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CARBON DIOXIDE TARGETS

*Climate
Cap - Country
Targets*

EEC

West Germany : 25% cut by 2005

Netherlands: stabilize by 1994 and 5-8% cut by 2000 , then substantial cuts thereafter

Denmark: 20% by 2000 and up to 50% by 2030

Italy: stabilisation by 2000 and possible 20% cut by 2005.

France Belgium and Luxembourg: support a Community proposal to stabilise emissions at 1988 levels by 2000

U.K. stabilise at current levels by 2005.

EFTA

Austria: 20% by 2005

~~Switzerland~~, Norway and Sweden freeze at current levels

OTHER COUNTRIES

New Zealand: 20% by 2005

Canada: stabilise at current levels by 2000

Japan : stabilise at "lowest possible levels" by 2000. (predicted to be 10% above current levels)

PROGRESS REPORT ON CONTROLLING GREENHOUSE GAS EMISSIONS
Summing-up of the Co-chair (Japan)

21 September 1990

The Energy and Industry Subgroup (EIS) of the Response Strategy Working Group (RSWG) of the Intergovernmental Panel on Climate Change (IPCC) met to review and to discuss the various issues related to the analysis of greenhouse gas emission targets as remanded to the IPCC by the Noordwijk Declaration in November 1989 and tasked to the EIS at the Third IPCC Plenary Meeting in February 1990.

COUNTRY/REGIONAL STUDIES

By the completion of the EIS report to the RSWG report in June, case studies for 21 countries had been examined. However, they varied in nature (e.g. business-as-usual scenarios, policy case scenarios or policy/program declarations), in scope (e.g. single vs. more than one greenhouse gas) and in supporting information, particularly on cost.

The Subgroup meeting on September 19-21 noted some new studies. New country studies such as Denmark and Italy were presented. Updated or new information was available, for example, from Brazil. The EIS recognized that new policy studies were made or were in progress in several countries, e.g. Australia, Germany, Japan, Norway, UK, and US.

However, there are many questions and comments raised to be answered and included in these studies.

RELEVANT ISSUES

The Subgroup reviewed the report from the technical workshop in London, sponsored by the UK government as well as its preparatory meeting held in Paris jointly supported by the UK and the International Energy Agency.

Together with the information available from additional country studies, the EIS identified an illustrative list of specific issues which all countries will need to consider in determining economically feasible targets on greenhouse gases, if such targets were to be decided. The list is attached as Attachment 1. The need for further elaboration of this list was recognized.

COSTS/BENEFITS

The assessment of costs/benefits of response options as well as the impacts of the possible climate change is one of the key factors in taking any response action to control greenhouse gas emissions.

The first EIS analysis recognized the difference between technical potential, economical potential and market potential of response options. Generally, market potential is smaller than economic potential, which in turn is lower than technical potential. A presentation illustrated that market and economic potentials could be enhanced by the removal of market distortions, such as unnecessary regulations and subsidies, and by the proper internalization of externalities.

A presentation on some technical feasibility and cost issues was made: The total cost of any particular response is equal to the value of new goods and services foregone by implementing policy measures to reduce GHG emissions. Existing studies of the feasibility of GHG emissions reductions have been found to measure different aspects of the costs of response strategies. Some studies have measured the technological cost by comparing the emissions and cost

profiles of alternative technologies. Others use energy-economic models to assess costs of policy implementing measures. With this methodology, measures of various stringency are used to estimate marginal cost of carbon avoided curves. Another methodology utilizes macro-economic models in an effort to estimate costs.

It was pointed out that in assessing feasibility of costs, equity concerns, in other words, who pays the costs, will also be important. The distribution of costs will differ among nations, within nations and among income classes. It was recognized that because of the interdependence of the international economy, actions by some countries would affect all countries. At the same time, it was suggested that the distribution of the world's coal reserves could indicate that those countries and regions with the largest reserves must be part of any agreement if it is to be effective.

Some country studies assessed other environmental benefits, such as SO_x and NO_x emissions reductions and reduced road damage, as well as non-monetary benefits, e.g. fewer traffic accidents. Case studies on domestic effects for some individual industrialized countries indicated that CO₂ emissions could be reduced without significant economic costs.

The use of global multi-sectoral, multi-regional models could facilitate the assessment of impacts of stabilization or reduction of greenhouse gas emissions, e.g. CO₂, on the world economy, i.e. the global cost of response actions. One international organization representative presented its ongoing project to conduct such an analysis whose first-stage results are expected by spring 1991. A preliminary result of a similar analysis was introduced by a national representative. Despite its preliminary nature, the model suggests a significant downturn of the world economy, including the developing countries, arising from CO₂ emission stabilization and reduction in the developed market economies.

Further elaboration and improvement of analyses in both case studies and global model approaches are expected and needed. Different studies may give varying results.

A presentation illustrates the approach taken to assess the French energy conservation potential by analysing flows and stocks of equipment and their static and dynamic (i.e. incorporating R&D) nature of potentials and their sensitivity to introduction of a carbon charge (1000 or 2000 French francs per ton of carbon) and other accompanying policy measures. It illustrates the range of conservation potential to be materialized by different mixes of policy measures (including a carbon charge) by the year 2005. It does not address the issue of macro-economic impact of those measures.

FUTURE WORK

In reviewing the subgroup work so far made and in progress, and anticipating the continuation of the IPCC process and the newly arising analytical issues related to the negotiation process of a framework convention, the EIS discussed its future activities. In order to facilitate the future IPCC deliberation on future work, the subgroup identified a series of areas of ongoing and proposed studies to support its activities. The list is attached as attachment 2.

CHECK LIST

Specific issues which all countries will need to consider in determining any economically feasible targets concerning greenhouse gases.

TECHNICAL ASPECTS

1. Does the target apply to
 - all greenhouse gases (including CO₂, CH₄, N₂O, CFCs, halons, etc.)?
 - selective targeting of some gases only?
2. If more than one gas is in the target
 - how are they to be converted to a common base (e.g. an index of global warming potential)?
 - over what integration period is the conversion to take place?
3. Is the target to be of net of sinks (e.g. reforestation)
 - which sinks (forests, oceans, coral reefs)?
 - how are sinks to be incorporated into the target?
 - how are sinks to be assessed?
4. How is the target to be specified?
 - emissions v concentrations
 - reduction v stabilization
 - percentage v absolute measure
5. What will be the base year?
 - does it reflect a normal year in terms of emission levels?
6. What will be the target year (e.g. 2000, 2010, 2030)?
7. What are the definitions of the terms stabilization and reduction?
8. How will a multinational target be disaggregated and account for different national circumstances?

ACCOUNTING ASPECTS

1. Are emission inventories for all sectors adequate to allow a target to be set/measured?
2. How are the following issues to be addressed
 - fuel bunkers?
 - embodied energy (e.g. in exports of aluminum, cement, steel and petrochemicals)?
 - energy trade (e.g. electricity produced in one country and used in another)?
 - non-energy use of oil products
3. How do you measure the full fuel cycle effects of actions?
4. How is achievement of targets to be measured/verified?

