepared to give to their less wealthy partners to ensure that studies can be undertaken and that countries are better prepared to meet the challenge of climate change without unacceptable economic, social and development constraints.

Mr. Chairman, I would like to emphasize the importance of information flow in the Panel's activities and refer to the issue of the IPCC Information Exchange Seminars. I wish to thank the United Kingdom and Norway for providing funds to support this programme. Certainly, if we are to maintain what we have achieved so far, there must be increased exchange of information between the scientific community on the one hand, and policy makers and the general public on the other.

It is in this context that I am pleased to announce the establishment of a new Information Unit on Climate Change (IUCC) within the Global Environmental Monitoring System in Geneva. This Unit will seek to sensitize decision-makers both from the private and public sectors on the implications of climate change to their activities. It will also have an important role to play in informing about the work done and progress made by IPCC as well

as the negotiation process for a Framework Convention on Climate Change, being undertaken by INC. I am confident that there will be close co-operation between IPCC and the Information Unit on Climate Change. I take this opportunity to extend thanks to the Governments of Switzerland and Luxembourg for supporting the establishment of the climate change information unit, and I appeal to other Governments to provide their backing as well.

Ladies and Gentlemen, you have a heavy agenda and only three days to complete your work. Let me wish you success in your deliberations.

Thank you."

1.3 Opening remarks by Prof. B. Bolin, the Chairman of IPCC

1.3.1 The Chairman thanked Prof. Obasi and Mr. Mansfield for their remarks.

1.3.2 He reported on his presentation to the second and third sessions of the Intergovernmental Negotiating Committee (INC) in June and September 1991 respectively and stated that his statements were available with the IPCC Secretariat.

1.3.3 Recognizing that the INC was in the process of finalizing its work for the climate convention, expected to be ready for signature at the UNCED (Rio de Janeiro, 1-12 June 1992), it was important that the 1992 IPCC Supplement - to be completed by February 1992 - be short and clear and contain new findings and not repeat the conclusions of the IPCC First Assessment Report (except by way of reference). In parallel, but with lower priority, the long term tasks should be pursued.

1.3.4 The revision of the IPCC emissions scenarios was important also and care should be exercised in explaining them, so that their misuse is avoided. The emissions scenarios are indeed uncertain and thus it would be all the more important to distinguish among:

a. the estimates of likely future emissions of greenhouse gases;

b. the assessments of future atmospheric concentrations of greenhouse gases for given emissions;

c. projections of climate changes brought about by given concentrations in the atmosphere of greenhouse gases.

Scenarios are not predictions, and a set of alternative scenarios should be useful in outlining the possible range of future changes of climate and help in assessing the sensitivity of such changes to alternative action programmes.

1.3.5 He also stated that the session on the technical aspects of the economic implications of climate change (see section 7) planned for the afternoon of 30 October 1991 would provide an opportunity to examine what kind of "scientific" assessment of those implications might be undertaken.

1.3.6 With regard to restructuring the IPCC Bureau (see section 3), Prof. Bolin said that there was no doubt in his mind that the participation of the developing countries in the Bureau should be increased. It was up to the Panel to decide how best this could be done.

1.4 Approval of the agenda

The approved agenda is attached as Appendix B to this report.

1.5 Programme of work of the session

The Panel decided to meet from 1000 to 1300 hours in the mornings and from 1500 to 1800 hours in the afternoons with appropriate breaks.

2. ELECTION OF THE CHAIRMAN OF THE PANEL (agenda item 2)

Prof. B. Bolin was elected Chairman by acclamation.

3. IPCC-INC RELATIONSHIP (agenda item 3)

3.1 Upon invitation by the Chairman, Mr. Michael Zammit Cutajar, the Executive Secretary of the Intergovernmental Negotiating Committee noted the excellent relations between the Secretariats of IPCC and INC. He paid tribute to the valuable institutional and, especially, personal, support to the INC Secretariat of the Executive Heads of UNEP and WMO. Summarizing the relationship between IPCC and INC at the intergovernmental level, he considered that negotiators had had access, and continued to have access, to up-to-date information of relevance to them on the work of IPCC. In particular, they were aware of the areas of study in the short term which the Panel and its Working Groups were undertaking. The IPCC Supplement (see section 9.4) expected to be available in February 1992 would be extremely valuable.

3.2 Mr. Zammit Cutajar outlined the arrangements for future meetings of the Committee and noted that, following their mandate from the third session of the INC, the Officers of the Committee's two Working Groups had been working hard and productively to prepare texts for the fourth INC session which were intended to focus and facilitate the next stage of the negotiations. The resulting documents would be available shortly.

3.3 The IPCC took note of the existing cooperation between INC and IPCC. It would continue its assessment activities on climate change and transmit to INC its 1992 Supplement. The Panel requested its Working Groups to pay particular attention to the issue of sinks, as far as practicable, in their short term work.

3.4 The Chairman requested the Working Group Chairs to transmit to him, by 10 december 1991, material that could be included in his statement to the fourth session of INC (Geneva, 9-20 December 1991).

4. THE STRUCTURE OF THE IPCC BUREAU (agenda item 4)

4.1 The Panel agreed without dissent on restructuring its Bureau for better geographical balance. There was unanimous recognition that changes to the structure of the Bureau should be made in such a way as to allow uninterrupted progress on the 6 tasks approved by the Panel in March 1991 (Report of the Fifth Session, Geneva, 13-15 March 1991) and that the scientific integrity and rigour of the Panel's work be preserved. There was also recognition that a certain degree of flexibility would be desirable, perhaps through gradual change, in view of discussions now taking place in other arenas.

4.2 There was some discussion about the need to include countries that are particularly vulnerable to sea level rise and extreme events (e.g., tropical storms), or have GHG sinks. There was also a discussion on a more balanced representation of the developing and industrialized countries; one way of achieving this could be through broadening the participation in the review process of the output of the Panel and its Working Groups.

4.3 The recommendations of the Special Committee on the Participation of Developing Countries should be kept in mind and efforts made to implement them.

4.4 The Panel decided to establish an IPCC Task Force to make proposals on the future structure of IPCC under the Chairmanship of Prof. Bolin. The Panel approved the following terms of reference for the Task Force:

a. the Task Force will recommend to the IPCC options for restructuring the Panel to enable it to best fulfil its role as a scientific and technical assessment body once the Climate Change Convention is signed during UNCED;

b. these options are to cover both its continuation as an independent scientific and technical body and functions that may be assigned to it in relation to the Convention;

c. in developing options, the Task Force will canvass the opinions of participating countries of the IPCC, Regional Economic Integration Organizations, WMO, UNEP and INC, and relevant Non-Governmental Organizations;

d. it will take into account the need to maximize the role and participation of developing countries particularly in the scientific work of the IPCC, recognizing also the desirability of fair geographical representation;

e. it will present its initial findings to the Panel at its seventh session in February 1992 with a view to a final decision by the Panel at its eighth session following UNCED.

4.5 The Panel also decided on an interim expansion of the IPCC Bureau, to be effective immediately and to continue until the end of the eighth session. This was done by naming additional Vice-Chairs to the three Working Groups to achieve an improved geographical balance. Thus, the Panel elected unanimously to the Bureau:

* India (it nominated Mr. Mukul Sanwal) to represent Asia as a Vice-Chair of Working Group I;
* Germany (it nominated Dr. Hartmut Grassl) to represent the industrialized countries as a Vice-Chair of Working Group I;
* Argentina (it nominated Prof. Osvaldo Canziani) to represent South America as a Vice-Chair of Working Group II;
* Kenya (it nominated Prof. Richard S.Odingo) to represent Africa as a Vice-Chair of Working Group II;
* Peru (it nominated Dr. Alfonso Maguiña) to represent South America as a Vice-Chair of Working Group III.

This would bring the total membership of the Bureau to 21, including the vacant Chairmanship of the Special Committee on the Participation of Developing Countries. This Bureau would function until the eighth session of IPCC.

4.6 The Chairman of the Intergovernmental Negotiating Committee (INC) will have a standing invitation to attend all meetings of the Panel and its Bureau, Working Groups, Subgroups and Task Forces. The INC Executive Secretary will also receive invitations to all IPCC meetings.

4.7 The Panel approved the memberships of the Steering Groups for the Working Groups (see Appendix C for the respective lists). The memberships would be in effect until the eighth session of the Panel (see para 4.4).

5. TERMS OF REFERENCE OF THE IPCC WORKING GROUPS AND THE SPECIAL COMMITTEE ON THE PARTICIPATION OF DEVELOPING COUNTRIES (agenda item 5)

The Panel decided that the topic of this item should be dealt with by the Task Force on IPCC Structure (see para 4.4).

6. ELECTION OF THE OTHER OFFICERS OF THE PANEL, NAMELY, THE VICE-CHAIRMAN AND THE RAPPORTEUR (agenda item 6)

In view of its planned restructuring, the Panel decided to continue the term of office of its Vice-Chairman, Dr. A. Al-Gain, and of its Rapporteur, Dr. J.A. Adejokun, until its eighth session.

7. SELECTED STUDIES ON THE TECHNICAL ASPECTS OF THE ECONOMIC IMPLICATIONS OF CLIMATE CHANGE (agenda item 7)

7.1 By invitation of the Chairman, the following lectures were delivered at the afternoon meeting on 30 October 1991:

* Uses and limits of economic analysis in climate change by Dr. Michael J. Grubb, Royal Institute of International Affairs, UK;

* L'analyse économique: Des outils pour cerner les implications des politiques anti-effets de serre by Dr. Jean-Charles Hourcade, Centre International de Recherche sur l'Environnement et le Développement, France;

* Models, policy instruments and equity perspectives from economics by Dr. Prodipto Ghosh, Tata Energy Research Institute, India;

* Possible uses of macroeconomic models in the greenhouse debate by Dr. Richard Richels, Electric Power Research Institute, USA.

7.2 Abstracts of the presentations are attached in Appendix D.

7.3 A representative of the OECD outlined their programme of work on climate change, and emphasized the four main areas of work at present: methodologies for assessing the economic costs involved in greenhouse gas abatement; the income and international transfer effects of different strategies for global greenhouse gas abatement; the policy instruments available for doing so; and issues involved in the negotiating process, for example the significance or otherwise of "free riding" by countries which do not join an agreement. The objectives of future work is to deepen understanding in these areas and to investigate aspects of the distribution of costs and benefits.

7.3 One country was of the view that value judgement conclusions had been made by the lecturers that initiated reservations on the part of some countries.

7.4 On the basis of the presentations at the session and earlier discussions, the IPCC recognized the importance of economic issues in the global warming context and hence that it was important that the implications of ongoing scientific, technical research in the field of economics be dealt with in an integrated manner.

7.5 The IPCC also recognized the necessity to sharply define tasks and questions in this field and in this way clearly maintain the distinction between the scientific/technical knowledge on the one hand and political value judgements that necessarily come in in using the economic assessments on the other.

7.6 The IPCC further recognized that consideration of this matter would be best dealt with at its eighth session after June 1992.

8. APPROVAL OF THE REPORT OF THE FIFTH SESSION (agenda item 8)

8.1 The Panel approved the report of its fifth session (Geneva, 13-15 March 1991) after agreeing

* to amend it to include the importance of hydrology and water resources (and desertification and drought) appropriately by including a short sentence under task 2 in that report;
* to amend the title of task 1 to include the words "and their implications".
* to replace Figure 1 in the report by a clearer figure.
* to amend paragraph 5 of the report to reflect the approval of the report.

9. PROGRESS REPORTS FROM THE WORKING GROUPS (agenda item 9)

9.1 Report of IPCC Working Group I

Greenhouse gases

9.1.1 The Chairman of IPCC Working Group I, Sir John Houghton, reported that under task 1 approved by the Panel in March (see the report of the fifth session of IPCC, Geneva, 13-15 March 1991 for a full description of the tasks), the sections on the following GHGs were completed in their first draft:

* CFCs/HCFCs (lead authors: Watson, et al.);
* CH4, NMHC, CO, N2O (lead author: Sanhueza);
* CO2 (lead author: Meira);
* NOX (lead author: Isaksen);
* sulphur gases (lead author: Rodhe).

Contributions to the sections were received in the following manner: at the meeting of the Task Force on Greenhouse Gases, London, 8-11 July 1991; submissions from individual experts; the results of the NATO meetings on the carbon cycle (Il Ciocco, Italy, 8-20 September 1991) and on global methane (Mt. Hood, USA, 7-11 October 1991): and the WMO/UNEP international ozone assessment carried out under the provisions of the Montreal Protocol. The combined first draft should be ready for review by the end of November 1991.

Global Warming Potentials (GWPs)

9.1.2 A first draft would be prepared under the lead authorship of Isaksen, drawing heavily as relevant on the just-completed WMO/UNEP international ozone assessment and would also be ready for review by the end of November 1991. GWPs were expected to be adjusted to conform to the new information on the atmospheric lifetimes of some of the greenhouse gases.

Emissions scenarios

9.1.3 The first draft of the sub-section by the USA-Netherlands group was undergoing review.

9.1.4 One delegation suggested that a sensitivity range of scenarios needed to be developed as options, rather than a single scenario - the IPCC 1991 Reference Scenario. It recalled that it had been agreed at the fifth session that updated cases would reflect different levels of emissions. The delegation stated that the Brundtland Commission had also emphasized the need for a 50% reduction in primary energy consumption in industrialized countries and that one scenario needed to be developed along these lines. The delegation expressed the view that there was also an urgent need to agree upon definitions of terms such as "historical" and "net" emissions since this was critical for application in country studies.

9.1.5 Another delegation expressed its reservation with respect to the views in para 9.1.4.

9.1.6 The Panel noted that sensitivity analyses of the 1991 IPCC Reference Scenario would give some idea as to other scenarios, that available time was not in favour of the development of other scenarios in detail and that the December 1991 Workshop was planned to refine definitions of terms. The Chairman reminded the Panel of the existence of the IPCC emissions scenarios B, C and D (see the First Assessment Report) with which comparisons still could be made. The Panel expressed the view that the uncertainties and the underlying assumptions in the development of scenarios should be stated as clearly as possible.

9.1.7 The Panel noted that the influence of the Kuwaiti oil fires on the calculation of the GWPs and on the climate of the region would be included in the work of the Working Group.

Climate modelling

9.1.8 The first draft prepared under the guidance of Dr. L. Gates would begin to be reviewed shortly. A revised draft would be prepared at a lead authors' meeting scheduled in Bristol, UK, on 20-22 November 1991.

Climate observations

9.1.9 A first draft was being prepared under the guidance of Mr. C. Folland. A revised draft would be prepared at a lead authors' meeting scheduled in Melbourne on 25-26 November 1991.

National inventories of net GHG emissions

9.1.10 A workshop was planned for 5-6 December 1991 in Geneva for the following purposes:

(a) to familiarize national representatives with the draft methodology (including the technical basis and results of sample applications);

(b) to identify difficulties and shortcomings to suggest improvements.

9.2 Report of IPCC Working Group II

9.2.1 Prof. Y. Izrael, the Chairman of Working Group II, reported on the activities of the Working Group. The working Group had met in its fourth session in Geneva on 12-13 August 1991 and had set up the following mechanism to effectively carry out its task (task 2): in addition to the six existing subgroups of the Working Group,

* a Coordination Group was set up under the Chairmanship of Academician M. Budyko to look into palaeoanalogue forecasting of regional climate changes (jointly with Working Group I) and thence to assess regional impacts;
* an Expert Group on compiling and summarizing available national inventories of impact studies under the Chairmanship of Prof. I. Nazarov (a questionnaire had been circulated in May 1991 to countries for this purpose);
* an Expert group under the joint Chairmanship of Dr. S. Nishioka and Dr. M. Parry to begin the task of preparing guidelines for national impact assessments;
* an Expert Group under the Chairmanship of Prof. Izrael to look into the monitoring needs for application to impact studies (see Appendix E for the list of Co-Chairs of the subgroups).

The Working Group had also established an ad-hoc interim steering Group of 17 countries (see Appendix C).

9.2.2 The Panel urged the Working Group to undertake as broad a peer review as possible of the results of its work before distribution for review by the member countries of IPCC.

9.3 Report of IPCC Working Group III

9.3.1 The Chairman of the Working Group, Mr. R. Reinstein, reported on the results of the fourth session of the Working Group (Geneva, 5-8 August 1991) and on the plans for the upcoming session on 1-2 November 1991. There were some commonalities among tasks 3, 4 and 5: role of country studies; development of common methodology; concerns of the developing countries. There were also some common elements for coordination between Working Groups II and III (see the Report of the Fourth Session of Working Group III, Geneva, 5-8 August 1991). Workshops were being used to develop methodologies under all the tasks. Some of the concerns of the developing countries were being addressed by holding the meetings of the WG III subgroups at the time of the meetings of the Working Group itself; this also afforded an opportunity to provide at least partially simultaneous interpretation in the UN languages.

9.3.2 The Panel noted that each subgroup was free to plan its review process and that the question would be further addressed at the session on 1-2 November 1991. The Panel emphasized the importance of coordination between Working Groups II and III on tasks 4 and

5, even though part of the coordination was achieved through the serendipitous circumstance of the same experts co-chairing relevant subgroups in the two Working Groups.

9.3.3 The Panel further noted that some efforts were under way to include the role of open oceans and coastal areas as sinks of GHGs, the ecological aspects such as biological corridors and sample coastal management plans. The first while raised during the discussion of the progress report of WG III, falls properly under WG I and the other two would be dealt with by WG II.

Co-ordination among Working Groups

9.3.4 The Panel recommended to the Chairs of all Working Groups that each designate focal points for coordination purposes. It requested the Working Groups to ensure as broad a peer review of their material as possible by as large a group of experts from different disciplines as possible.

9.4 Structure of the 1992 IPCC Supplement

9.4.1 The Panel decided that the Supplement should be organized along the 6 tasks approved in March 1991. This implied that about 5 pages would be devoted to each task for an overall length of about 30 pages. Thus, coordination among the Working Groups was vital as most tasks were cross-cutting issues falling within the purview of more than one Working Group. The Panel further decided that only new information should be in the Supplement and that the Supplement should not repeat what was already in the First Assessment Report except for a resume of the recommendations of the Special Committee on the Participation of Developing Countries. The Panel agreed with the Chairman's proposal that the IPCC Secretariat be tasked to draft the resume from the Policymaker Summary of the Special Committee (see First Assessment Report) for review by all countries.

9.4.2 Further, the Supplement might have a short addition with respect to drought and desertification, and in general on water resources, if this were not adequately dealt with within the framework of the tasks and were judged essential by the Panel. The Supplement would consist of the contributions to be produced and agreed to by the Working Groups, appropriately integrated. It would have an appropriate introduction to be drafted by the Chairman for approval by the Panel which could state that the Supplement was based on the compilation by the Working Groups of technical/scientific material, but that such material was not reviewed nor approved by the Panel.

9.4.3 The Supplement should be published in all the UN languages. Further, the Overview and Policymaker Summaries of the First Assessment Report, whose publication had been pending, should also be published.

9.4.4 The scientific/technical material developed by each Working Group to support its contribution to the Supplement should be about 80 pages long. These should also be subject to peer review. Governments should be given opportunity to review them but not at the sessions of the Working Groups or the Panel. However, in those cases where the Panel amended the draft Supplement, the supporting material could be amended for maintaining consistency. The supporting material, as approved by the respective Working Group, would

be published in a suitable manner in English only with a preface that would make it clear that the IPCC had not approved the material.

10. FINANCIAL AND OTHER SUPPORT (agenda item 10)

10.1 The status report as of 28 October 1991 of the IPCC budget and other support is attached as Appendix F. In response to a query, the Secretary of IPCC stated that the World Meteorological Organization had exempted the IPCC Trust Fund from the charge (usually 14%) it normally levies on all trust and other similar funds it handles.

10.2 The Panel noted that only expenditures through May 1992 had been anticipated in the status report. It recalled that the sessions of the Working Groups had not been included in the 1991-1992 budget except for travel support to experts from developing countries. It further noted that, during this session, its eighth session (to take place after UNCED), possibly two sessions of its newly-constituted Task Force on IPCC Structure, a meeting of the Editorial Board of Working Group II in St. Petersburg (January 1992) and the publication of the Supplement by the IPCC Secretariat had been added to the activities planned earlier (see Appendix G for the list of meetings).

10.3 The Panel also noted that attendance of the developing countries at the session (53 including 3 that were not supported from the IPCC Trust Fund), while gratifying, could still be improved. The average attendance of the developing countries in IPCC activities stood at 35 countries per meeting until this session. It was imperative that the participation of the developing countries be further increased; this was particularly important at the lead authors/expert group/subgroup/task force/ peer reviewers level.

10.4 Noting the precarious state of the Trust Fund, the Panel appealed to potential donors not only to increase their contribution but also to remit them in time to ensure increased and more active participation of the developing countries.

11. STATUS OF THE IPCC INFORMATION EXCHANGE SEMINARS (agenda item 11)

11.1 The status report as of 28 October 1991 of the IPCC Information Exchange Seminars is attached as Appendix H.

11.2 The Panel expressed its appreciation to the Governments of Norway and the United Kingdom for their generous funding of the seminar effort.

12. OTHER BUSINESS (agenda item 12)

There was none.

13. TIME AND PLACE OF THE NEXT SESSION (agenda item 13)

The Panel decided to meet in its seventh session in Geneva from 10 to 12 February 1992.

Zimbabwe offered to host, or co-host, a future session of IPCC or of any of its Working Groups.

14. ADOPTION OF THE REPORT OF THE SESSION (agenda item 14)

The report of the session would be completed by the Chairman with the assistance of the IPCC Secretariat in draft form and would be submitted for adoption at the seventh session.

15. CLOSURE OF THE SESSION (agenda item 15)

This sixth session of the Intergovernmental Panel on Climate Change (IPCC) was closed at 1815 hours on 31 October 1991.

APPENDIX A

List of Participants

(Distributed during the sixth session of IPCC and not attached here in order to save bulk)

APPENDIX A

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Geneva, 29-31 October 1991

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INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

APPENDIX B

INTERGOVERNMENTAL PANEL
ON CLIMATE CHANGE
SIXTH SESSION

Geneva, 29-31 October 1991

IPCC-VI/Doc. 1 REV. 1

AGENDA

1. OPENING OF THE SESSION

   1.1 Remarks by Prof. G.O.P. Obasi, the Secretary-General of the World Meteorological Organization
   1.2 Remarks by Dr. M.K. Tolba, the Executive Director of the United Nations Environment Programme
   1.3 Remarks by Prof. B. Bolin
   1.4 Adoption of the agenda (Doc. 1 and Doc. 2)
   1.5 Programme of work of the session

2. ELECTION OF THE CHAIRMAN OF IPCC

3. MATTERS RELATED TO IPCC-INC COOPERATION (Doc. 4)

4. THE STRUCTURE OF THE IPCC BUREAU (INF. 2 and Doc. 6)

5. TERMS OF REFERENCE OF THE IPCC WORKING GROUPS AND THE SPECIAL COMMITTEE ON THE PARTICIPATION OF DEVELOPING COUNTRIES (Doc. 7)

6. ELECTION OF THE OTHER OFFICERS OF THE PANEL, NAMELY, THE VICE-CHAIRMAN AND THE RAPPORTEUR (Doc. 5)

   6.1 Election of the Vice-Chairman
   6.2 Election of the Rapporteur

7. SELECTED STUDIES ON THE TECHNICAL ASPECTS OF THE ECONOMIC IMPLICATIONS OF CLIMATE CHANGE

8. APPROVAL OF THE REPORT OF THE FIFTH SESSION (Doc. 3)

9. PROGRESS REPORTS FROM THE WORKING GROUPS (Doc. 8, Doc. 9, Doc. 10, Doc. 11)

   9.1 Participation in the writing and review of the 1992 Supplement to the IPCC First Assessment Report (1990)

   9.2 Structure of the 1992 Supplement

10. FINANCIAL AND OTHER SUPPORT (Doc. 12 and Doc. 13)

11. STATUS OF THE IPCC INFORMATION EXCHANGE SEMINARS (Doc. 14)

12. OTHER BUSINESS

13. TIME AND PLACE OF THE NEXT SESSION (INF. 3)

14. ADOPTION OF THE REPORT OF THE SESSION

15. CLOSING OF THE SESSION

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6. CHINA
7. NETHERLANDS
8. USA

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5.	ARGENTINA	17.	JAPAN
6.	FINLAND	18.	USSR
7.	MALAYSIA	19.	MEXICO
8.	NIGERIA	20.	FRANCE
9.	NORWAY	21.	AUSTRALIA
10.	POLAND		
11.	S. ARABIA		
12.	VENEZUELA		

APPENDIX D

THE ECONOMICS OF CLIMATE CHANGE

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1. Introduction:

The issue of Climate Change has emerged as potentially one of the most significant policy questions in the current international arena. This is because the risks of possible Climate Change may be high, and the costs of abatement or adaptation measures also large, and both are likely to fall variably, but uncertainly, on different regions and at different times.

Climate Change is also arguably, one of the most complex global policy issues to have arisen so far. The questions involved relate to numerous disciplines, in the pure and applied natural sciences, positive social science, and political economy, besides ethics and morality. Analysis of the divergent facets of the issue is likely to proceed at the cutting edges of current human knowledge and understanding, and indeed may involve several extensions to the frontiers.

Given the deep and pervasive complexities of the issue, it is a little disconcerting to find that some of the recent literature in the field has tended to focus largely on the technical aspects of Climate Change, in particular on some of the more alarming scenarios generated by Global Circulation Models (GCMs), and gloss over the key question of equity in abatement and adaptation measures. We emphasise at the outset, that in our view, both positive ("what is") and normative ("what ought") questions need to be kept in the spotlight at all times. We have attempted to follow this precept in the present paper.

It is, of course, gratifying that Climate Change has, in just a few years, acquired prominence in both the public mind, as well as that of policy makers throughout the globe. Further, that the world community has acted with commendable despatch in sitting down to substantive multilateral negotiations on regulatory approaches to the issue. However, one may as well recognize that the complexity, and the deep equity implications of approaches to the issue, rule out any quick fixes to the problem. Any multilateral approach which seeks to install a regulatory regime, without allowing for proper analysis and deliberation, or for periodic review of the substantive provisions of the regime, in the light of increasing understanding of the myriad dimensions of the problem, may soon prove to be unworkable, or inequitious, or ineffective.

This paper seeks to summarize some aspects of the current economic understanding of the regulation of Climate Change, in both positive and normative aspects. It is structured in the following manner: Section 2 discusses the application of Cost-benefit methodologies, which have emerged as a major analytical tool for public policy in several countries, to policy analysis for Climate Change. Much of our current knowledge of Climate Change has been revealed by the use of large-scale atmospheric and macroeconomic models, and Section 3 discusses the role, and limitations of employing economic models for predicting greenhouse gases (GHGs) emissions, and the impacts of regulatory and abatement strategies.

Section 4 is about the costs associated with economic and social transformation in different countries, if multilateral regulation for Climate Change is implemented. The choice of policy instruments is a crucial element in designing any regulatory scheme, multilateral or domestic, and Section 5 addresses this question in the Climate Change context, drawing upon both theoretical and experience based insights. Finally, Section 6 attempts to furnish a structure for analysing the key question of equity in Climate Change, drawing upon an existing theoretical framework, and attempts to derive some normative implications from insights gained from several ethical schools.

2. The Development of Cost-Benefit Analyses (CBA): Difficulties and Limitations:

The need for devising global policies for Climate Change arises from the fact that there is no reason to suppose that Providence would ensure that the costs of Climate Change manifestations would be visited exclusively on the polluters, and symmetrically, that benefits would flow exclusively to the environmentally abstinent. Variants of Cost-Benefit analysis have been developed for ranking alternative policy options in a number of situations, including several (local and regional) environmental contexts. However, CBA techniques need to be developed further in several aspects, before they can be applied meaningfully to the analysis of Climate Change options.

Very briefly, in CBA, different policy options are ranked with respect to the present value of the respective streams of benefits and costs over time, reckoned with respect to increase or decrease respectively in a chosen objective function, subject to the resource and technical constraints faced by society. There are two principal types of CBA. The first, i.e., Kaldor-Hicks CBA attempts to rank different policy options on the basis of their respective potentials for increase in national income (GDP) in society. An alternative procedure which is often employed in situations where there is great uncertainty regarding the future streams of benefits, is "cost-effectiveness analysis", in which the policy options are ranked in the order of lower (present value of) resource costs to achieve a given policy goal (for example, a specified level of environmental quality). The second, i.e., Social Cost-Benefit analysis, on the other hand, employs as a ranking criterion the potential increase in a Social Welfare Function (SWF), explicitly chosen by the analyst or the client policy makers, and which incorporates society's distributive concerns, along with efficiency considerations. An example of a SWF is a weighted sum of the aggregate income levels of different social groups, where the weights are the (relative) marginal utilities (cardinal, inter-personally comparable) of incomes of the respective groups ("Utilitarian SWF").