ECONOMIC IMPACT ASPECTS

1. How do we distinguish what is technically and economically feasible?
2. How are benefits to be defined, e.g. resource, welfare, environmental and/or macro benefits both domestically and internationally, and intertemporally?
3. How are costs to be defined, e.g. resource, welfare, environmental and/or macro costs both domestically and internationally, and intertemporally?
4. How are costs/benefits to be reported
 - i.e. in total benefits?
 - in marginal terms?
 - in average terms?
5. What is the time frame for assessing costs and benefits?
6. What is the discount rate for assessing costs and benefits?
7. How do you combine micro/bottom-up studies of costs and benefits of reducing emissions from particular industries/sectors, with macro/top-down assessments of the overall economic implications of the diverse policy measures?
8. What are the ramifications for international and domestic energy markets (availability of supplies, security of supplies, price)?
9. What are the barriers to the adoption of economically viable policy measures (e.g. market imperfections, hidden costs)? How, and to what extent, could these barriers be overcome in a cost effective manner?
10. What are the cost levels under different time schedules for implementing policy measures?

ONGOING/PROPOSED STUDIES TO SUPPORT FUTURE EIS ACTIVITIES

1. Technical Analyses

- (1) Improvement of GHG emissions inventories covering energy and industry sectors (OECD, IEA, US, Netherlands)
- (2) Full fuel cycle analysis (IEA)
- (3) Emissions accounting (suggested)
 - bunkers
 - embodied energy and trade
 - energy trade (e.g. electricity)
 - fossil fuel utilization for non-energy uses

2. Economic Analyses

- (1) Identification and assessment of technical, economic and market potential of policy options in different timeframes. (IEA/OECD)
- (2) Survey/review of models (OECD)
- (3) Assessment of the macroeconomic and international implications of the implementation of options (OECD, IEA, Japan, US)
- (4) Comparison and evaluation of case studies, and stated targets, if any (EIS, USEPA)
- (5) Implications of policy options for energy markets (IEA)
- (6) Implications of policy options for the transportation sector (IEA)
- (7) Impact of application of target criteria to some countries (U.K.)
- (8) Assessment of technical potential and costs of non-agricultural CH₄ control options (USEPA, Japan)
- (9) Evaluation of economic implications of comprehensive greenhouse gas targets (US)

3. Policy Instruments Analyses (suggested)

- (1) Identification and assessment of policy instruments (efficiency, economic effectiveness, etc.)
- (2) Survey of country experiences concerning policy instruments (including targets)

4. Support for LDC/Eastern European Analyses

Workshop on energy-related emissions, reduction option and costs (US, with Netherlands and Japanese participation; to be held at Lawrence Berkeley Laboratory, Oct. 1990)

(Proposed workplan for further activities to be developed at Workshop.)

note: 1. Countries/organizations in parentheses indicate parties which are undertaking or have expressed their intent to do so. (Suggested) indicates items where such parties have not been identified.

2. Many of the ongoing studies are being undertaken to meet objectives which are broader than the work of the EIS. This is particularly true of the OECD, which includes non-energy sectors, and the IEA, which addresses multiple energy policy objectives. The inclusion of studies in this list indicates the intention of the EIS to incorporate results as available but does not obligate parties to alter contents or schedules for the EIS.

3. Economic and policy analyses will incorporate available information on technical and economic potential for reducing all greenhouse gases to the maximum extent possible.

OPENING STATEMENT OF PROFESSOR G. O. P. OBASI
SECRETARY-GENERAL OF THE WORLD METEOROLOGICAL ORGANIZATION

PREPARATORY MEETING FOR NEGOTIATIONS ON A
FRAMEWORK CONVENTION ON CLIMATE CHANGE
Geneva, 24 September 1990

Executive Director of UNEP, Dr. Tolba,
Distinguished delegates and dear colleagues,
Ladies and Gentlemen,

It is my great pleasure to welcome you to Geneva, and to the Opening session of the Preparatory Meeting for Negotiations on a Framework Convention on Climate Change. We that are present here this morning, on this significant occasion should regard ourselves fortunate. Fortunate, because we have a unique opportunity to provide the initial shape and form to an international enterprise of great importance; that is, the negotiation between nations of a global framework convention on climate change. Such an agreement could give man some degree of control of the broad direction of changes in climate and so have profound effects on the economies of all countries and on the quality and richness of life on our planet Earth for many generations to come.

It is good to see here my respected friend and colleague, Dr. Tolba, armed with authority from the Governing Council of UNEP, very like that which I have from the Executive Council of WMO. It is also good to see Mr. Strong, here to follow the work closely on behalf of the Preparatory Committee for the UN Conference on Environment and Development, Brazil, 1-12 June 1992.

I am sure that it has not escaped his notice that, in General Assembly Resolution 44/228, governments recognized the need to adopt the Convention, if possible, at that meeting. Many here will also know that that interest was sustained in last month's Preparatory Committee meeting in Nairobi, when representatives of those governments that were present charged Mr. Strong with recommending how they might contribute to the negotiating process.

We have all been provided with a sound and thorough technical basis for our discussions and negotiations in the recent report of the Intergovernmental Panel on Climate Change. This report tells us that if we continue with "business as usual", we are probably committing the world to rates of global warming and sea-level rise unprecedented since man first tilled the soil. (Professor Bolin, Chairman of the Panel is here and it is good to welcome him as well).

I know that some countries think that more certainty is needed before potentially very expensive action is taken on a global scale to prevent or alleviate the effects of climate change. But all agree that we should go ahead with response strategies that are also fully justified for other reasons. All are agreed that the IPCC should continue its work in reducing the uncertainties in the science and in its assessment of the effectiveness of response options. There is also agreement that some estimate should be made of the costs and other economic uncertainties associated with the responses on a global scale, even if it is only to assess the range of uncertainty in them and the degree of urgency.

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IPCC

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Done by
IPCC

I will not address the major, and even geopolitical, consequences of this, which the report foresees, which are the reason behind our being gathered here and with which you are now familiar. Let me stress, WMO's role is, and so far as I can see will continue to be, that of the independent authoritative scientific voice. I see the need to reduce scientific uncertainty and this must result in accelerated efforts in global monitoring and research. It is particularly constructive that many of you here have taken part in the IPCC process: I may say WMO takes some pride in its role in the process. WMO will continue to offer its full support to co-ordinating any international strategy for action through the World Climate Programme, its Global Atmosphere Watch, its World Weather Watch and other related international programmes.

There is also a major task in harmonizing relevant scientific information within the UN system, using the World Weather Watch, UNEP's GRID and so on. As a scientist, I make no comment on the political issues of the needs, or ways and means, to control emissions of greenhouse gases or mechanisms which many call for to enable all states play their role. Many call for equity and most would not disagree: the problems arise in agreeing on what is equitable between states with very different endowments of economic power, mineral resources, living resources, culture, past history, present standards of life and aspirations for the future. At the very least, resolving what is truly equitable will call for a great deal of economic and social data, many of which already exist, to be viewed in this particular light and interpreted with wisdom rather than short-term self interest.

But advances in science are just a part, though a crucially essential part, of the many substantive matters that arise out of the IPCC report and which are for the negotiations to come. We are here to discuss and agree on the manner in which the negotiations should proceed. Dr. Tolba and I have provided to you, as attachments to our letter of 24 August, the relevant Resolutions and Decisions of the WMO Executive Council and UNEP's Governing Council requiring Dr. Tolba and me to convene this meeting of an "open-ended" intergovernmental working group to prepare for the first negotiating session in the US in February next year.