CBA methodologies have evolved for policy evaluations in limited temporal and spatial contexts, and further, for scales of costs and benefits which are not large in relation to the concerned national or regional economies.

Policy options for Climate Change present several challenges to the development of CBA methodologies. First, the "society" is no longer a national or regional entity, but global in a spatial sense. Second, the time-frames of policy options for Climate Change may extend over many human generations, while conventional public policy concerns do

not generally spill-over more than a few decades. Third, the Climate Change issue is characterized by pervasive uncertainties in the timing and nature of environmental impacts, their regional distribution, besides the economic and social effects of the regulatory mechanisms themselves. Fourth, the likely scales of costs and benefits are no longer marginal, but large, so that major restructuring of economic patterns might be involved. Finally, one must confront a fundamental ethical question: Is it appropriate to address deep environmental issues from an anthropocentric standpoint, i.e., basing policy choices on patterns of human preferences? We discuss below, in brief, each of these aspects:

2.1. Cost-Benefit Analyses for a Global Society:

CBA on the Kaldor-Hicks criterion, conducted for policy options for a national or regional economy, makes an important, if implicit, assumption. That is, either the distributive impacts of each of the policy options are negligible, or alternatively, that the economy has a suite of separate policy instruments which reliably, and costlessly, ensure that the society's preferred pattern of resource distribution is achieved at each level of aggregate societal income. If these assumptions are valid, in that case increases in economic efficiency (i.e., national income) are unambiguously desirable, and candidate policies may be ranked on that basis.

Policy analyses for Climate Change in a global perspective must, however, contend with the fact that neither assumption is tenable. Actual manifestations of Climate Change will almost certainly impose costs, and may confer benefits, unevenly across different regions. For some, the costs may be of catastrophic dimensions. Further, the control measures themselves, may impose highly skewed costs and benefits across different regions. In addition, no human agency yet exists which can be trusted to (costlessly) reassign these costs and benefits, (or indeed any kind of resources), according to any predetermined pattern.

Clearly an exclusive focus on efficiency in policy analyses of global Climate Change options is inappropriate. The analyst has to address the task of devising policies which incorporate mechanisms for redistributing costs and benefits across agents, besides efficiency concerns. In other words, a Social CBA approach is unavoidable in this instance. Conducting a Social CBA however requires the explicit adoption of a SWF at the global level. This is the central aspect of the equity dimension of the Climate Change issue, which is discussed in greater detail below. At this point one may note that the choice of a global SWF is not the task or province of the policy analyst, but is inherently a political act, in which policy makers from different countries, regions, and political and cultural orientations, are the players. At issue is the very nature and process of political authority in the global context.

2.2. CBA in an Inter-Generational Context:

Climate Change is characterized by benefits and costs flowing unevenly across several human generations. Policy analysis employing CBA have encountered few multiple generation situations so far, and accordingly the question of how different generations are to be treated by the present generation, which currently has the power to

unilaterally decide on long-term policy options, is a fertile area for normative policy research.

One possible input to CBA methodologies from inter-generational considerations is the choice of (one or several) social discount rate(s), i.e., how benefits and costs, whether expressed in economic terms, or in relation to changes in a global SWF, are to be discounted over time.

Any strictly positive discount rate applied to economic costs and benefits implies a determination that allocation of resources to the current generation is more important than to future generations. One argument in justification of this position is that because of capital accumulation (and technological advances) by the current generation, future generations will be richer. A typical member of the future generation will therefore, value a unit of income (in utility terms) less than would a typical member of the current generation. Further, they will have greater resources for adapting to adverse impacts of actual Climate Change. On the other hand, arguments have been advanced for zero discount rates, i.e., which would not distinguish between individuals belonging to different generations.

A large volume of literature exists on the choice of a social discount rate in the CBA of conventional policies, i.e., with a time horizon of no more than a few decades. A major problem is revealed by the fact that the application of such conventional social discount rates, typically in the range of 8-12% per year, in an inter-generational context, i.e., with time horizons of, say, 100 years, yields extremely low present values of (postulated) very high future costs. This runs counter to intuitive notions of equity, because it implies that virtually all of the costs of adaptation or abatement measures should be passed on to future generations, even if they are believed to be very high.

Several attempts have been made to incorporate inter-generational concerns in the CBA framework, which are intuitively appealing. These approaches may be summarized as follows:

(a) Imposing sustainability constraints: This approach seeks to allow the maximization of net benefits to the current generation, subject to the requirement that (natural and man-made capital) resources available to future generations would allow them to attain at least the welfare level of the current generation. The major theoretical formulation of the sustainability principle was furnished by Solow (1974), who showed in a simple two-factor model (i.e., natural resources and capital), that a constant level of consumption can be maintained as long as any one of the following conditions are satisfied:

(1) The elasticity of substitution between the factors is greater than unity, or

(2) The substitution elasticity is unity, but the share of capital exceeds that of natural resources, or

(3) that there is sustained resource augmenting technical change.
Of course, important questions arise with respect to whether any of these conditions can

be maintained very far into the future. Little practical headway has yet been made in operationalization of this concept, except for tentative attempts at computing GDP, taking changes in levels of natural resources into account.

(b) Positive approaches: Some attempts have been made to show that even from the perspective of the current generation, social discount rates below private discount rates are appropriate in an inter-generational situation. An argument for considering only the preferences of the current generation, furnished by Arrow and Kurz (1970), is that because the revealed preferences of individuals are accepted in making other social choices, they should be accepted in the inter-generational context as well. The counter argument, of course, is that lack of representation to future generations is the real problem.

One example of a positive approach is that of Marglin (1963). The argument runs that consumption by future generations is a public good to members of the present generation. Accordingly, all members of the current generation are made better off by a social choice in favour of greater savings and investment than would have been the case with individuals acting independently. Such a decision would imply a social discount rate below the private rate. This argument, though intuitively appealing, does not hinge on notions of inter-generational equity, but rests on efficiency considerations.

(c) SWFs embodying inter-generational equity: In this approach, discounting is eschewed in favour of specifying welfare criteria based on the actual welfare levels of different generations. One example of this approach relies on welfare criteria based on the Rawlsian (Rawls, 1971) ethic. Very briefly, this principle ("maximin") states that the welfare of society is the welfare of the worst off member, given that basic freedoms are available equally to all.

A counterintuitive implication of this principle applied inter-generationally was noted by Solow (1974). He looked at the problem of determining the largest sustainable level of consumption for society, subject to constraints on capital accumulation and the stock of an exhaustible resource. The maximin principle would require a large initial capital endowment, and if it is small, then the level of consumption must be small forever, because capital must not be accumulated by sacrificing the consumption of the first generation which is poor.

A way out was suggested by Phelps and Riley (1978). If generations are allowed to overlap, the earlier generation which accumulates capital has a claim to more retirement consumption provided by the labour of the next generation, which has an obligation to work more in exchange for the gift of capital. Such a program can be supported by appropriate debt creation, and growth is further encouraged if the earlier generation derives utility from the consumption of the later generation.

(d) Modifications to the social discount rate: Several examples of this approach exist. One approach seeks to set discount rates to zero, on the ground that one should be impartial with respect to the time at which an individual lives. Such impartiality may be justified, for example in a Rawlsian framework, on the "veil of ignorance" argument. That is, individuals who are unaware of their future place in society and meeting to

decide on a constitutional framework, would be risk averse, and accordingly choose not to place any group at an advantage or disadvantage relative to others. An argument against zero discount rates due to Olson and Bailey (1981) is that discounting proceeds from utility discounting ("time preference") and consumption discounting. They have shown that if time preference is zero, i.e., complete equality exists between generations, and interest rates are strictly positive, individuals should rationally reduce present consumption to zero, which is counterintuitive.

Formulations of consumer discount rates, as well as of producer rates, besides combinations of these also exist (see Pearce, 1991). These approaches are still not theoretically satisfying. Empirical results of the first and second of these approaches remain counterintuitive, and of the third, appear to rest on some strong assumptions.

The long time-horizon of Climate Change also leads to some problems in positive analysis of economic impacts. Long-term predictions are usually based on economic models, and several assumptions must be incorporated, which may drive the models' results. These assumptions may relate to technological change, economic structure, population trends, and other aspects. It is hazardous to assert that any one of the several alternative assumptions will ultimately prove to be valid.

2.3. Uncertainty:

The Climate Change issue is permeated with ubiquitous uncertainties in the types and regional distribution of environmental impacts, besides the economic and social impacts of control or adaptation policies. One way to think about uncertainty in Climate Change is to consider that at each period in the future, the world could experience different sets of such impacts or "outcomes". These possible outcomes may vary with the actual control (and/or adaptation) regime that is implemented, but while for each policy only one of the possible outcomes will be actually realized, there is no way of knowing in advance, which one it will be. Nonetheless, choices among competing policies must be made based on incomplete knowledge.

In an important sense, this notion of uncertainty in Climate Change differs from uncertainty as understood in conventional CBA. In the latter, it is assumed that outcomes of policies depend on "states of nature", i.e., unforeseeable events, but that for any realized state of nature, it is possible to determine unambiguously the outcome of a given policy. For example, whether or not an earthquake occurs is a state of nature, but given that one occurs, one may determine with certainty whether a particular hydroelectric dam, embodying a particular policy choice, will survive. On the other hand, uncertainty in Climate Change implies that the outcomes of policies cannot be determined definitively in any case, because they are insensitive to any intervening states of nature, all of which may be manifest in the long term over which Climate Change may occur. In other words, in Climate Change, "God does not play dice with the world," but that uncertainty arises from inadequate human knowledge and understanding, which could improve with time and effort. For example, uncertainty exists about the predictions of Global Circulation Models (GCMs) of the atmosphere, or of economic models of regulatory policies, on which policies must be based, because they are

sensitive to modelling assumptions or parameter values, whose validity may be in doubt. However, further research may reduce these uncertainties.

In the context of Climate Change, further complexity is introduced by (a) long-time periods involved, on account of which uncertainties in the costs and benefits of policies, and their regional and inter-generational distribution increase; (b) the possibility of catastrophe, meaning that under some equity perspectives the costs of some impacts should be valued as infinite, even if they are remote in time or have a very small probability of occurrence; (c) that knowledge of the uncertainties may change over time, because of gains in scientific knowledge or better modelling (including economic modelling) techniques, meaning that in hindsight, policy choices may be seen to have been mistaken; and finally (d) that there is a hierarchy of policy choice situations, i.e., global, national, and perhaps, subnational, so that policy choices at one level of the chain may impact the outcomes of policies at other levels. This may be the case, for example, with trade and the international division of labour, which may depend on the interactions of global, national, and local regulatory regimes and economic policies. Further, in the multilateral context, the issue of the process of policy choice and of criterion of choosing among alternative policies is reasserted.

Ways of dealing with uncertainty in conventional CBA ultimately rest on subjective judgements. These judgements relate, first, to the choice of a decision criterion. For example, "maximization of expected value", in which the mathematical expectation of net benefits, using subjective probability estimates, is the decision variable). Alternatively, the so-called "maximin returns" rule, in which each candidate policy is evaluated at the minimal net benefit it assures, with the one with the highest such guarantee being chosen. Another option is the "minimax risk" principle, in which the alternative with the smallest "maximum risk", defined for each combination of an alternative and a state of nature, as the excess of the maximum net benefit available in the state of nature and that actually resulting from the given decision in that state of nature, is chosen. Second, judgements of the probabilities of the different outcomes are also inherently subjective, and cannot be formulated as a strictly technical exercise. Before or after an event, no particular probability estimate of the same can be unambiguously validated, even in principle.

In conventional CBA, with a clearly designated policy making authority, the subjective judgements of that authority must prevail. This remains true, even if the tasks of choice of decision rule, or estimating probabilities, are delegated to policy analysts or experts, because it is the decision maker who exercises this choice. In the context of multilateral decision making for global Climate Change policies, each party to the negotiations would make his own subjective choices. In this, there is scope for strategic behaviour by the negotiators. For example, a country may adopt a negotiating strategy of asserting a low probability to adverse impacts in its territory, or conversely, high probability to favourable impacts, in the expectation that this may reduce pressures on it to adopt stringent emissions limits. If enough countries behave in this way, the aggregate global levels of emissions may be negotiated at levels too high to appreciably impact the onset or severity of Climate Change.

2.4. Large Scale of Impacts:

Conventional CBA deals with policies whose economic impacts are at the margin, i.e., small in relation to the overall economy, and even perhaps to individual markets. Several assumptions may be justified in such cases. For example, most conventional CBA rests on partial equilibrium analysis, so that only the markets directly impacted need to be studied, maintaining the ceterus-paribus ("all else unchanged") assumption.

Climate Change impacts, or regulatory measures, may however, have to be studied in a more comprehensive manner. For example, since regulation of GHGs emissions will impact patterns of energy use, and energy is a significant input in all industries, regulatory policies may need to be evaluated in a general equilibrium framework, i.e., looking at the inter-dependence of and impacts on all markets, including the traded sectors. Additionally, policies for global GHGs regulation will impact national or regional economies differentially, altering their inter-relationships, for example patterns of comparative advantage and trade.

General equilibrium analyses typically rely on large-scale models of economies, in contrast to the small scale, project or program level focus of conventional CBA. A comparison of such micro level ("bottom up") and model based ("top down") estimates of abatement costs reveals systematic differences in the results. The top down studies, which typically rely on the neo-classical assumption of cost minimizing behaviour by firms, show national economies moving away from an initial equilibrium in which all firms employ resources optimally, so that abatement costs are positive. On the other hand, bottom up studies, employing the assumption of "unfettered penetration of technologies", frequently show negative abatement costs, because the benign technologies may also be more efficient, at least when no changes in relative prices are allowed for. While it is clear that because of the large scale of impacts, general equilibrium effects must be taken into account, one challenge of model development is to realistically incorporate rapid or discrete technological change.

2.5. Is an Anthropocentric Approach Ethical?

Climate Change may impact the major ecosystems of the globe, and thus, all life forms. It may promote speciation through modification of habitats, and for the same reason, may result in the extinction of some species. While several other policy questions have concerned significant local or regional ecological impacts, Climate Change is the one issue in which impacts may be planetary in scope and permanent in duration.

The validity of CBA, or indeed any methodological approach (for example, decision analysis), based on human preferences or valuations, presupposes that an anthropocentric world view is appropriate. The issue may be framed in terms of whether mankind has rights of domination over all Creation (and may therefore employ all of nature as he pleases), or is but one species among many (and accordingly, has no right to disturb the natural order), or has a special responsibility to preserve other living and non-living entities without regard to his own benefit, i.e., stands in relation to the rest of Creation as guardian or trustee. Clearly, no analytical answer to these issues is possible, and the matter is at the heart of ethical philosophy.

Several serious researchers (e.g., Tribe, 1987), have sought to define an environmental

ethic not based on human domination over other "modes of being", including living and non-living entities. Thus, Tribe suggests that "at a minimum, we must begin to extricate our nature regarding impulses from the conceptually oppressive sphere of human want satisfaction, by encouraging the elaboration of perceived obligations to plant and animal life and to objects of beauty in terms that do not falsify such perceptions from the very beginning by "insistent 'reference to human interests'." Some specific proposals in this general direction include:

(a) Legal recognition of a principle that the concept of "rights" is not confined to humans (Stone, 1972). This should not be confused with the idea that their "wants" should be identified and included in a calculus of preferences. Recognizing these rights may be consistent with acknowledging that there maybe circumstances in which such rights may be overridden, as indeed is the case with several "human rights."

(b) The appointment of guardians or trustees for environmental entities, living and non-living, as an embodiment of the recognition of such rights.

(c) Making explicit obligations to nature in environmental surveys and statements, and allocating resources to improving the technical capacity to incorporate such obligations in policy analyses.

The use of CBA, or other analytical techniques based on human preferences, is ultimately based on the doctrine of human domination over nature. Since Climate Change has generated global discourse, it is indeed appropriate that the issue is looked at from alternative cognitive perspectives.

3. The Use of Formal Economic Models:

Policy analysis of Climate Change has relied extensively on formal modelling exercises. Two principal categories of such models are, first, global energy-carbon dioxide prediction models, and second, national or regional economic models focused on energy use and regulation. The next two subsections briefly recount these modelling efforts, and the last subsection considers the possible use of formal models in policy analysis of Climate Change.

3.1. Global Energy-Carbon Dioxide Models:

Numerous attempts have been made at making long-term (i.e., half a century or more) predictions of atmospheric carbon dioxide, employing formal, quantitative models. However, all such predictions are intrinsically uncertain, with the uncertainty increasing sharply with the time horizon. The uncertainty arises both from the tentative nature of economic forecasts of anthropogenic activities which generate GHGs, as well as from inadequate scientific understanding of the various natural processes of the carbon cycle. There are three basic types of such models:

The first type are simple extrapolations of historical trends of energy use, and may be regarded as summarizations of more detailed projections. They may be useful for sensitivity analyses of the carbon cycle and the climate system, but have little intuitive

appeal as systems of comprehensive carbon dioxide accounting. Examples of this type of model include: Keeling and Bacastow (1977), and Siegenthaler and Oeschger (1978).

The second type of global carbon dioxide models are "uncontrolled" (i.e., no regulatory mechanism is embedded), global energy-climate systems models. They include relatively detailed descriptions of global energy supply and demand, and carbon dioxide emissions are an incidental output. Various models of this type vary greatly in design, in the extent to which formal modelling techniques are employed, and in the details of fuels, geography, and other factors. Examples of this approach include: Perry and Landsberg (1977), Edmonds and Reilly (1983), Rotty and Marland (1980), Nordhaus (1977 and 1979), and IIASA (1981).

The third type of models incorporate feedbacks from changes in atmospheric carbon dioxide to the global energy system. They require a basic analysis of a model of the second type as input, but additionally, take into acount changing levels of carbon dioxide, or costs of climate change. In other words, the level of atmospheric carbon dioxide is included as a possible external constraint on the energy system. Examples of models of this type include Nordhaus (1980), Perry et. al. (1982), and Edmonds and Reilly (1983).

The results of all models which are based on reasonably in-depth studies of carbon dioxide emissions project a growth in energy use over the next 40 to 50 years of 2 to 2.5 times the 1975 level (which was 8 Terrawatt-years/year). Whenever such scenarios do not project a large share of non-fossil fuels, they lead to serious concerns about climate change in the next 50 to 100 years.

3.2. National (Regional) Energy Focused Models:

Models of national economies focused on energy supply, demand, and the impacts of policy, have been taken seriously by policy makers from the time of the first oil price shock of 1973. An example is Hudson and Jorgenson (1978). Numerous models in this category have been developed, varying widely in level of modelling detail, assumptions, time-frame, and methodology.

The current generation of this category includes applied general equilibrium models designed to simulate the impacts of price shocks with a high level of causal detail (e.g., Despotakis and Fisher, 1989), or to simulate the impacts of multilateral and domestic GHGs regulatory instruments (e.g., Ghosh, 1990), or to evaluate the costs of environmental quality regulations (e.g., Hazilla and Kopp, 1990). It also includes disaggregated long-term models to evaluate the impacts of pollution regulation on growth (Jorgenson and Wilcoxen, 1989), and long-term macroeconomic models for estimating the economic costs of carbon dioxide emissions limits (e.g., Manne and Richels, 1989). Several of these models attempt to estimate the average or marginal costs of fossil fuel carbon dioxide reductions in the respective countries. The estimates vary widely, reflecting underlying differences in modelling assumptions, structure, and abatement scenarios. A representative sample of these estimates is furnished below:

Table 3.1: The Costs of Carbon Dioxide Reductions: Representative Estimates:

Author(s)	Region	Forecast Year	% CO_2 Reductions	Reference Year	Costs 1989 US$/TC Average	Marginal
Gerbers et.al. (1990)	Nether.	2020	20	1990	31	31
		2020	70	1990	174	889
Yamaji et.al. (1990)	Japan	2005	0	1988	n.a.	281
Manne & Richels (1990)	USA	2030+	20	1990	210	250
Jorgenson & Wilcoxen (1990)	USA	2100	20	1990	n.a.	46
CBO (1990)	USA	2100	20	1988	n.a.	110-440
Morris et.al. (1990)	USA	2010	20	1990	28	39

Source: Adapted from Edmonds and Wuebbles (1991).

3.3. The Use of Formal Models in Policy Analysis of Climate Change:

Typically, the development of formal predictive or policy analysis models requires significant resources of time and effort. Implicitly, the expectation of the modellers in engaging in such intensive research activity is that the simulation results of the models would be taken seriously by policy makers and activists, and actually employed as inputs to policy formulation. An important question that arises is: Why and to what extent should policy makers and other players in the policy game accept analyses which employ such models as credible inputs to the policy making process? The issue of validity of policy modelling is intimately linked to the perceptions of whether these approaches constitute "science". There is general agreement that the scientific method includes (a) the dominant role of empirical testing, (b) the reproducibility of results, (c) of being explicit about uncertainty, (d) of peer review, and (e) of open debate about alternative theories. We discuss below the applicability of each of these attributes of the scientific method to existing policy analysis practices:

(a) Empirical validation: Differences between validation in the natural sciences and policy analysis models are centered on the facts that empirical policy analysis models are contingent on place, time and circumstance, rather than universal, and that validation by the process of controlled experimentation is not possible when the subject of the experiments is society itself (a difficulty common to all social science).

Policy analysis models present some further difficulties which are not encountered in the "hard" sciences. First, policy analysis models often attempt to project the implications of policy decisions far into the future, and direct testing of predictive validity cannot be carried out until long after the analysis is required. Second, such models are frequently designed to simulate the impacts of alternative policies. In such cases, empirical validation of the models in respect of the policies which are not adopted is not possible, even in principle. Finally, when the models can be calibrated against historical data, there is no assurance that past parameter values, or even causal relationships will hold in the future.

It is clear that direct empirical validation is not possible for several types of policy modelling, including those related to long-term Climate Change. This unavoidable situation places a greater burden on policy modellers to observe the other canons of scientific procedure, if the results of the models are to be relied upon even to a limited extent. However, it seems that these conventions are not yet well established among policy analysts, as discussed below:

(b) Reproducibility: Policy analysts have largely neglected the issue of reproducibility, as may be seen, for instance in the frequent lack of adequate documentation that would enable other researchers to reproduce the results. This may be on account of the fact that standardization of methods and tools is not yet sufficiently advanced in policy analysis, so that it is difficult to convey the details of models adequately in typical journal length articles.

(c) Uncertainty: Despite, or perhaps because of, the vast uncertainties inherent in most policy analysis models, it is still not standard practice to treat uncertainties in an

explicit, probabilistic fashion. This contrasts with the practice in the experimental sciences, in which it is usual to report estimates of random or systematic error in measurements or estimates. It is clearly prudent to conduct sensitivity analyses of policy analysis models with respect to parameter values or key assumptions, but this practice, while increasing, is not yet the norm.

(d) Peer review: In conventional science, peer review takes place largely through the refereeing and publication of research reports. For a large and complex policy model, an adequate review can be time consuming and problematic, even if adequate documentation exists. It has also been argued that owing to the time urgent nature of several types of policy analysis, peer reviews are inappropriate, even for models of modest scale. While this may be true in some cases, a general failure to focus on peer reviews has perhaps contributed to the slow development of standards of good analytical practice, as well as a failure to extract generalizable insights from specific analyses.

(e) Debate: Any model used in policy analysis will, at best, be an approximation to the real world. Further, policy analysis almost always deals with situations that are ill-structured. In traditional sciences there are norms about how to conduct experiments, what kinds of theories are interesting, and what questions are interesting: These constitute the prevailing "paradigm" of the discipline. In policy analysis, on the other hand, there seems to be no clearly prevailing paradigm, but rather a number of different contending criteria and methodologies. This lack of agreement on paradigm, and on the focus on ill-structured problems makes the criterion for deciding what is "best" especially difficult. It has been suggested (Mitroff and Mason, 1980) that policy analysis is a dialectical process in which a model is proposed, and counter-models are offered in response. Debate focuses on the relative failings of the competing models, and over time, an improved model may be synthesised from the initial ones. Claims to validity of any policy model, are thus always tentative.

It is likely that the findings of policy research influence policy making, not directly ("instrumental use"), but in a diffuse and indirect manner, without policy makers being able to cite specific research findings employed by them ("conceptual use"). Alternatively, such findings may be employed for reinforcing partisan viewpoints, or as an aid to legitimizing decisions that have already been taken ("symbolic use").

The fact of possible, even probable, symbolic and conceptual use of research findings, casts a special responsibility and need for restraint on the part of policy analysts. The findings of formal models which are not rigorously validated (including those which by their very nature or time frame do not lend themselves to empirical validation) and in which the extent of uncertainty in the results is not determined to specified confidence levels, should not be employed in proposing actual policy measures. This is not to suggest that the findings of such unvalidated models should not be disseminated to policy makers. Provided that the theoretical structure of the models is sound as determined by peer review, that the data employed is believed to be reliable, and that the models are robust as demonstrated through sensitivity analyses over key assumptions and parameter values, the focus of such revelations should be on the causal insights gained. In particular, these insights may relate to mechanisms which are not transparent to the intuition, and in identifying promising policies for further analysis.

4. The Inertia of Social and Economic Systems:

Simple economic models frequently furnish important insights that are difficult to gain from pure intuition. These models are "simple" in the sense that they involve several abstractions from reality, to reduce the number of interacting variables. The construction of such models involve making numerous assumptions, for which economists are notorious. Indeed it has been asserted that economic models are to be judged not by the plausibility of
their assumptions, but solely by their predictive power.

A "standard" assumption in economics is that factors of production are fungible between economic activities, and accordingly, changes in economic patterns are for the most part, costless. Firms may therefore respond smoothly to policy or price changes, although adjustments of different types of inputs may involve different time lags. Thus, in the "very short run", firms may alter materials (and energy) entering process streams, and in the "short run", labour. In the "long-run", capital employed may be changed, and firms may enter or exit a given industry. "Fixed costs" refer to capital (including human capital) stocks which are specific to a given plant (or activity, in the case of human capital), and which cannot be reassigned in any meaningful time frame. Such costs, once incurred, as treated as "sunk." A major theme of neoclassical economics is that only variable costs matter for making economic decisions, and that sunk costs are to be ignored in a rational calculus.

Strategies for reducing GHGs emissions, or in adapting to Climate Change may involve changes in technology, economic structure, and life-styles. The existing patterns are, in each country, the result of historical evolution. Unlike the neo-classical economic assumption, changes in technology and economic structure will not be costless, nor will changes in life-styles be without pain.

Considerable economic and social infrastructure is currently built around energy dependent systems. One example illustrates this assertion. Modes of transport, i.e., whether mass or personal transportation systems dominate, and the vehicular mix in each, determine capital stock and technologies in the sector, besides public infrastructure: railway lines, airports or highways, and patterns of fuel use. Second order linkages include composition of industrial output and trade, besides occupational patterns, human settlement modes, and lifestyles. Clearly, limitations on GHGs use in the transport sector would have pervasive effects throughout the economy. A similar order of economic and social linkages and effects of GHGs regulation may be traced for other energy intensive sectors, for example power generation, industry, agriculture, etc.

In reality, of course, physical capital stocks are not fungible across sectors, or across different technologies in a given sector. In other words, much investment in physical capital is to be regarded as a 'sunk cost', in any significant change in economic structure, including technical change. To an extent, this would also be true of human capital. While some types of workers may be retrained at relatively little cost and deployed in newer lines of economic activity, several skills may become manifestly obsolete and/or because of barriers to labour mobility, the workers may be unable to relocate. The human capital embodied in the skills of such workers must then also be

reckoned as a 'sunk cost.'

Since regulation of Climate Change, as well as its possible impacts may involve major restructuring of the economy, the question of the magnitude of these 'sunk costs' becomes important. Analogously, lifestyle changes may also occur, bringing unhappiness or disutility (and it may be possible to assign monetary values to such disutility, for a given distribution of resources in society). These magnitudes are closely related to the time-frame in which regulatory measures are implemented (or adaptation is necessary). This is because of several reasons:

First, if the required changes are implemented gradually, it may be possible to run down existing (physical and human) capital stocks fully in a given sector, before fresh investments embodying new technology (and skills) are made. A similar situation may prevail for human capital i.e., workers of a given skill may superannuate by the time that new investments requiring new skills are made. Second, if existing capital is not in fact fully depreciated (i.e., in an intrinsic, not financial book value sense), but the period of (premature) replacement is spread out, given positive private discount rates, the present value of 'sunk costs' would be relatively low. Further, one may anticipate that significant technological improvements would occur over time, and this fact may also reduce anticipated adjustment costs if the period of restructuring is spread out. Finally, one may intuitively accept that rapid lifestyle changes may bring greater disutility than gradual changes, and further, if positive time preferences exist with respect to utility, the magnitude of total disutility (perhaps aggregated by monetary imputations) would be lower still.