We have also provided some initial ideas, in Annex 8, concerning the present meeting. We hope that you will find the proposals in that Annex as a useful starting point for your discussions. Like the provisional agenda in Annex 7 of the letter they are very preliminary thoughts. There is a new REV.1 of Annex 7. Those proposals concerning organizational matters, such as needs for Working Groups or sub-groups, fall within the mandate to prepare for negotiations, but which "elements" a convention, and any related legal instruments, should contain, and which questions should be addressed, are clearly matters for the negotiators themselves. At the same time, it will not be possible for you to prepare for negotiations without at least agreeing on what the issues are behind them.

Whilst you, no doubt, have many ideas of your own, and certainly those negotiating next February and afterwards will have, it seems useful for Dr. Tolba and myself to include those which occurred to us, so as to show some of the scope which the process might need to cover. No doubt you will also study those identified in the IPCC report and elsewhere which may not have been included in the Annex.

Of course, between now and next February, the Second World Climate Conference will address the subject in a limited manner. Then the 45th Session of the UN General Assembly will provide its guidance in accordance with its Resolution 44/207.

If you finally agree to the establishment of the Bureau members as envisaged under item 4 of the provisional agenda REV.1, you may wish to consider that your Rapporteur should head a drafting group of representatives to prepare the report of this session, with the intention that the report be an input to the first negotiating session, recommending the arrangements and procedures which that session might adopt both for itself and for subsequent negotiating sessions. We expect to be able to arrange for you to adopt the report in six United Nations languages at the end of your session on Wednesday.

However, I am sure we all agree that as we move into more formal nation-to-nation negotiations, that UN rules of procedure should be closely adhered to. This is especially true of the languages of work and documentation.

For the ongoing negotiations, you may wish to consider the type of secretariat you will need for the meetings and inter-sessional work ahead. My own view is that there should be continuing input from the IPCC, and close liaison with its Secretariat. It is also imperative, to ensure that any arrangement be effective, but inexpensive, even frugal. There is much urgency to the negotiations if an effective Convention is to be achieved by the time of the June 1992 UN Conference on Environment and Development in Brazil. We do not have time, nor on my part do I see the need, to develop a very large secretariat structure. We can build on what already exists. We would welcome your views on the role that you will expect a Secretariat to play and any suggestions you may have about the type that will be required for the negotiations.

Handwritten signature

However, as an interim arrangement Dr. Tolba and I have each seconded one officer and provided appropriate support for this preparatory meeting here in Geneva.

Dear colleagues, If we are to achieve together the challenging goal of forging a truly effective Convention in time for the 1992 Conference, a great deal of difficult work must be accomplished. But hard work alone will not be enough. This effort must be characterized by large amounts of wisdom and of courage. Wisdom to listen, to understand and to take into account the views of delegates from other nations, and courage to modify and change positions to achieve the creative compromises or new solutions that will be required.

Finally, let me assure you of my availability at any time to assist in any way you may wish in the enormous task ahead of you. The WMO Secretariat staff will also be put at your disposal to ensure a successful meeting.

I wish you success in your deliberations and may your discussions over the next few days be marked by wisdom and courage.

Thank you.

Now, I will call on Dr. Tolba, the Executive Director of UNEP, to present his Opening Remarks.

The Chief Law

The Public Good

STATEMENT BY

DR. MOSTAFA K. TOLBA

EXECUTIVE DIRECTOR

UNITED NATIONS ENVIRONMENT PROGRAMME

TO AD HOC GROUP OF LEGAL AND TECHNICAL EXPERTS

PREPARING FOR NEGOTIATIONS OF A FRAMEWORK CONVENTION ON

CLIMATE CHANGE

Geneva, 24 September 1990

Professor Obasi, Distinguished Delegates, Ladies and Gentlemen.

It is an honour and a pleasure to join with my dear friend and colleague Professor Obasi in welcoming you to this crucial meeting, preparing the ground for the start of negotiations of an international accord to deal with one of the most serious threats, if not the most serious one, facing humanity - the threat of climate change and global warming.

To deal with it, governments everywhere, in developed and developing countries, will have to agree binding international legal instruments specifying clear commitments, defined responsibilities, targets and schedules and workable and equitable institutional mechanisms.

There are signals - evident at the June session of the World Meteorological Organization (WMO) Executive Council and at the last month's Special Session of UNEP's Governing Council and the Preparatory Committee meeting of the United Nations Conference on Environment and Development (UNCED) - that the world community accepts the fact climate change is a global issue. We need to agree to well-considered, credible and concrete solutions at the international, regional and national levels. This is the time neither for rhetoric nor generalities. We must find a common ground to deal with many divisive issues, and we must do so in some one-and-a-half years, if we are - as we must - to reach Rio de Janeiro with some meaningful document in hand.

As Professor Obasi said, we begin our work on a strong foundation. The First Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) showed past and present industrial, agricultural, forestry and other practices have clearly influenced what was assumed to be a stable climate regime. This report is perhaps the most authoritative statement ever achieved on such a complex scientific issue. The decisions of the Executive Council of WMO and the Governing Council of UNEP that the IPCC will continue its work, assures that the Panel will be the scientific and technical storehouse feeding into these negotiations.

As the IPCC has carved the scientific clarity necessary for a global response, the next month's Second World Climate Conference will, I am confident, galvanize the political will. But, your challenge here is still one of the most difficult scientific, diplomatic, commercial and environmental ever faced.

We cannot defer difficult decisions to future meetings. Both the Secretary-General of the WMO, and I, as Executive Director of UNEP, have been requested by our governing bodies to prepare for negotiations now. So, we are all here to set an agenda for the difficult task ahead. Specifically, we are here to consider how to proceed in the forthcoming negotiations. We need to decide on a realistic timetable for meetings. In so doing, we must take account of the difficulties many developing countries face, and which the Governing Council of UNEP asked to avoid, the proliferation of avenues of meetings and the coincidence of their dates.

Professor Obasi and myself recommend that negotiations should be conducted in the main ad hoc working group of legal and technical experts, under which sub-working groups would be established.

Those could deal with the following issues: greenhouse gas emissions, energy efficiency, deforestation, research, monitoring and assessment and the special situation of developing countries. This meeting is expected to advise

*2nd World
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UNEP/WMO.*

elements

the first negotiating session on the points that need to be addressed by them under these issues. The note by the Secretary-General of WMO and myself, which is before you, sets out a number of these points for your consideration. We believe that you would have to advise the negotiating groups to address the topics of, for example, which gases ought to be included in atmospheric concentrations stabilization and emission reductions, target dates, base year, criteria for calculating emission levels - per capita, per unit of GNP or GDP, according to area of the country, its climatic conditions, the size of natural carbon sinks, energy consumption per production unit or a mixture of all these or other criteria.

The basic question of what exactly is the goal that we want to achieve through reductions of greenhouse gases must probably figure at the top of considerations by this working group.

The negotiating group should also address the energy efficiency issues, as well as fuel mixing, increased investment in energy renewables such as solar, wind and hydrogen power.

They should address elements related to possible reduction target in the rate of global deforestation and a major afforestation campaign, defining as clearly as possible an overall target area, by a target date, with a consideration of criteria for allotting responsibilities to achieve the target.