Several differences exist between industrialized and developing countries with regard to the current age and composition profiles of (physical and human) capital stock. Generally speaking, in many OECD countries, traditional industrial sectors which are GHGs intensive have experienced slow or negative growth in the past several decades. On the other hand, several "sunrise" sectors, i.e., those which have shown relatively high growth rates in recent decades, for example, information intensive sectors such as services, pharmaceuticals, entertainment software, etc., are not GHGs intensive. This means that in industrialized countries, the age of capital stock in GHGs intensive sectors is on the average "high", and that of less GHGs intensive sectors, "low". This situation contrasts with that in many "Newly Industrializing Economies" (NIEs). In these countries industrial capital stock is largely concentrated in GHGs intensive sectors, for example, steel, fertilizer, electric power, and are "new", as compared to similar capital stocks in industrialized countries. A case is therefore apparent, even on cost minimization grounds, i.e., without involving equity considerations, for global GHGs regulatory policies to be focused on the earlier restructuring of OECD economies away from GHGs intensive activity. Equity considerations, taking into account the relative burden of restructuring costs across countries, would seem to only reinforce this conclusion, which dominates the alternatives of restructuring by all countries at the same rate, or a policy of earlier restructuring by developing countries.

5. The Issue of Instrument Choice:

The environmental economics literature distinguishes between two broad classes of

environmental regulatory instruments, i.e., "command and control" or fiat type instruments, and market incentive based instruments. An example of the former is emissions standards (i.e., quantity restrictions on pollution emissions of a given type e.g., SOX, emitted) imposed by directive, and of the latter, pollution taxes i.e., a uniform tax on polluters per unit of pollutant of a given type emitted.

In the case of carbon dioxide whose emissions primarily result from fossil fuel use, the possibility also exists, at least in the context of a national economy, of the use of conventional fiscal and tariff instruments on energy sources and energy intensive sectors. The use of these instruments may, by altering the structure of relative prices perceived by economic agents, impact patterns of energy use by inter-fuel substitution (e.g., substitution of fossil fuels by hydropower for electricity generation), or of factors use (i.e., substitution of energy by capital and/or labor, e.g., by promoting energy conservation), or of industrial and trade structure (e.g., shifts in output and/or trade from energy intensive industrial sectors like steel to (skilled) labor intensive sectors such as services). These shifts in energy use patterns may impact the emissions of carbon dioxide, and perhaps of other GHGs as well.

Some results from the theory of environmental regulation relating to the choice of environmental regulatory policy instruments are summarized in the next subsection.

5.1. Standard Theoretical Results:

In the case of a pollution tax, a necessary condition of economic efficiency in a competitive economy is that the rate of tax is set equal to the marginal damage from pollution. However, and this would very likely be true of Climate Change, the information required to reach efficiency (i.e., the marginal damage at the efficient point to all agents exposed to the pollutant) is unlikely to be available. In that case, a pollution tax will still achieve a given level of environmental quality (e.g., aggregate GHGs emissions levels) at least resource cost, under the assumptions of cost minimization and price taking by firms, which fiat based instruments are unlikely to accomplish. Further, a rigid standard may involve unacceptable control costs if the regulator is misinformed about the magnitude of actual marginal control costs. Another advantage of a pollution tax over a standard under these assumptions is that a tax provides a continuing incentive to polluters to reduce emissions if cost effective means are available, no matter how low they are already. This may stimulate technical change in abatement methods.

On the other hand, while pollution taxes may involve substantial expenditures on monitoring and enforcement, these may be significantly lower for standards if they are imposed by the device of mandated technologies (e.g., a "best available abatement technology" policy). Another disadvantage of a pollution tax is that the level of environmental quality attained cannot be chosen in advance, as it results from the decentralized actions of numerous (and diverse) agents. To achieve a given level of aggregate emissions, tinkering with the pollution tax rate over time may be necessary. However, if an initial level of pollution tax leads to investments in abatement, the costs of adjustment in response to a change in tax rate may be high.

An alternative to pollution taxes that is sometimes suggested is a subsidy to reduce pollution. The argument goes that resource allocation, including the emissions of pollutants, does not depend on the assignment of environmental property rights (i.e., whether agents are taxed or rewarded for abatements does not affect the outcomes, except for the distribution of incomes). Typically such subsidies take the form of payment, at least in part, of the costs of pollution control. Three major problems arise in this approach. First, it is difficult to establish benchmarks for emissions levels (reduction below which will merit lump sum subsidy payments) for each agent without creating incentives for them to misrepresent their actual emissions levels. Second, a subsidy may bias the choice of abatement technology. For example, if capital costs are subsidized, but operating costs are not, capital intensive control methods may be adopted even if they are not efficient (economic). Third, because the subsidy payments can impact agents' profits, while each existing polluter may reduce emissions, an incentive is created to other agents to enter the polluting activity, and in the long-run, the aggregate level of pollution will tend to increase.

In addition, tradeable permits have been proposed by economists as a means of achieving aggregate pollution emissions levels at potentially lower costs than standards imposed on each polluter. Further, tradeable permits also eliminate uncertainty about aggregate emissions levels (or ambient quality, if so desired). However, the monitoring and enforcement costs of tradeable permits may be higher than for pollution tax, because of the need to keep track of trades in permits after the initial assignments. Additional administrative costs may be incurred in operating a scheme for the initial assignments. In the theoretical analysis of tradeable permits, it is assumed that once assigned, a competitive market operates among agents owning these permits.

Two principal ways of assigning these permits are as follows. First, the permits may be distributed among agents on the basis of a political determination of entitlements. In this case, unequal political power of agents may result in "inequitious" distributions of these rights among agents. Second, they may be auctioned by the regulator. In the latter case, if some agents are "large", they may form (buyers' and sellers') cartels and the outcome may differ from that which would be realized if the bidding were perfectly competitive.

A widely shared view among economists is that which of these instruments accomplishes a desired level of control at least cost, including monitoring and enforcement costs, is essentially an empirical one. The following subsection briefly surveys the experience so far with the actual operation of incentive based environmental regulatory instruments at the level of national (and subnational) economies:

5.2. Actual Experience with Environmental Regulatory Instruments:

Pollution taxes (emissions charges), and other similar fee based systems have been operated in Europe, Japan, and the U.S., for at least two decades. These include effluent charges on water pollutants (France, Italy, Germany,Netherlands and U.S.), air pollution charges (France and Japan), taxes on polluting vehicles (Sweden), and on hazardous solid waste (U.S.). Some insights which may bear generalization are as follows:

(1) Charges have been typically designed to raise revenue, rather than to achieve efficient levels of pollution control, or even minimize costs of achieving given environmental standards. The level of improvements appear to be positively related to the level of charges. However, the impacts are low when the revenues are returned to the polluters.

(2) Typically the revenues from charges are used for specific environmental purposes, rather than for reducing reliance on conventional taxes (which may involve greater distortions in resource allocation than pollution taxes).

(3) Where charges have been successful, they have been introduced gradually and increased over time (at rates exceeding the inflation rate).

Tradeable permits schemes have not yet been employed as widely as pollution taxes. Three examples are from the U.S., i.e., trading emissions rights under the Clean Air Act, trading of lead in gasoline, and control of water pollution in a river. A fourth example involves air pollution trading in Germany (for which only very limited information is available). Once again, some insights which might be relevant in other contexts, are as follows:

(1) The market structure and the behavioral norms of the regulated agents are important. In the case of the Wisconsin Fox River, the disappointing results of a scheme of trading discharge permits are traced to (at least) two reasons. First, several of the polluters (pulp and paper plants) are oligopolistic, and may not behave as competitive firms in the permits market. Second, another set of polluters are municipal waste plants subject to public utility regulation, and perhaps insensitive to market incentives.

(2) Where a trading scheme has resulted in large numbers of trades (e.g., as allowed under the "netting" component of the emissions trading program of the U.S. Clean Air Act), significant cost reductions in compliance have resulted (exceeding $ 10 billion in accumulated capital savings under all components of the program). Further, while environmental quality has certainly improved under the scheme, since the emissions trading program is additional to, and not in replacement of the traditional command and control regulatory approach, it is not possible to say how much of the improvement is attributable to the emissions trading scheme.

(3) Effective monitoring and widespread agreement on environmental objectives are important for the success of tradeable permits schemes. This appears to be the case with the lead trading program among refineries in the U.S., which also conforms closely to the notion of a competitive market in permits.

In the next subsection we identify some implications of the above discussion for the choice of multilateral and national level policy instruments for regulation of GHGs emissions.

5.3. Choice of Policy Instruments for GHGs Regulation:

Multilateral level policy instruments which have been suggested for regulation of GHGs

emissions by different countries or regions include variants of standards ("commitments on sources"), as well of pollution taxes ("carbon taxes"), and tradeable permits. While there has been some debate, both in
policy forums as well as in the academic literature, on instrument choice, the question of monitoring and enforcement (M&E) mechanisms has received comparatively little attention. This omission is surprising, both because regulatory schemes are critically dependent on effective M&E, and because the M&E costs of different regulatory strategies may vary widely, impacting the choice of policy instruments.

In the multilateral arena, several political considerations, for example, national sovereignty, may dominate strictly economic criteria (i.e., costs or efficiency), in the choice of regulatory schemes. In addition, the choice of policy instruments may have important distributive (or equity) implications both across and within the regulated agents (countries or regions). Thus, for example, considerations of national sovereignty may preclude the use of emissions standards based on technologies mandated by external authorities. Considerations of sovereignty would also dictate that the choice of domestic regulatory instruments, in fulfilment of multilateral obligations, must be left to national policy makers. However, the feasibility of effective national level regulation would constitute an input into the fixing of multilateral obligations. Equity issues within regulated entities (countries) may, for example, involve changes in relative factor rewards (i.e., interest rates, wage levels, and land rentals), impacting the incomes of different social classes.

If one assumes that any scheme of multilateral regulation of GHGs will be focused on sovereign States, the first question which arises in the context of instrument choice is whether the standard theoretical results would continue to hold in the multilateral context. In particular, we need to enquire whether the assumption of cost minimization by firms has a clearly identifiable counterpart in the case of States. Further, when considering international tradeable permits, whether there is good reason to believe that the resulting permits markets would be competitive.

In attempting to answer the first question we initially proceed in a normative, rather than a positive manner: The minimization of (domestic resource) costs of compliance with a multilateral regulatory regime would result in a gain in efficiency. Public authorities of States "should" however, seek to maximize societal welfare, which has components of both efficiency and distribution across societal classes. Characteristically, policy choices involve tradeoffs between efficiency and distribution. For this reason, gains in economic efficiency may not be unambiguously desirable. Because different (multilateral) regulatory approaches may have varying impacts on efficiency and distribution, it follows that quite rationally, policy makers may not display cost minimizing responses to multilateral regulation. Switching to a positive approach, we note that a sizable literature on the theory of public choice suggests that the maximization of a societal welfare function may conflict with the incentive structure of public officials, and for that reason, is unlikely to occur.

The second question, i.e., whether we may expect an international tradeable permits market to be competitive, may be answered intuitively by looking at the existing

distribution of resources across countries. The facts of vast disparities in the wealth of nations, concentration of wealth in a relatively small number of nations, and great heterogeneity and political differences among a much larger number of poor nations, would suggest that formation of emissions permits cartels by rich nations would be easy. No effective device can be visualized to counter this reality.

The limited experience with operating market based regulatory schemes (discussed above) suggest that deviations from the assumptions on which the theoretical results are based would tend to make these instruments ineffective. Two key theoretical assumptions indeed seem to be violated in the case of market based multilateral instruments. Further, as we have seen, in the case of emissions standards, the option of basing them on mandated technologies, which may reduce M&E costs in their case, may violate notions of national sovereignty. Having said this, one may recognize one advantage of international carbon taxes and (auctioned) tradeable permits over several alternative schemes. These instruments may yield significant net revenues to the multilateral regulatory agency, which may be important in devising practical schemes for financial transfers to developing countries, as may be mandated by a determination of the equity question.

Any multilateral GHGs regulatory regime focused on sovereign States has to be translated by national public authorities to a domestic regulatory framework for domestic emitters, designed to ensure national level compliance with the multilateral responsibilities. In the case of developing countries generally, an important consideration is that a major part of economic activity is in the "unorganized" sector, with little possibility of access by regulatory instruments, including market based instruments. This is because such activity is typically tiny in scale, widely dispersed, and may have little market nexus. It would be unrealistic, accordingly, to subject developing countries to stringent application of multilateral regulatory instruments, and at least in the near term, expect that they would be effective.

Energy is a ubiquitous input in all economic activity, and different energy sources are (partly) substitutable with each other, and in the aggregate are substitutes (or complements) for other inputs to production, i.e., capital, labor, land, and materials. Accordingly, the effects of any domestic policy instrument impacting GHGs emissions through inducing changes in energy use, applied to a single sector (e.g., electricity generation), or a category of economic agents (e.g., consumers) carry over, through changes in relative prices and factor rewards to all aspects of the economy. These include changes in patterns of production, trade, aggregate income and its distribution, consumer welfare, government revenues and expenditures, inflation, savings and investment, and the external balance of payments. Further, global regulation of GHGs may be expected to alter comparative advantage across nations, and relative prices of tradeables, besides financial and investment flows.

It is not likely that all these diverse impacts of GHGs regulation can be predicted intuitively. Some insights may be gained through formal economic modelling techniques. While several limited modelling efforts have indeed been made, we are still far away from an adequate understanding of the impacts of global and national level regulation of GHGs emissions. Clearly there is need for further research on the question of

instrument choice in the multilateral and domestic GHGs regulatory context. Given the present state of knowledge, one would hesitate to unreservedly recommend any particular regulatory arrangement for adoption in the near term.

6. Structuring the Equity Issue:

The key to an eventual international instrument for regulation of Climate Change is the issue of equity or fairness. Equity is involved not only in the distribution of possible benefits of control, but also, importantly, in the costs of abatement responsibilities. A gestalt view of the latter aspect is that since a Protocol would have to limit global emissions, and also apportion entitlements to emissions (or the share of net revenues that might be yielded by the use of international regulatory instruments, such as carbon taxes or tradeable permits), real resource transfers are involved in such schemes. Further, since the sharing of burdens, entitlements, and benefits would occur not only among countries or regions, but also across human generations, equity in the context of Climate Change has both spatial and temporal dimensions. The issue is complex, and in this paper we do not attempt anything more than providing an outline of a framework for analysis of the problem.

Notions of fairness are deeply intertwined with the idea of "equality." The term 'equality' is used in different senses. It may refer to "equality before the law", i.e., equality of treatment by authorities. Alternatively, it may refer to "equality of opportunity", i.e., equality of chances in an economic system. A third meaning is "equality of result", i.e., equal distribution of goods or productive resources. Coleman (1987) seeks to distinguish between these different meanings in the following manner:

Suppose that a system consists of:

(a) a set of positions which have two properties:

(i) when occupied by persons, they generate activities producing valued goods and services;

(ii) the persons in these positions are rewarded for these activities, both materially and symbolically;

(b) a set of adults who occupy positions;

(c) children of these adults;

(d) a set of normative or legal constraints on certain actions.

Equality under law concerns (b), (c), and (d): i.e., the normative or legal constraints on actions depend only on the nature of the action, and not on the identity of the actor. That is, the law treats persons in similar positions similarly. Equality of opportunity

concerns (a), (b), and (c), i.e., that the process through which persons come to occupy positions give an equal chance to all. Ordinarily this means that a child's opportunities to occupy one of the positions (a) does not depend on which particular adults from set (b) are her parents. Finally, equality of result has to do with (a ii), i.e., the rewards given to the position occupied by each person are the same, independent of the activity. These three concepts can also be seen as involving different relations of the "State" to inequalities that exist, or arise in society. Equality before the law means that laws do not recognize distinctions between persons that are irrelevant to the activities of the positions they occupy, but that otherwise policies do not attempt to eliminate inequalities as they arise. Equality of opportunity means that the State intervenes to ensure that inequalities do not cross generations. Equality of result implies that the State periodically or continuously intervenes to ensure that inequalities arising from activities are not accumulated.

In applying these concepts to Climate Change, the first key question is that of the "identification of agents". Ordinary notions of equity involve fairness among human individuals as agents, although often phrased in terms of equity between different groups, or classes. An intuitively appealing notion of "agent" in the Climate Change context would be human beings, irrespective of where or when they happen to live. Alternative notions of 'agent', for example, countries, regions, or defined communities are unappealing, if for no other reason than that they are susceptible to fundamental change in character and composition in the time frame of Climate Change. In that case, (i.e., with agents as individuals as defined above), sovereign States may assume the role of trustees with respect to their citizens in the matter of equity in Climate Change, and an attribute of sovereignty would be that such a claim of trusteeship is not open to challenge.

In the context of multilateral regulation of Climate Change, given that this definition of 'agents' is accepted, how may we identify the other elements of the system described above? 'Legal constraints on actions' may be interpreted as limitations on GHGs emissions. Further, the 'set of positions' would include various occupations (consumption) resulting in GHGs emissions and resulting in economic reward (utility), no matter where or when located. Finally, 'children', would, at any given generation, mean the members of the succeeding generations.

What would 'equality under the law' imply, given these definitions? Since under this principle, no note must be taken of distinctions which are irrelevant to the activities of the agents, a multilateral regulatory framework cannot distinguish between individuals on the basis of nationality, temporal generation, or other attributes, such as race, religion, or colour. Equality under law is generally considered the weakest equity principle, to which even an minimalist State may be expected to adhere, and almost coincident with the notion of "rule of law." It would be difficult to argue against following this principle, in any multilateral context, including of course, Climate Change.

What of 'equality of opportunity'? This principle requires that inequalities (in wealth, welfare) arising from differential levels of GHGs emissions by agents do not carry over across generations. Specifically, at a minimum this principle would seem to require that

the access to GHGs emissions cannot be hereditary, (ruling out "Grandfathering" as a basis for emissions entitlements), and that the incremental wealth accruing to individuals from higher, unentitled GHGs emissions by them, cannot be bequeathed to their offspring. This principle furnishes the basis for the assertion that societies with higher historical per-capita emissions, should compensate societies with lower past per-capita emissions. Ensuring equality of opportunity is a central concern of the welfare State, and (to varying degrees) is sought to be realized in all but avowed legally minimalist States. Little support may be found in international public documents, or current instruments, for abrogating this principle.

Finally, 'equality of result'. Different ethical schools have evolved to address this question, albeit in the context of distribution of the national income between different social classes or groups. In the Climate Change context, this principle should be interpreted as equal per-capita rights to GHGs emissions (which may be voluntarily transferable) across all
agents.

Several philosophical positions take equality of result as 'natural', in the sense that while it needs no justification, deviations from the principle would require it. Rawls (1971), accordingly seeks to address the question: "When can inequalities of result be justified?" The answer, summarized in a sentence, is that "only those inequalities are just, which would make the least well off person in society better off than that person would be, (given ceterus-paribus and that basic human rights are equally assigned to all), in the absence of the inequalities." Rawls' theory of justice would thus cast a strong onus on advocates of differential per-capita GHGs emissions entitlements to demonstrate that any scheme of unequal entitlements would be of greater benefit to the poorest of mankind, than equal entitlements.

Traditional welfare economics based on Utilitarianism, would support the idea of equality of result in income, since declining marginal utility of income would mean that social welfare, an aggregation of individual utilities (cardinal, inter-personally comparable), is maximized when incomes are equal (Pigou, 1932). A progressive per-capita distribution of GHGs emission rights (i.e., emissions rights for the poor are higher than for the rich) might have the effect of equalizing incomes, and thereby, increasing global social welfare. Of course, the underlying assumptions for existence of such a social welfare function are strong. However, there is another objection to the Pigouvian result. That is, if individual welfare is inter-dependent, or in other words, if one person's activities benefit or harm others, even if such external effects are unintended, maximization of social welfare over time would require such external effects to be taken into account. This would mean an allocation of resources (emissions rights) to persons in line with the value of these external effects, justifying some inequalities. Of course, the application of this principle must be comprehensive, i.e., all external contributions of all persons over all time must be accounted for, and it is difficult to see that practical ways of implementing this principle can be devised.

Libertarianism (Nozick, 1973) points out that a preferred (say, equal) societal distribution of resources at one point in time will lead, by the very process by which persons pursue their own welfare, to less preferred (unequal) distributions at later times.

The three ways to prevent this, i.e., preventing economic exchange, or banning economic activities which lead to inequality, or progressive taxation, can each be shown, in the limit, to reduce societal welfare. In other words, continuous interventions by the State to restore the preferred resource distribution may lead to reduction in societal welfare. The Libertarian premise is thus, that interventions by public authorities to promote equality of result cannot increase societal welfare and is thus unjustified. Nozick further asserts that distribution of resources cannot be seen in isolation from the process by which wealth is created. "Whomever makes something, having bought or contracted for all other held resources used in the process (transferring some of his holdings for these cooperating factors), is entitled to it. The situation is not one of somethings getting made, and there being an open question of who is to get it. Things come into the world already attached to people having entitlements over them."

This "historical entitlement theory" would seem, as applied to goods which come into being with pre-existing claims to them, arising for example, from initial property rights over the factors of production, or from the application of one's skill, to deny that equal rights to these goods is natural. However, this would not be the case with resources which are virginal in nature, and Nozick has difficulty in specifying which of several possible methods, for example, through labour, first occupancy, possession, declaration, or some other historical means is appropriate. Steiner (1977) has pointed out that since the process of acquisition of natural resources (which would clearly include environmental resources) creates nothing new, but involves the extraction of pre-existent resources from nature, differential entitlements to virginal resources should be proscribed by the Libertarian. Moreover, the equal right to liberty to which Nozick (apparently) subscribes should imply an initial equal distribution of natural resources. It is thus possible, even from the premises of Libertarianism, to derive the principle of equal per-capita rights to GHGs emissions.

Developing countries assert that their levels of past, current, and (foreseeable) future per-capita GHGs emissions would not aggregatively induce Climate Change. On the other hand, just continuing with the past rates of emissions of industrialized States suffice to ensure increasing concentrations of GHGs in the atmosphere. Further, because of the apparent close linkages between economic growth and GHGs emissions, developing countries cannot accept any commitment with regard to their emissions levels in the foreseeable future. In addition, equity principles, as argued above, would justify compensatory transfers to them for the historically high levels of emissions by industrialized countries, besides equal per-capita emissions entitlements in the future.

The arguments of the developing countries cannot easily be dismissed, even if one urges that in their own self-interest, because of likely adverse environmental impacts, developing countries should eschew GHGs intensive growth paths. However, a determination of the equity issues in Climate Change before the current multilateral efforts to finalize a Framework Convention for regulating Climate Change are concluded, is unlikely. Two possible operative aspects of such a Framework Convention are commitments by industrialized countries to stabilize and then reduce GHGs emissions, within a specified time-frame, and second, financial flows to developing countries to adopt strategies to reduce future growth of GHGs emissions by them. The first aspect is unexceptionable from the point of view of developing countries, as long

as similar commitments are not sought from developing countries before a determination of equity principles. Regarding the second, two considerations are important. One, that such flows must be additional to, and not competitive with, normal aid flows for growth. Second, that financial (and technology) flows, without an equity determination (when these might accrue as of right), must be considered as paternalistic, and no obligation can be cast on anyone to accept such transfers. Accordingly, it would be inappropriate to prescribe binding norms for such financial or technology transfers, and it should be open to individual developing countries to state the conditions under which they would accept such transfers.

Concluding comment:

The past two decades have witnessed a tremendous surge in public concern with the environment. Over time, attention has moved from local environmental quality issues impacting health, recreational amenities, and aesthetics, to global issues which involve the life-support systems of mankind and other living species.

The discipline of economics had, in the earlier phases of environmental awareness, an ambivalent relationship with the policy making process. One view which had some currency earlier, is that economics can contribute little to the resolution of natural resource depletion and environmental quality. This is because the origins of the problems are to be traced in the insensitivity of economic systems to these concerns. Economics was seen as guiding these systems, and the discipline was urged to undergo fundamental restructuring if environmental concerns were to be incorporated into economic policy.

While little paradigm shift occurred in economics in response to this criticism, economists did seek to develop a body of theorems, models and concepts for analysis of resource and environmental issues. Important insights were obtained regarding patterns of depletion or pollution emissions under different market and institutional arrangements. The role of identifying the incentives faced by agents, and their likely responses to these incentives, was identified as a crucial input in designing regulatory policy. Novel policy instruments were devised and to an increasing extent, employed in regulatory frameworks. Policy analysts gradually accepted that economics can indeed furnish useful insights in devising environmental policy.

One conclusion is however, inescapable from the present survey. That is, the challenges of global policy analysis for Climate Change will require a significant sharpening of existing analytical tools of economics. These challenges arise from the very long time frame, extending to the past as well as the future, besides the pervasive uncertainties, both scientific, as well as relating to economic and social impacts, involved in the Climate Change issue. While the basic approach of the discipline, i.e., a behavioral assumption that agents maximize some objective subject to their perceived constraints, remains valid, the global environmental arena calls into question many of the existing formulations of this theme. It is not easy to furnish a listing of the areas where advances of a rather fundamental nature will be required, suffice it to say that they will be over a very broad range, including both positive and normative aspects. It is also clear that the evolving discipline of environmental economics will have to establish

deeper linkages with the theory of social choice, formal ethics, and positive political theory.

REFERENCES:

Arrow, K.J. and Kurz, M: Public Investment, the Rate of Return, and Optimal Fiscal Policy, Baltimore, John Hopkins Press, 1970.

Coleman, J.S: "Equality," in: The New Palgrave Dictionary of Economics, Eatwell, J, Milgate, M, and Newman, P. (Eds), W.W. Norton & Co., 1987.

Despotakis, K.A. and Fisher, A.C: "Energy in a regional economy: A CGE model for California," Journal of Environmental Economics and Management, 15, 313-330, 1988.

Edmonds, J. and Wuebbles, D: "Greenhouse gases: sources and sinks," mimeo, 1991.

Ghosh, P: "Simulating greenhouse gases emissions due to energy use by a Computable General Equilibrium model of a national economy," School of Urban & Public Affairs, Carnegie-Mellon University, Pittsburgh, PA, 1990.

Hudson, E. and Jorgenson, D: "Energy prices and the U.S. economy, 1972-76," Natural Resources Journal, 18(4), 877-97, 1978.

Jorgenson, D. and Wilcoxen, P.J: "Environmental regulation and U.S. economic growth, " Harvard Institute of Economic Research, Harvard University, Cambridge, Mass, Discussion paper No. 1458, 1989.

Manne, A.S. and Richels, R.G: "CO2 emissions limits: An economic analysis for the USA," mimeo, 1989.

Marglin, S.A: "The social rate of discount and the optimal rate of investment," Quarterly Journal of economics 77:95-112, 1963.

Mitroff, I.I. and Mason, R.O: "On ill-structured policy issues: Further explorations in a methodology for messy problems," Strategic Management, 1, 331-42, 1980.

Nozick, R: "Distributive Justice," Philosophy and Public Affairs, 3(1), 1973.

Olson, M. and Bailey, M: "Positive time preference," Journal of Political Economy, 89(1), 1981.

Pearce, D: "Internalising long term environmental costs: Global warming and intergenerational fairness," mimeo, 1991.

Phelps, E.S. and Riley, J.G: "Rawlsian growth: Dynamic programming of capital and wealth for intergeneration 'maximin' justice," Review of Economic Studies, 45:103-20, 1978.

Pigou, A.C: "The Economics of Welfare," 4th ed. London, Macmillan, 1932.

Rawls, J.A: "A Theory of Justice," Cambridge, Mass: Harvard University Press, 1971.

Solow, R.M: "Richard T. Ely lecture: The economics of resources or the resources of economics," American Economic Review, 64:1-14, 1974.

Solow, R.M: "Inter-generational equity and exhaustible resources," Review of Economics and Statistics 29-45, 1974.

Steiner, I.H: "The natural right to the means of production," Philosophical Quarterly 37, 41-49, 1977.

Stone, C.D: "Should trees have standing? Toward legal rights for natural objects," Southern California Law Review 45(1972):490.