Here you could advise them to take into account last month's meeting in Montreal of the International Union of Forestry Research Organizations, in which foresters focused on specific mechanisms to assist developing countries protect disappearing forests. You could advocate the essential need to strike a balance between the sovereign right of nations to exploit their natural resources, and needed action to deal with global environmental problems. And in this respect, let me recall last November's Noordwijk Ministerial Declaration, which called for a slowing in global deforestation, the creation of vigorous forestry programmes and afforestation plans for both temperate and tropical zones. It called for a 12 million hectare net increase in forests by the year 2000.

And here also, you may wish to draw to the attention of the negotiating group parallel international actions: specifically negotiations which begin in November towards a Global Convention on Biodiversity, the plans of the Food and Agricultural Organization (FAO) to develop a global convention on the conservation and management of forests; the Tropical Forestry Action Plan, the International Timber Trade Agreement and the views expressed and decisions taken in Nairobi last month on this subject of forestry by the Preparatory Committee for the 1992 Conference on Environment and Development.

Under the special situation of developing countries you may wish to bring to the attention of the negotiating group the growing recognition by industrialized countries that they are primarily responsible for greenhouse gas emissions, and that they should accordingly take the lead role in stabilization and reduction measures. There is also recognition, exemplified three months ago during negotiations to amend the Ozone Layer Montreal Protocol and strongly reinforced last week in Montreal, that a global partnership is the sole means to tackle global environmental problems. In these global environmental problems we are all affected and we have no option but to work together. There is no charity, no handouts. There is co-operation.

① Greenhouse gases

② Energy efficiency
alts.
renewables

③ Afforestation

Noordwijk
resolution re
afforestation

? = what

④ Help to
Developing
countries
financial
- grace pd.
- soft & hard
tech transfer

So, under the item of special situation of developing countries you may wish to recommend to the negotiating group to the issues of a "grace period" of emission ceilings, similar in principle to the Montreal Protocol: the core issues of technology transfer, additional financial resources, and the establishment of a multilateral fund, either by way of considerable expansion of the proposed Global Environmental Facility, or a separate fund specifically designed for the Global Climate Convention. In the area of transfer of technologies, this should include "soft" technologies like training, education and management strategies geared to local needs in addition to the actual transfer of the environmentally benign technologies.

As to research, monitoring and assessment, Professor Obasi has dwelt in detail on this subject, and I need not add anything to his views in this respect, which I fully share.

Research, monitoring and assessment is probably the only straightforward area which is not likely to create many difficulties during the negotiations. The other issues - greenhouse gases; energy efficiency; forests and the special needs of developing countries - are each pregnant with controversy. Progress in them would most probably not become obvious before a year or so of negotiations. You may thus wish to recommend to the negotiation group that they decide only towards the end of the next year or early in 1992 whether there has been progress enough to allow the development of Protocols.

Distinguished Delegates,

Of all the issues I have mentioned, three will dwarf our negotiations. They are financial requirements, technology transfer and economic reforms. At last month's Special Session of UNEP's Governing Council, and at the Preparatory Committee of the UN Conference on Environment and Development, governments expressed support for the financial mechanisms and technology transfer agreement contained in the amended Montreal Protocol. It could act as one guide to future negotiations. With regards to economic reforms, consideration will have to be given to issues like CO₂ tax, pollution charges and a global permit trading scheme, whereby emitters who can achieve specific targets have the option of trading excess emissions to countries unable to meet immediate targets.

In essence, we are talking about creating global markets to reduce global warming. Tradeable permits, together with consideration of other mechanisms such as carbon taxes and user's fees, should never be considered as licences to pollute, but flexible instruments that need elaboration, and warrant consideration.

These basic issues, especially the issue of cost of implementing the Convention, require further detailed consideration by the IPCC and the immediate preparation of a number of country specific studies in both developed and developing countries. Your working group may wish to recommend such a course of action.

Ladies and Gentlemen,

Your meeting today is not only an organizational meeting. You are convened by the two governing bodies to prepare for the negotiations. That goes beyond organization. The report of this meeting will be the main document for the negotiating session in Washington D.C.

Financial plans
- CO₂ tax
- pollution charges
- global permit trading scheme.

IPCC - analyze cost.

I certainly do not underestimate that this meeting is a short one. Time constraints may not allow you to go into details. I hope it will allow consideration of the essential elements. I do not either underestimate the difficulties the negotiations will entail. Nor will I rehearse with you the ecological, economic and ethical necessity of negotiating a Convention with clout. Already, 2000 environmental agreements and conventions exist. There is no need to create a document merely destined to diplomatic archives.

Nor is there a need to await an ecological disaster to begin action. Today, we must pull together, tap into our collective wisdom, and be committed to collective action. The great author Cicero said "The good of the people is the chief law". Two thousand years later, that advice endures. Whether our planet endures through the third millenium depends in no small measure on our willingness to work together to build international laws that help save our planet. Let us rise to that challenge, as we begin our work.

Thank you.

AD HOC WORKING GROUP OF GOVERNMENT
REPRESENTATIVES TO PREPARE FOR
NEGOTIATIONS ON A FRAMEWORK
CONVENTION ON CLIMATE CHANGE

UNEP/WMO
Prep./FCCC/L.1/REPORT

Geneva, 24-26 September 1990

I. INTRODUCTION

1. The meeting of the Ad Hoc Working Group of Government Representatives to prepare for negotiations on a Framework Convention on Climate Change was held in Geneva, from 24-26 September 1990, at the International Conference Centre. The meeting was convened in pursuance of Resolution 8 (EC-XLII) adopted by the Executive Council of WMO at its forty-second session in June 1990 and decision SS. II/3 adopted by the special session of the Governing Council of UNEP in August 1990 both entitled "Framework Convention on Climate Change".

II. ORGANIZATIONAL MATTERS

A. Opening of the meeting

2. In his opening statement, Professor G.O.P. Obasi, Secretary-General of WMO summarized the background to the preparation for negotiations and emphasized the sound and thorough technical basis provided by the recent report of the Intergovernmental Panel on Climate Change.

He stressed WMO's role as the independent authoritative scientific voice and pledged WMO's full support in any agreed international strategy, through the World Climate Programme and through the Global Atmosphere Watch, the World Weather Watch and other related international programmes. He recognized that calls for equity raised problems in agreeing on what was equitable and that a great deal of economic and social data would need to be co-ordinated and reviewed in this particular light and interpreted with wisdom.

He emphasized the need for this short meeting to concentrate on organizational preparations for the first negotiating session in the United States in February 1991. The real issues behind the negotiations need to be identified only. Discussing and resolving them are matters for the negotiations and not this preparatory meeting.

He proposed that as the negotiations proceeded to a more formal stage it would be necessary to adhere closely to UN type rules of procedure. He also advocated an effective, inexpensive, even frugal, secretariat for negotiations and invited views on its role.

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Finally Professor Obasi assured representatives of his own availability and that of the WMO Secretariat to assist them in their enormous task. He wished them success and that their discussions might be marked by wisdom and courage.

3. The Executive Director of UNEP, Dr. M.K. Tolba, in his opening statement emphasized that this meeting is to prepare the ground for the start of negotiations of an international accord to deal with one of the most serious threats facing the world that of climate change and global warming.

To deal with it, governments will have to agree binding international legal instruments specifying clear commitments, defined responsibilities, targets and schedules and workable and equitable institutional mechanisms.