Tribe, L: "Ways not to think about plastic trees," in: When Values Conflict: Essays on Environmental Analysis, Discourse, and Decision, Tribe, L:, Schelling, C.S., and Voss, J. (Eds): Ballinger Publishing Company, Cambridge, Mass: 1987.

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"Uses and limits of economic analyses in climate change"

USES AND LIMITS OF ECONOMIC ANALYSIS IN CLIMATE CHANGE

* Economics as one of the tools to help decision-making
* Need to separate or clarify value-laden components

OUTLINE

1. Limits to economic analysis

2. Benefits of economic analysis

3. Possible areas for IPCC economics work

4. Practical considerations for IPCC economics work

1. LIMITS TO ECONOMIC ANALYSIS

* Problems of assigning monetary value
  - Value of life and quality of life (e.g. human impacts)
  - Value of non-market/human goods (e.g. ecosystems)
* Danger of including only the things we can measure
* Distributional issues versus efficiency
* Time preference (personal and national differences, and inconsistencies)

Hence:

Cannot address all questions
May often not get clear-cut answers
Beware of inappropriate "objectivity"

2. BENEFITS OF ECONOMIC ANALYSIS

* Way of making assumptions and valuations clear
  => Aid to understanding and narrowing differences

* Way of reflecting trade-offs between different issues and strategies
  => Important aid to thinking about problems and decisions

* Information on policy options and impact of different policies => Aid to finding effective and efficient ways of implementing political decisions

* Information concerning practical constraints
  (e.g. rates and processes of technology diffusion; patterns of resource depletion; also economic law e.g. GATT)

* Highlights important areas of lack of knowledge, and of substantive factual disagreement
  => Aid to specifying future research and assessment goals

CONCLUSIONS CONCERNING POSSIBLE ROLES OF ECONOMIC ANALYSIS

Economic analysis can:

* Lead to better understanding of the issues and tradeoffs, including the potential impacts and resources required for given degree of responses

* Provide important factual information on constraints and relevant experience

* Identify options for more efficient (less wasteful) ways (policies) of using any resources made available

* Provide various information relevant to the question of appropriate degree and/or timing of responses

* Clarify important issues of disagreement

Economic analysis cannot:

* Provide "the answer" concerning appropriate responses

* Address distributional questions such as "who should pay"

These and other decisions and judgements are issues of negotiation

3. POSSIBLE AREAS FOR IPCC ECONOMICS WORK

* Cost/benefit and decision analysis.
  (Very difficult for the reasons outlined above, and because of the scientific uncertainties. But some sensitive way of trying to think consistently about the problem of "how much should we do" is needed).

* Abatement costs and the factors which affect them
  (Complex but very important. Note wide differences of views.)

* Adaptation costs and the factors which affect them
  (Highlight important focusses for impacts research)

* Feasible rates of change and physical constraints
  e.g. feasible rates of change in energy systems and in the development and diffusion of new technologies - particular but crucial part of both the above.

* Environmental and energy policy instruments
  Experiences to date

* Economic analysis (efficiency, effectiveness and distributional impacts) of potential agreements with respect to differences in:
  - scope (sources, economic groups)
  - ways of implementing

* Practical issues
  e.g. potential points of conflict with GATT clauses.

4. PRACTICAL CONSIDERATIONS FOR IPCC ECONOMICS WORK

* Insulated from politics as far as possible
  (e.g. use of professional analysts with record of publications as far as possible, as with science; ..)

* Importance of different perspectives
  => good representation of different economic groups and perspectives

- "Rules of procedure" to ensure the above without blocking all progress.

* Evaluation not research?

* Don't expect too much too soon
  At the very least processes for economic assessments should have been tested by the time of UNCED.

* Economics work should aim to explain and inform, not to prescribe

CONCLUSIONS CONCERNING POSSIBLE ROLES OF ECONOMIC ANALYSIS

Economic analysis can:

* Lead to better understanding of the issues and tradeoffs, including the potential impacts and resources required for given degree of responses

* Provide important factual information on constraints and relevant experience

* Identify options for more efficient (less wasteful) ways (policies) of using any resources made available

* Provide various information relevant to the question of appropriate degree and/or timing of responses

* Clarify important issues of disagreement

Economic analysis cannot:

* Provide "the answer" concerning appropriate responses

* Address distributional questions such as "who should pay"

These and other decisions and judgements are issues of negotiation

L'ANALYSE ECONOMIQUE DES OUTILS POUR CERNER LES IMPLICATIONS DES STRATEGIES ANTI-EFFET DE SERRE

J.C. HOURCADE
Directeur de Recherche CNRS
Directeur du CIRED

I. Toute action concrète vis-à-vis des risques climatiques implique que l'on réponde, implicitement ou non à trois catégories de questions:

- quels objectifs fixer qui ne mettent pas en cause le développement?
- quelle répartition des coûts et des charges peut être jugée équitable dans un monde inégal?
- quels instruments économiques, quelles "règles du jeu" fixer pour que chacun trouve intérêt à participer à un effort collectif.

II. L'analyse économique ne peut prétendre donner des réponses définitives à ces trois questions car, tout en se fondant sur un maximum possible de données objectives, elle ne peut éviter de recourir à des jugements de valeur et d'indiquer des réalités institutionnelles et culturelles très diverses à l'échelle mondiale.

En revanche, laisser s'enclencher une négociation sans expertise scientifique sur la dimension économique des discussions, c'est laisser la porte ouverte à l'arbitraire.

III. Le rôle de l'analyse économique dans un processus d'étude des liens entre développement et risques climatiques est donc de:

- comprendre les implications des stratégies pour chaque type d'acteur
- de hiérarchiser les désaccords et d'éviter les fausses querelles
- de focaliser l'attention sur les enjeux véritables et faciliter la compréhension des compromis possibles.

IV. Les limites de l'approche économique classique, l'analyse coût-bénéfice, sont évidentes pour le problème qui nous concerne ici:

- grandes incertitudes

  - sur les impacts à long terme des changements climatiques (donc sur le bénéfice à retirer de toute action de prévention)

  - sur les technologies disponibles à long terme et leur coût

- présence de jugements de valeur concernant :

  - la forme du développement économique à long terme

  - l'attitude par rapport au risque

  - la solidarité avec les générations futures

Tout calcul essayant de déterminer le degré "optimal" de réduction des émissions risque donc de buter sur une grande instabilité des résultats (encore plus si on en vient à la répartition des coûts)

V. En revanche l'analyse coût-efficacité retrouve toute sa pertinence si on précise la nature de la question à poser. Cette question est la suivante:

"De quoi devons-nous et pouvons-nous décider aujoud'hui pour prendre une assurance vis-à-vis de risques majeurs mais mal connus". Il convient donc d'isoler le coeur, le noyau des actions possibles et de les hiérarchiser. C'est ici que l'analyse économique peut être d'une aide puissante.

VI. A court et moyen terme la question est celle du contenu de stratégies "sans regret", ce qui ne veut pas dire "sans coût".

Ces stratégies supposent que l'on repère dans le domaine de l'énergie, des transports, de l'habitat, de l'industrie et de l'agriculture, les actions de réduction des émissions de gaz à effet de serre susceptibles:

- d'entraîner des externalités positives

  - sur d'autres aspects de l'environnement (encombrement des villes par exemple)
  - sur le développement technologique lui-même

- d'être atteintes par simple suppression d'inefficacités actuelles dans le fonctionnement des marchés (distorsion tarifaire par exemple)

- d'être compatibles avec divers niveaux d'aversion au risque.

Bien des controverses sur les marges d'action ainsi disponibles peuvent être réduites si on distingue clairement stratégies "sans regret" et stratégies "sans coût". En effet, la mobilisation d'actions qui s'avèreront ex-post profitables suppose des efforts:

- pour inciter les agents économiques
- pour accepter des coûts de transition
- pour transformer certaines barrières institutionnelles.

Il est donc nécessaire et possible de clarifier:

- la hiérarchie des actions acceptables pour chaque pays pour atteindre divers objectifs éventuels de réduction (actions par domaine d'activités)
- la valeur des conséquences économiques et des coûts entraînés (macro-économiques? sectoriels? transitaires? etc...)
- la nature des compensations éventuelles
- le jeu d'instruments économiques (taxes, droits à polluer, fonds d'aides, etc..) efficace pour chaque type d'action et acceptable par les traditions administratives et politiques de chaque pays (fiscalité sur le carbone en déduction d'autres prélèvements obligatoires par exemple).

VII. Sur le plus long terme un travail important est nécessaire malgré la présence de grandes incertitudes :

- pour cerner les marges de manoeuvre possibles une fois exploitées, les potentialités des actions "sans regret" à court et moyen terme. L'enjeu ici est celui des signaux économiques permettant une bonne orientation du progrès technologique et de l'innovation.
- pour apprécier les effets dits "d'équilibre général", c'est-à-dire les conséquences structurelles à long terme des actions étudiées (effets de taxes sur la géographie industrielle à long terme par exemple)
- pour étudier les bifurcations irréversibles dans lesquelles pourraient nous entraîner, dans un scénario de laisser-faire, la poursuite de telle ou telle des tendances actuelles et dont il serait très coûteux, ensuite de se dégager.

APPENDIX E

LIST OF CO-CHAIRPERSONS FOR THE SUBGROUPS OF IPCC WORKING GROUP II

Chairman

Prof. Yu. A. Izrael	(USSR)

Vice-Chairmen

O. Canziani	(Argentina)
W.J. McG. Tegart	(Australia)
M. Hashimoto	(Japan)
R.S. Odingo	(Kenya)

1. Subgroup on Agriculture and Forestry

J.J. Burgos	(Argentina)
S.K. Sinha	(India)
M. Parry	(UK)
O. Sirotenko	(USSR)

2. Natural terrestrial ecosystems

R. Street	(Canada)
S. Semyonov	(USSR)
C. Magadza	(Zimbabwe)

3. Hydrology and water resources

H. Lins	(USA)
E. Stakhiv	(USA)
I. Shiklomanov	(USSR)
B. Rincon	(Venezuela)

4. Energy industry, transport, human settlements, health and air quality

S. Nishioka	(Japan)
I. Nazarov	(USSR)

5. World's oceans and coastal zones

A. Tsyban	(USSR)
J. Everett	(USA)
M. Perdomo	(Venezuela)

It may be noted that Venezuela is also a co-chair of the Coastal Zone Management Subgroup (CZMS) of Working Group III.

6. Cryosphere including the problems of mountain ecosystems and of the Arctic and the Antarctic

R. Street	(Canada)
P. Melnikov	(USSR)

7. Co-ordination Group

M. Budyko	(USSR)

8. Inventories of available national impact studies

I. Nazarov	(USSR)

9. Guidelines for impact assessments

S. Nishioka	(Japan)
M. Parry	(UK)

10. Monitoring for impact applications

Prof. Y. Izrael	(USSR)

APPENDIX F

IPCC BUDGET AND OTHER SUPPORT - STATUS REPORT OCTOBER 1991

1. Introduction

1.1 This is a report on the status of the WMO/UNEP Joint IPCC Trust Fund and IPCC Secretariat staffing as of 1 October 1991.

2. Receipts in the joint WMO/UNEP IPCC Trust Fund for 1991

2.1 Receipts in the Trust Fund thus far in 1991 are:

	Amounts in SFr	
	Received	en-route (a)
Australia	69,607	
CEC		89,635
France (b)		
Germany	112,840	
Japan		147,000 (c)
Netherlands		154,740 (c)
Norway		44,540
Switzerland	60,000	50,000
United Kingdom	100,966	
USA	650,317 (d)	
UNEP	125,000	
WMO	125,000	
TOTAL	1,243,730	485,915

TOTAL OF RECEIVED AND EN-ROUTE 1,729,645

(a) The UN exchange rate for October 1991 has been used. The bank rate is different and changes daily. Thus, the actual amounts received may differ slightly from that shown in the third column, if the remittances are through a commercial bank and in currencies other than the Swiss Franc.

(b) France intends to contribute.
(c) For 1991 and 1992.
(d) The total US contribution is allocated as follows:

*1991 contribution	SFr 381,536
*cost of the fourth session of Working Group III (Geneva, 5-8 August 1991)	SFr 106,400
*Partial 1992 contribution	SFr 162,381.

2.2 Many governments have contributed in kind to the 1991 IPCC assessment effort, by hosting meetings and/or providing services including interpretation and local travel, assisting directly with the cost of the participation of experts from developing countries and/or otherwise. These have not been separately identified as these are not direct contributions to the Trust Fund.

2.3 Through separate Memoranda of Understanding, the Governments of Norway and the United Kingdom have provided contributions of Nkr 700,000 and upto £ 100,000 respectively for a series of IPCC information exchange seminars in developing countries (see IPCC-VI/Doc. 14). These are not shown in the receipts as these are not direct contributions to the IPCC Trust Fund.

3. IPCC Secretariat staff

3.1 The WMO bears the person-year cost of the Secretary of IPCC and the cost of housing the IPCC Secretariat in addition to its cash contribution. UNEP bears the person-year cost of the Senior Programme Officer in the IPCC Secretariat in addition to its cash contribution. The person-year cost contributions by the two sponsoring organizations amount to a little over SFr 420,000 and are shown neither in the receipts nor in the expenditures.

3.2 A Scientific Officer was seconded by the Secretary-General of WMO to the IPCC Secretariat between 1 June 1990 and 18 January 1991. The person-year cost of this officer was provided by the Government of France. This cost was included in the receipts and expenditures for 1990 and as such is not listed in this document.

3.3 A professional officer was seconded through August 1991 by the Government of the United Kingdom to the IPCC Secretariat to plan and implement the IPCC seminar series. This cost was not paid via the Trust Fund and does not appear in this document.

3.4 All other staff in the IPCC Secretariat are paid for through the Trust Fund.

4. Expenditures and obligations through 2 November 1991

Preliminary summary expenditures and obligations are provided below. These will be updated in February 1992 and the audited details of the expenditures will be available by April 1992.

		Amounts in SFr
A.	Travel support to participants from developing countries	848,467
	SUBTOTAL	848,467
B.	Other meetings-related expenses:	
	1. Interpretation	138,820
	2. Translation	54,704
	3. Printing	180,753
	4. Mailing and other overhead	53,020
	5. Other Miscellaneous (temporary staff, rental of equipment etc.)	77,657
	SUBTOTAL	504,954
C.	IPCC Secretariat	
	1. Administrative Assistant, 2 clerical/typing staff	432,800*
	2. Travel (IPCC+INC+other)	30,718
	3. Equipment	1,655
	SUBTOTAL	465,173
TOTAL OF A, B AND C		1,818,594

* Through November 1992.

5. Underestimates and potential problem areas

Underestimates

5.1 It may be recalled that at the time the IPCC budget request for the 1991-1992 biennium was prepared, the principles governing IPCC work had not been adopted. Consequently, the costs of simultaneous interpretation in the 6 UN languages were not anticipated fully: interpretation in 4 UN languages (English, French, Russian and Spanish) was anticipated for the fifth session of IPCC and the Bureau sessions, and in all the 6 UN languages for the subsequent sessions of the Panel. But none was anticipated for the sessions of the Working Groups (only travel support for experts from the developing countries was requested for the Working Group sessions). The same applies to the translation costs. Thus, if the Working Groups themselves do not provide for this cost, the strain is greater on the Trust Fund.

5.2 The travel support cost (ticket and per diem) was assumed to be SFr 5000 per trip; an examination of the actual cost so far in 1991 discloses that this is an underestimate by about 10%. Bulk mailing has also increased. Three sessions of the Panel and two sessions of the Bureau were anticipated for the biennium. The Panel and the Bureau have or would have met twice each in 1991.

Potential problem areas

5.3 With receipts and expected remittances amounting to SFr 1,729,645 and a carry-over from 1990 of SFr 536,710 (see document IPCC-VI/Doc. 12), the Trust Fund has a credit of SFr 2,266,355. Expenditures, anticipated and incurred, through 2 November 1991 (through the fifth session of Working Group III, Geneva, 1-2 November 1991) amount to SFr 1,818,594. Thus the expected balance in the Trust Fund on 2 November 1991 is SFr 447,761.

5.4 The number of meetings planned between November 1991 and May 1992 is 14 (see IPCC-VI/INF. 3). The anticipated expenditures for these amount to some SFr 2,000,000 including travel support to developing countries. Taking into account the expected balance on 2 November 1991, the 1992 cash contributions of WMO and UNEP, and the arrangements being planned by the Working Groups, contributions in the amount of SFr 1,092,240 will be required by mid-November 1991. Cash flow is quite critical for timely support to developing countries whose 1991 participation has averaged about 35 countries per meeting. A little over 75% of the anticipated expenditures through May 1992

APPENDIX G

IPCC INFORMATION EXCHANGE SEMINAR SERIES
UPDATE

1. Introduction

1.1 It may be recalled that the IPCC Special Committee on the Participation of Developing Countries recommended various steps to encourage the full participation of developing countries in the work of IPCC (see Policymaker Summary of the Special Committee, 1990). One such step was the dissemination of information on climate change issues by means of information exchange seminars.

1.2 As the Panel is aware, the Norwegian Government has provided, through a Memorandum of Understanding (MOU), NKr 700,000 for such seminars. The UK Government, through another MOU, has offered up to £100,000 for the same purpose; it had also seconded an official to the IPCC Secretariat, until August 1991, to help get the project planned and implemented.

2. Seminar structure

2.1 Teams of 2 or 3 speakers who are familiar with the IPCC First Assessment Report are funded to present a 1-3 day seminar in each interested developing country. Copies of the visual aids used by speakers are left behind for use in follow-up activities. Small lump sum grants towards local costs may also be made to the host country if necessary.

2.2 The IPCC Secretariat works closely with local organisers to encourage the participation of as many ministers and their senior advisors as possible. Sessions may also be held for other interested audiences, including academics, the press and industrial and environmental organisations.

3. Status of the programme

3.1 Seminars have now been held in 11 countries. Others for later this year are being planned. The calendar for the seminars is given below. So far about 50 ministers and some 1200 senior and middle level advisers, scientists and others have been briefed. In addition, two one-day seminars have been held for delegates to the second and third sessions of the Intergovernmental Negotiating Committee.

4. Seminar costs

4.1 The average single country seminar costs about SFr 20,000. This includes travel of speakers, travel of the representative of the IPCC Secretariat in selected cases, lump sum grants to host country also in selected cases. The IPCC Secretariat representative is included both for introducing the seminar and for evaluating it.

Some Nkr 410,000 of the Norwegiancontribution has so been obligated by August 1991, as has £50,000 of the UK money. A small amount of the funds has been used to prepare a set of slides for use at the seminars: these are available in English, French and Spanish.

5. Seminar calendar

5.1 Seminars completed

17 December 1990	Mauritius
16-18 January 1991	Venezuela
18-19 March 1991	Argentina
11 April 1991	Trinidad
6-7 May 1991	Nicaragua
14-15 June 1991	INC/Second session
14-17 June 1991	China
31 July - 2 August 1991	Peru
4-6 September 1991	Botswana
5-6 September 1991	Uganda
8 September 1991	INC/Third session
9-11 September 1991	Zimbabwe
8-9 October 1991	Central African Republic

5.2 Seminars in planning

November	1991	Philippines
November	1991	Lesotho
TBD	1991	Gambia
TBD	1991	Mozambique

LIST OF CLIMATE CHANGE RELATED AND OTHER ENVIRONMENTAL MEETINGS

1991

January 16-18	Caracas	IPCC Information Exchange Seminar (Venezuela/Norway/UK/IPCC)
February 4-14	Washington D.C.	Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (INC) - first session
February 15	Washington D.C.	IPCC Bureau - third session
March 12	Geneva	Public Information and Promotion Task Force of the International Conference on Water and Environment
March 13-15	Geneva	IPCC - fifth session
March 13-15	Geneva	Ozone Research Managers' Meeting (Montreal Protocol)
March 18-19	Buenos Aires	IPCC Information Exchange Seminar (Argentina/Norway/UK/IPCC)
March 18-19	Geneva	Bureau of the Vienna Convention
March 18 to April 5	Geneva	Preparatory Committee of UNCED - second session
April 11	Trinidad	IPCC Information Exchange Seminar (Trinidad/Norway/UK/IPCC)
May 1-25	Geneva	Eleventh WMO Congress
May 6-7	Nicaragua	IPCC Information Exchange Seminar (Nicaragua/Norway/UK/IPCC)
May 7-10	Bangkok	Regional Commission on Food Security for Asia and the Pacific - 5th session (FAO)
May 13-15	Nairobi	African Ministerial Conference on the Environment - 4th session (UNEP)
May 20-31	Nairobi	UNEP Governing Council - 16th session
May 22-23	Paris	DAC Working Party on Development Assistance and Environment (OECD)
May 27-29	Geneva	WMO Executive Council - 43rd session

June 3-7	Oslo	FAO Reg. Forestry Commission for Europe (FAO)
June 3-28	New York	UNDP Governing Council - 38th session
June 8 (or 18 ?)	Nairobi	Bureau of the Montreal Protocol - 3rd meeting (UNEP)
June 10-21	Rome	FAO Council - 99th session
June 14	Nairobi	Bureau of the Vienna Convention - 2nd meeting (UNEP)
June 14-15	Geneva	IPCC Information Exchange Seminar (before second session INC)
June 14-15 & 17	Beijing	IPCC Information Exchange Seminar (China/Norway/UK/IPCC)
June 16-19	Oslo	Center for International Climate and Energy Research, University of Oslo - Workshop on research findings on effective abatement strategies
June 17-18	Nairobi	Conference of the Parties to the Vienna Ozone Convention - 2nd meeting (UNEP)
June 19-21 (or 20-22 ?)	Nairobi	Parties to the Montreal Protocol - 3rd meeting (UNEP)
June 19-28	Geneva	INC - second session
June 24 to July 3	Madrid	Ad hoc Working Group of Legal and Technical Experts on Biological Diversity
July 3-26	Geneva	Economic and Social Council (ECOSOC)
July 8-11	UK	IPCC Working Group I - Task force on GHGs
July 31 - 2 August	Lima, Peru	IPCC Information Exchange Seminar (Peru/Norway/UK/IPCC)
Summer 1991	Geneva	United Nations Conference on Trade and Development - 8th session (UNCTAD)
August 5-8 (a.m. only on 8)	Geneva	IPCC Working Group III - fourth session
August 5-7	Geneva	IPCC Working Group III - Energy and Industry Subgroup
August 8-10 (p.m. only on 8 & a.m. only on 10)	Geneva	IPCC Bureau - fourth session

August 12-13	Geneva	IPCC Working Group II - fourth session
August 12 to September 4	Geneva	Preparatory Committee of UNCED - third session
September 5-6	Kampala, Uganda	IPCC Information Exchange Seminar (Uganda/Norway/UK/IPCC)
September 5-6 (or 13-14)	Gabarone, Botswana	IPCC Information Exchange Seminar (Botswana/Norway/UK/IPCC)
September 8	Nairobi	IPCC Information Exchange Seminar for interested participants of the INC
September 8-20	Il Ciocco, Italy	NATO Advanced Study Institute - "The Global Carbon Cycle"
September 9-11	Harare, Zimbabwe	IPCC Information Exchange Seminar (Zimbabwe/Norway/UK/IPCC)
September 12	London	Technology Transfer and the Global Environment (WRI and RIIA)
September 17-26	Paris	Tenth World Forestry Congress (FAO)
September 24-25	Rome	Steering Committee of the International Conference on Water and Environment (Dublin, 26-31 January 1992)
September 9-20	Nairobi	INC - third session
October 5-13	Portland, Oregan, USA	NATO Advanced Research Workshop - "The Atmospheric Methane Cycle: Sources, Sinks, Distributions and Role in Global Change"
October 7	Paris	Ad Hoc Group on Environment and Development Assistance (OECD)
October 8-9	Paris	Working Party on Development Assistance and Environment (OECD)
October 8-9	Bangui, Centr. Afr. Rep.	IPCC Information Exchange Seminar (Centr. Afr. Rep./Norway/UK/IPCC)
October 16-18	Les Diablerets * Switzerland	IPCC Working Group I - "Greenhouse Gases" - drafting session of lead authors

* In conjunction with Montreal Protocol Scientific Ozone Assessment.

October 21-25	Milano, Italy	ESETT '91 - Int. Symposium on Environmentally Sound Energy Technologies and their Transfer to Developing Countries and European Economies in Transition
October 28	Geneva	Expert Group on Guidelines for Impact Assessments - IPCC Working Group II
October 28	Bilthoven The Netherlands	Expert Group on Inventories of available National Impact Studies - IPCC Working Group II
October 29-31	Geneva	IPCC - sixth session
November 1-2	Geneva	IPCC Working Group III - fifth session
November 6-8	Kyoto, Japan	IEA/RITE Seminar: Technology Responses to Global Environmental Challenges
November 11-13	Seoul, Korea	IPCC Working Group III - EIS Workshop
November 18-19	Sydney	IEA/Australia Clean Coal Use Technology Seminar
November 18-22	Manila Philippines	IPCC Information Exchange Seminar (Philippines/Norway/UK/IPCC)
November 19-22	TBD	Executive Body for the Convention on Long-range Transboundary Air Pollution (ECE)
November 20-22	Bristol, UK	IPCC Working Group I "Climate modelling" - drafting session of lead authors (UK/IPCC)
November 25-26	Melbourne, Australia	IPCC Working Group I "Climate observations" - drafting session of lead authors (Australia/UK/IPCC)
December 5-6	Geneva	IPCC Working Group I - Workshop to review methodology for national emissions inventories (UK/IPCC)
December 9-10	Geneva	IPCC WG II - Lead authors' meeting (USSR/IPCC)
December 9-11	Noordwijk, The Netherlands	IEA/NOVEM Seminar
December 9-13	Rome or Abidjan	FAO Committee on Forest Development in the Tropics (FAO)

December 9-20	Geneva	INC - fourth session
December 11-12	Geneva	IPCC Working Group II - Editorial board (USSR/IPCC)
December 14-15	St. Petersburg USSR	IPCC Working Group II - Co-ordination Group (USSR/IPCC) (postponed)

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January 5-10	Irvine, California USA	Atmospheric Methane: First Annual Conference
January 6-7	St. Petersburg USSR	IPCC Working Group II - Coordination Group (USSR/IPCC)
January 6-8	St. Petersburg USSR	IPCC Working Group II - Editorial Board (USSR/IPCC)
January 13-15	Guangzhou, China	IPCC Working Group I - third session (China/UK/IPCC)
January 20-23	Canberra Australia	IPCC Working Group III - AFOS. Assessing Technologies and Management Systems for Agriculture and Forestry in relation to Global Climate Change (Australia/USA/IPCC)
January 26-31	Dublin	International Conference on Water and Environment
February 3-5	Nairobi	UNEP Governing Council - third special session
February 5-7	Geneva	IPCC Working Group III - sixth session (USA/IPCC)
February 6-7	Geneva	IPCC Working Group II - fifth session (USSR/IPCC)
February 8	Geneva	Task Force on IPCC Structure
February 10-12	Geneva	IPCC - seventh session
February 18-28	New York	INC - fifth session
March 9-13	Margarita Island, Venezuela	International Workshop on the Rising Challenge of the Sea (Venezuela/The Netherlands/USA/IPCC WG III-CZMS)
March 9 to April 3	New York	Preparatory Committee of UNCED - fourth session
April 6-10	Noumea, New Caledonia	Prep. Meeting CZMS on Sea Level Rise Vulnerability Methodology (SPREP/IPCC WG III - CZMS)
April TBD	TBD	INC - sixth session

May 11-15	Joensuu Finland	IPCC Working Group III - AFOS, Carbon Balance of Global Forest Ecosystems (Finland/IPCC)
June 1-12	Rio de Janeiro	United Nations Conference on Environment and Development (UNCED)
June 22 to July 4	Geneva	WMO Executive Council - 44th session
August 27-28	Geneva	Task Force on IPCC Structure - second session
September 20-25	Madrid	15th Congress of the World Energy Council (WEC)
September 28-30	Laxenburg TBD	IIASA/EIS Workshop on Economic Related Issues
October 1-2	TBD	IIASA/EIS Workshop on Technology Related Issues
Early October	Santa Fe, USA	Meeting on Country Study Methodologies (joint USA/IPCC)
October 26-29	Woods Hole, Mass., USA	Workshop on Biospheric Feedbacks in the Global Climate System (Woods Hole Research Center/IPCC WG I)
November 9-10	Harare, Zimbabwe	Task Force on IPCC Structure - third session
November 11-13	Harare, Zimbabwe	IPCC - eighth session
TBD	TBD	IPCC Working Group III - seventh session

(WANG: LSIMIGS)