He stressed that recently the world community accepts the fact that climate change is a global issue which has to be addressed in some one-and-a-half years, to reach Rio de Janeiro with some meaningful document in hand.

Dr. Tolba emphasized that both the Secretary-General of the WMO and he -- as Executive Director of UNEP -- have been requested by their governing bodies to prepare for negotiations now. The task of this meeting is to consider how to proceed in the forthcoming negotiations and to decide on a realistic timetable for future meetings, taking into account of the difficulties many developing countries face, and which the Governing Council of UNEP asked to avoid -- the proliferation of venues of meetings and the coincidence of their dates.

He said both Professor Obasi and himself recommend that negotiations be conducted in the main ad hoc working group of legal and technical experts, under which sub-working groups could be established. Those could deal with the following issues: greenhouse gas emissions, energy efficiency, afforestation, research, monitoring and assessment and the special situation of developing countries. This meeting is expected to advise the first negotiating session on the points that need to be addressed by them under these issues. It is not expected to start the negotiations here. This is the job of the negotiation group. The note by the Secretary-General of WMO and the Executive Director of UNEP which was prepared for this meeting, sets out a number of these points for consideration, for example, which gases ought to be included in atmospheric concentrations stabilization and emission reductions, target dates, base year, criteria for calculating emission levels -- per capita, per unit of GNP or GDP, according to area of the country, its climatic conditions, the size of natural carbon sinks, energy consumption per production unit or a mixture of all these or other criteria.

Of all the issues highlighted, Dr. Tolba said three would dwarf the negotiating process, namely: financial requirements, technology transfer and economic reforms. The financial mechanisms and technology transfer agreement contained in the amended Montreal Protocol could act as one guide to future negotiations. With regard to economic reforms, consideration could be given to issues like CO₂ tax, pollution charges and a global permit trading scheme, whereby emitters who can achieve specific targets have the option of trading excess emissions to countries unable to meet immediate targets.

Mont. Prot. as model
for financial mech. &
tech. transfer

Dr. Tolba emphasized that this meeting is not only an organizational meeting but the preparatory meeting for the negotiations which goes beyond organization only. The report of this meeting is going to be the main document for the negotiating session in Washington D.C. Taking into account the time constraints, this meeting may not be able go into details but hopefully will consider the essential elements to be included into future legal acts dealing with climate change.

B. Attendance

4. The meeting was attended by representatives of the following countries: Algeria, Argentina, Australia, Austria, Bahamas, Bangladesh, Belgium, Bhutan, Brazil, Bulgaria, Canada, Central African Republic, Chile, China, Colombia, Côte d'Ivoire, Democratic People's Republic of Korea, Denmark, Egypt, El Salvador, Ethiopia, Finland, France, Germany, Federal Republic of, Ghana, Greece, Honduras, India, Indonesia, Ireland, Israel, Italy, Japan, Kenya, Kiribati, Malaysia, Maldives, Mali, Malta, Mexico, Morocco, Nauru, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Papua New Guinea, Peru, Philippines, Portugal, Republic of Korea, Saudi Arabia, Singapore, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Thailand, Tunisia, Turkey, Uganda, USSR, United Kingdom, United Republic of Tanzania, U.S.A., Uruguay, Venezuela, Yugoslavia and Zimbabwe.

5. The following organizations attended the meeting as observers: UNDP, UNCTC, Unesco and its IOC, FAO, UNCED, CEC, EC Council, IPCC, ICSU, IPIECA, IUCN, Environmental Law Institute, Environmental Defense Fund, Greenpeace International, Leadership Council for Effective Climate Change Policy and World Wide Fund for Nature.

C. Bureau

6. The following Bureau was elected by the meeting:

Chairman	- Mr. I. Topkov, Bulgaria
Vice Chairman	- Mr J.P. Bruce, Canada
Vice Chairman	- Mr. A. Al-Gain, Saudi Arabia
Rapporteur	- Mr. L.G. Meira Filho, Brazil

D. Adoption of the Agenda

7. The following agenda was adopted by the meeting:

1. Opening remarks by Secretary-General of WMO and Executive Director of UNEP.
2. Election of Bureau for the preparatory meeting of the working group.
3. Adoption of agenda.
4. Organization of the negotiations for the framework convention.
5. Adoption of the report.
6. Closure of the session.

III. Discussion on Agenda item 4

8. During the general discussion on the organization of the negotiations for the framework convention delegations made the following main points: Regarding the option that the negotiations would be carried by an ad hoc working group of legal and technical experts, several delegations, while agreeing with the general approach, proposed that, because of the importance of these negotiations, the group carrying it out should be given a title commensurate with its job e.g., International Forum, Intergovernmental Negotiating Committee or a UN specialized conference.

9. Most of the speakers referred with appreciation to the relevant decisions of the UNEP Governing Council and the resolutions of the WMO Executive Council which led to the convening of this session. Delegations agreed that both WMO and UNEP should assist the negotiations, particularly taking into account the urgency of the problems to be solved and the very good past experience regarding the development of international legal instruments, for example, the Vienna Convention for the Protection of the Ozone Layer and its Montreal Protocol. On relations between the negotiating group and the UN Conference on Environment and Development, it was agreed that the framework convention should, if possible, be ready for signing in conjunction with the 1992 UNCED Conference in Brazil in June 1992. The Preparatory Committee of UNCED should be kept informed on the progress of the negotiations. Representatives noted that, in accordance with UN General Assembly Resolution 44/207, preparations for the negotiations will be reported to its 45th session as a contribution to its discussions on the ways and means and modalities to be adopted for the negotiating process. It was emphasized by a few delegations that a meaningful legal act for adoption in 1992 should be a target but not at the expense of agreeing to an instrument of only declaratory character. Others cautioned that if necessary the negotiations should continue after 1992.

10. Most of the delegations suggested Geneva, Switzerland, as the venue for the negotiating sessions. Several developing countries delegations considered it more convenient for them if some of the negotiating sessions were held elsewhere than Geneva, with Nairobi being preferred by most of those suggesting this option. Some suggested that meetings alternate between Geneva and Nairobi; others indicated that, while the preferred place for meetings would be Geneva, at least one session in 1991 should take place in Nairobi. The Secretariat reminded the meeting of a decision of UNEP's Governing Council at its special session in July 1990, which requested that meetings other than the first negotiating sessions scheduled for Washington D.C., should be held alternatively in Geneva and Nairobi. A few delegations indicated that if venues other than those with the customary UN conference facilities were proposed then the arrangements for sessions should follow the normal UN practices for organizing such meetings.

11. Regarding the duration of the meetings, most of the speakers suggested two weeks as the maximum duration of each meeting. Several delegations considered one week to be more appropriate. Another considered that two weeks would be not enough. Some delegations considered a three months interval

between negotiating meetings to be too short to allow proper consultations in their countries. Several delegations suggested a four month interval.

12. It was the general feeling that negotiations should take place in one single forum and that agreements reached in the negotiating forum, should not be reopened by another body. Several delegations suggested that the rules of procedure for the negotiating process should be developed, based on existing rules of procedure. One delegation recommended that decision-making in the rules of procedure should be based on consensus. Another cautioned against that. A few delegations suggested that the current meeting prepare the draft rules of procedure to be presented to the negotiating forum which is scheduled for February 1991 in Washington D.C. this year.

13. All governments should be invited to all negotiation sessions, and the participation of developing countries should be ensured. It was a common agreement that the negotiating meetings should be carried in the six official languages of the UN and that the documentation for the meetings should be distributed to countries well in advance to allow them time for full preparation for the meetings. Delegations agreed that relevant NGOs should be allowed to attend the negotiations as observers, taking into account their participation in the development of recent international legal instruments in the field of the environment. UN practice will provide useful guidance in this respect.

14. Regarding the proposed small supporting meeting sessions mentioned in the Note prepared jointly by the Executive Director of UNEP and the Secretary-General of WMO for the use of the working group and annexed to their letter of 24 August 1990, reservations were expressed by several delegations that many developing countries would not be able to attend such meetings and therefore the geopolitical representation might be unbalanced. Some delegations emphasized that it would be useful to provide for the setting up of substantive groups as part of the negotiating process. The need to establish a legal/drafting group was particularly emphasized. It was also suggested that the special situation of developing countries could be addressed either within these substantive subgroups or in a separate one.

15. All delegates agreed that the proper representation of developing countries had to be ensured and that the best way would be through the creation of a trust fund similar to that established for the IPCC. Some delegations expressed willingness to support such a fund. Some delegations called for allowing for more regional participation for example the South Pacific Forum.

16. Regarding the structure of the Bureau, all delegates agreed that the Bureau should not be too large but should ensure proper geopolitical representation. It was suggested that the Bureau should be of a permanent character and that its Chairman and members should attend every negotiating session.

*representation of developing
countries - trust fund* →

17 Many delegations suggested the establishment of a secretariat dealing with the negotiation process, separate from the IPCC Secretariat but located in Geneva, to allow regular interaction and exchange of information. The Secretariat would consist of UNEP and WMO staff supplemented by other professionals seconded by other UN agencies. One delegation suggested that staff might also be seconded by governments. The role of the IPCC in the negotiating process as a scientific and technical input-providing body was particularly emphasized.

role of IPCC =
Scientific/technical

18. Regarding the documents to serve as a base for the substantive discussions at the negotiating groups, most delegations suggested that the main document to serve as a basis for negotiations should be the IPCC First Assessment Report - including its identification of legal and institutional mechanisms and the Policymakers summary of Working Group III, particularly the elements on Pages 41 and 42. This document should be supplemented by the outcome of other international meetings, eg. the Toronto and Noordwijk Declarations. Some delegations suggested that the list of elements presented in the Note for this meeting by the Executive Director of UNEP and Secretary-General of WMO should also be taken into account at the discussions. One delegation drew attention to other useful documents which could be consulted, including the report of the Ottawa meeting on legal issues relating to the development of a climate convention and that part of the report of the World Commission on Environment and Development dealing with principles of Environmental Law. It was suggested that the Secretariat should gather documents together and that they should be presented to the first negotiating meeting in Washington with commentary. It is expected that at the Washington meeting, a legal drafting group will be convened to prepare, on the basis of consideration of the above documentation by the negotiating forum, the draft legal instrument or instruments as may be agreed upon. In referring to the IPCC report some delegations said that it had deficiencies. Not all developing countries had been able to participate in the IPCC process and the product contained a bias in favour of developed country opinion. Two delegations said that relying solely on IPCC documentation would propagate the bias into the negotiating forum. Delegates agreed that written contributions be solicited from developing countries relating to their specific concerns. These contributions should be translated and distributed to all governments and considered during the negotiating process. Some developing countries delegations complained that documentation of the kind foreseen during the negotiations invariably arrived late, due to poor communications in some developing countries, and asked that the secretariat consider priority distribution to these countries. Another delegate said that it would be helpful if the distribution of documents was not limited to the constituencies of WMO and UNEP but made more widely available within countries which might consider an appropriate network to ensure this.

19. The meeting was divided on whether or not protocols and other related legal instruments should be negotiated simultaneously with the convention. Many delegations suggested that the convention should contain specific obligations in order that the legal instrument could be effective in environmental protection. Many delegations expressed the view that protocols to the convention, which are required as part of an effective international regime on climate change, should be negotiated so as to enable their adoption at the same time as the convention. The meeting considered it important to

draw up a schedule of activities from the present up to the time of the proposed adoption of the treaty in 1992.

20. In order to ensure efficiency, one delegate said that each meeting should last for the shortest possible period of time, drawing upon the "marginal utility" principle to ensure efficiency. That delegation, Italy, offered to host convention-related meetings and workshops, especially those on the subject of energy efficiency. Some delegations, however, felt there was a need to limit the establishment of subgroups with some considering them unnecessary altogether. Several delegations asked for elaboration of plans to interact with the Preparatory Committee for UNCED and on how the adoption of the two conventions currently being negotiated, i.e., on climate and biodiversity, would be co-ordinated with UNCED. The question of the relationship of the negotiation to the UN General Assembly was raised and there was widespread agreement that a clear set of recommendations should be transmitted from the present meeting to the Assembly, concentrating on, inter alia, the rules of procedure; financial arrangements; composition of the bureau and the secretariat; basic documentation, the ways to achieve universal participation, the frequency and nature of the negotiating process and the venue and other organizational aspects.

who negotiating
biodiversity
convention?

21. A few delegations insisted that the negotiations be conducted in a forum duly established by the UN General Assembly, and that the best way to provide the necessary legitimacy and universality to the process would be through convening a UN Specialized Conference. It was important that the process of negotiations be conducted according to the principle of transparency in the negotiations, without which universal acceptance might suffer; it was equally important in this connection to avoid the practice of non-announced meetings in the negotiating process, irrespective of the forum to be chosen. One delegation further warned that it was not possible for the meeting to decide on the need for subgroup meetings, it could only recommend the need for establishing subgroups, recalling that it was within the purview of the United Nations General Assembly to establish the ways, means and modalities for conducting the negotiations. Supporting this view, another delegation said that the issues of financing and frequency of meetings similarly needed the opinion of the General Assembly.

22. Many countries, in particular African countries, drew attention to the importance of climate to their development and the sensitivity of many economic sectors to drought and flood. Several delegations said that the convention should include reference to drought and flood impacts and that it should also refer to the need for action plans on climate change, including monitoring, data acquisition and regional climate modelling. Several delegations expressed the need for better information dissemination on the climate change issue to sensitise more people to the potential risks and on the need for action. The need for regional meetings on the issue and the involving of relevant regional organizations was also expressed. It was proposed that the composition of the Bureau for the negotiating body should include a fair and balanced representation from regions of the world that are seriously at risk by drought, desertification and land degradation processes.

*drought/flood/
oceans should be
added

The countries most affected by this change-of-climate-risk are those in the IGADD-region (Eastern African countries) and the Sahelian and Magrehb countries. These regions should be given special consideration during the formulation of the Bureau for the composition of the negotiating body. Another representative drew attention to concerns associated with arid lands such as the Arabian peninsular. The attention of the meeting was also drawn to the vulnerability and risks of drought and desertification associated with potential climate change in other regions, such as Australia and North-east Brazil.

23. Several delegations, including those of small and lowlying island states and coastal areas, spoke of the unique vulnerability of such states to sea-level rise and the need to give prominence to this issue within the convention. Such countries are unique in that their physical and cultural survival is at risk from sea-level rise and consequent annihilation of their homelands. These delegations considered that they should be represented on the proposed Bureau, citing the degree of risk as a further criterion for determining the composition of the Bureau. The majority of delegations did not oppose the fact that these concerns would be taken into account when the negotiating body discusses the composition of the Bureau.

? = not rep'd?

24. The representative of the Commission of European Communities reported on the outcome of the session of the European Council held in June 1990 in Dublin and attended by Heads of State and of Governments of the Community. The Heads of Governments considered that the Community and its member states had a special responsibility to encourage and participate in international action aimed at tackling global environmental problems. Among comments on the structure of the future negotiations, the same representative said the European Community attached great importance to the full participation of developing countries to the negotiating process and said favourable consideration would be given towards providing support for this participation. Many individual states also indicated their intention to provide financial support through contribution to the Trust Fund. Some delegations noted their recent increased contributions to UNEP and indicated that they expected a proportion of the costs, especially that of the joint secretariat, to be met from UNEP and WMO funds.

25. The Chairman of the Intergovernmental Panel on Climate Change (IPCC) confirmed the Panel's willingness to assist the negotiations process. It intended to meet the short term needs of the negotiations towards elaboration of the convention by 1992 and also to satisfy longer term goals of improved knowledge. He informed the meeting of plans to hold a fifth IPCC meeting, in February 1991 soon after the first negotiating session in Washington D.C., in order to assess how to address the key issues identified at the meeting which were relevant to the IPCC. The IPCC would, if requested, make a presentation to the first negotiating session on how the IPCC could fulfil the supporting role suggested for it.

26. The Intergovernmental Oceanographic Commission (IOC) of UNESCO said there was a need to strengthen ocean and coastal area monitoring and that IOC, together with UNEP and WMO, had been invited by the Preparatory Committee of UNCED to study related ways and means through the establishment of a global

*US position??

ocean observing system (GOOS). He drew attention to the report by an IOC Ad Hoc Group of Experts which recommends the need to establish a protocol among member states in 1992 in order to implement GOOS in a timely fashion. The representative said that resources for monitoring, assessment and technical training, and assistance for developing countries were insufficient. He concluded by expressing his organization's willingness to support the negotiations.

27. Similar support was expressed by the representative of FAO who expressed FAO's intention to nominate a full time liaison officer to support the convention process. He suggested that similar liaison persons should be nominated by UNEP and WMO to liaise on the proposed FAO forest convention. The representative urged close co-ordination in developing legislation on forests in view of the common objectives and the need for coherent action. He suggested that, initially, the negotiating group should consider all aspects of forest conservation and that FAO were willing to co-sponsor a sub-group on these issues. The development of a forest convention was suggested by the FAO representative to be undertaken contiguously with the elaboration of treaties on climate and biodiversity. Some representatives said that the development of a forest convention should not complicate or delay negotiations of a climate convention and related legal instruments. Other however, several delegations responded negatively to this suggestion, fearing that the attention of governments would be diverted towards an issue which did not demand the same priority and would also duplicate the current and ongoing negotiations for a convention on biodiversity. Some of them noted that the state of the deliberations on forestry differed from that on climate change. The representative of FAO reassured the delegates of FAO's appreciation of their concern about conflicts between conventions and stated that he was sure that the Committee on Forestry would not make any recommendation that would conflict with the recommendations of the present meeting. He confirmed that FAO's support for the climate convention process was not dependent on a forest convention's being developed.

Many delegations said that the development of a forest convention should not complicate or delay negotiation on a climate convention and related legal instruments.

What are position on
forest convention in
light of being run
by FAO?

US?

Many feel forest
issue should be
dealt of separately
? disagree w/
Tolba?

IV. RECOMMENDATIONS

The ad-hoc working group of government representatives to prepare for negotiations on a framework convention on climate change adopted by consensus the recommendations listed below in Section A, and identified the option below in Section B, regarding the organization of the negotiating process for a framework convention on climate change. Both sections are submitted for consideration initially by the forty-fifth session of the United Nations General Assembly in pursuance of its resolution 44/207 to recommend ways, means and modalities for further pursuing negotiations, taking into account the work of the Preparatory Committee of the UN Conference on Environment and Development, and then by the negotiating body at its first substantive session scheduled for February 1991 in Washington, D. C., USA.

A. Recommendations adopted by consensus

1. The negotiating process should be organized and conducted in such a manner as to ensure openness, transparency, universality and legitimacy. It should reflect the full participation and commitment of all States to the negotiations.
2. There should be a single negotiating process leading to a framework convention on climate change and any related legal instruments as might be agreed upon.
3. The negotiating body will discuss the policy issues. Governments will need to be represented at a level appropriate for this. The name of the body should also reflect this function in accordance with options suggested in this document.
4. The negotiating body should respond to UN General Assembly decisions. It should also regularly inform the Assembly, through appropriate channels, of progress in its deliberations.
5. The bureau of the negotiating body should reflect a proper geographical representation, balance of interests and specific concerns as mentioned in the Report, and be of strength sufficient to ensure equity and still limited to ensure effectiveness.

6. It is highly desirable that an effective framework convention on climate change, containing appropriate commitments, be ready for signing by governments and by regional economic integration organizations in conjunction with the United Nations Conference on Environment and Development (UNCED) in Brazil, in June 1992. Any related legal instruments might be developed on the basis of consensus decision by the negotiating body.

7. Participation of the maximum number of States and regional economic integration organizations in the negotiating process is considered essential for its success. Countries which have not done so, are urged to set up a national co-ordinating group to handle national information requirements relevant to the negotiations, and to serve as a link to the Secretariat of the negotiations. The special problems associated with ensuring the participation of developing countries, and the recommendations contained in the report of the IPCC to overcome these problems, should receive particular attention. To ensure adequate participation of the developing countries, small island states and least developed countries, a special Trust Fund should be created, on a similar basis to that for the UNCED and the IPCC, to assist in their adequate participation.

8. Rules of procedure of the negotiating body need to be elaborated for approval by the first negotiating session. They should be based on existing relevant rules of procedure, be acceptable by all States, Members of the UN, the Specialized Agencies, IAEA, and regional economic integration organizations, be compatible with the status of the negotiating body, and be such as to ensure active participation by all governments through fully accredited representatives, and be consistent with Recommendation 1 above.

9. Most negotiating sessions should have a maximum duration of two weeks, within available resources.

10. A tentative calendar, to be reviewed at the end of each negotiating session, should be as follows:

February 1991 - Washington D. C., USA
May - June 1991
August - September 1991
November - December 1991

and whichever meetings are needed in 1992, leading into the UN Conference on Environment and Development, Brazil, June 1992.

11. Non-governmental organizations with a substantive interest in the field should be permitted to attend negotiating sessions as observers. The practices of the UN and of the Preparatory Committee for UNCED will provide useful guidance before rules of procedure are finalized.

12. The negotiating body must have a strong, efficient secretariat at its disposal. This would be best assured if the secretariat were:

(1) located in Geneva and working closely with the IPCC Secretariat, although independent of it,

and

(2) the joint administrative responsibility of WMO and UNEP under the guidance of the negotiating body; this arrangement should be reviewed at the time of the first negotiating meeting in Washington in February 1991.

It should be of an appropriate size and quality, (the professionals consisting mainly of WMO and UNEP staff supplemented by professionals seconded by other UN agencies) and be adequately funded, to ensure that meetings are served to UN standards; in particular that documents were always to be available in the six official languages of the UN according to an agreed timetable and that interpretation in the six languages should be available at all negotiating sessions and at meetings of any sub-groups. It should work closely, and as necessary, with agencies of the UN and other international bodies concerned with climate related issues.

13. Taking into account paragraph 6 above, the Preparatory Committee of the UN Conference on Environment and Development should be kept informed of the progress of negotiations.

14. The negotiating body should have a link with the Intergovernmental Panel on Climate Change (IPCC) to ensure that the IPCC can respond to the needs and requests of the negotiators for objective scientific and technical advice.

15. Depending on the decision on ways, means and modalities to be taken in UN General Assembly, the negotiating body may establish sub-groups as needed. Some sub-groups might be required only at a later stage of the negotiations. If there are sub-groups to the negotiating body, not more than two meetings of the main body or sub-groups should be in session simultaneously.

16. The main documentation to serve as a basis for negotiations should be the IPCC First Assessment Report - including its legal and institutional mechanisms - and the background documentation. Other supplementary documents for consideration would include those resulting from previous international conferences on the subject and from the forthcoming Second World Climate Conference and such other documents as the negotiating body chooses.

17. A list of the elements identified by the IPCC for possible inclusion in the framework convention, or other related legal instruments, documents containing such elements, and comparative presentation of general principles of relevant treaties, should be before the negotiating body.

18. Individual governments are encouraged to present papers to the negotiating body, with help from the Secretariat within available resources.

19. The funding of the sessions of the negotiating body, and of the supporting secretariat, should be arranged through provisions in the regular budget of WMO and UNEP and/or with the use of a Trust Fund arrangement and/or other relevant funds.

20. After the first session of the negotiating body in Washington D.C. in February 1991, subsequent meetings should take place in Geneva with at least one of them in 1991 in Nairobi to be decided at the first session in Washington.

B. Option identified by the Ad-hoc Working Group

1. The negotiating body could be an "Intergovernmental Negotiating Committee for a framework convention on climate change", under the auspices of WMO and UNEP, or a "Specialized Conference for the Negotiation of a Framework Convention on Climate Change" with a Secretary-General appointed by the Secretary-General of the United Nations.

V. ADOPTION OF THE REPORT

29 The report of the meeting was adopted on 26 September 1990 at 11.25pm.

VI. CLOSURE OF THE SESSION

30. After usual exchange of courtesies the chairman declared the meeting closed at 11.30pm.

Annex 1

Ad hoc working group of government representatives
to prepare for negotiations on a framework convention
on climate change, Geneva, 24-26 September 1990

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MEETING OF GOVERNMENT REPRESENTATIVES TO
DRAFT MINISTERIAL DECLARATION FOR THE
SECOND WORLD CLIMATE CONFERENCE

PM/D.Decl./REPORT/1
29 September 1990

Geneva, 27-29 September 1990

1. Introductory Remarks

The meeting of government representatives to prepare a draft Ministerial Declaration for consideration at the Ministerial portion of the Second World Climate Conference (Geneva, 29 October to 7 November 1990) was held 27-29 September 1990 at the International Conference Centre, Geneva.

Prof. G.O.P. Obasi, Secretary-General of the World Meteorological Organization (WMO), welcomed the delegates on behalf of WMO to this important "open-ended" meeting of government representatives. He noted the structure of the Second World Climate Conference (SWOC) with its two major components, (1) a scientific and technical conference, and (2) a Ministerial meeting. He indicated that the purpose of this meeting is to prepare a draft Ministerial Declaration. Prof. Obasi informed the meeting of the extensive consultations undertaken, to prepare an initial declaration which was sent to foreign ministries of all countries in July 1990. The informal meeting of some 20 representatives from developed and developing countries in May 1990 was of great value in this connection. He advised that the intention was that a second draft would be provided to all countries for their further consideration as a result of this meeting. A further meeting would be held before the Ministerial part of the SWOC to consider any remaining differences of view. He stressed the importance attached to this declaration as an input to the negotiation of a Framework Convention on Climate Change.

Dr. M.K. Tolba, the Executive Director of UNEP in his opening remarks noted the quickening pace of events relating to climate change drawing attention to the two recent important events, namely:

- (i) the release of the First Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) and
- (ii) the immediately preceding Intergovernmental Group of Legal and Technical Experts preparing for the negotiations on a global framework convention on climate change.

He emphasized that the epicentre of negotiations will have to encompass greenhouse gas emissions, energy efficiency, afforestation, research and monitoring and the special situation of developing countries. He said that the Ministerial Declaration must infuse an urgency into the negotiations on a Framework Convention and take the past agreements a step forward.

Success in negotiations, Dr. Tolba pointed out, will depend on the fibre and flexibility of global partnership - on international resolve to guarantee access of the global south to new technologies and additional financial resources.

2. Officers of the Meeting and Organization of the Work

In introducing the question of organization of the work of the session Dr. Tolba advised that he and Prof. Obasi recommended to the meeting that the President of WMO, Mr. Zou Jingmeng, and the President of the Governing Council of UNEP, Ambassador I. Topkov, be asked to co-chair the meeting, alternating as chairs of sessions. In addition to the involvement of Dr. Tolba and Prof. Obasi, they would be supported by the SWOC Co-ordinator, Mr. Ferguson and Mr. Clerc. Dr. Tolba noted that the key documents available were the Draft Ministerial Declaration dated 13 July 1990, which is available in all working languages. All comments on this draft received from governments as of 27 September 1990 are provided in PM/D.Decl./1 of 20 September 1990 and its Add. 1. These comments were characterized by Dr. Tolba as dealing with (a) paragraph by paragraph comments, (b) the structure of the declaration and (c) the size of the document, with most believing that a Ministerial document should be short and brisk.

Mr. Zou Jingmeng in accepting the chair initially, said that the declaration that will be developed by the meeting can be a milestone in human history.

In considering the adoption of the agenda it was agreed that in the provisional agenda, item 3 be amended and agenda item 4 be modified to read "Preparation of the Draft Ministerial Declaration", with the sub-heading deleted. The revised agenda was approved and is attached as Annex 1. Several delegates expressed the need for a Drafting Group. A decision on establishing such a group was deferred.

3. Background

Mr. H.L. Ferguson, the Co-ordinator of the Second World Climate Conference (SWCC) briefly recalled the history of the development of the SWCC. It was originally conceived by WMO's Executive Council in 1986 as a Scientific Conference. The sponsoring agencies subsequently decided that a Ministerial portion should be included. The scientific and technical portion will produce a Conference Statement at the end of its deliberations on 3 November 1990. As a supplement to the Co-ordinator's comments, Mr. Alain Clerc detailed the background and the evolution of the 13 July 1990 draft Ministerial Declaration. He pointed out that the text represented a synthesis of comments previously received from many countries, the informal meeting in May, and consultations with officials of government during some international conferences.

There was a general discussion on procedure. Some delegations made reference to the possible risks in confusing the results of the scientific/technical sessions and the Ministerial Declaration and noted that any such confusion must be avoided. It was agreed that the scientific statement should not be annexed to the Ministerial Declaration since governments were not officially represented at the scientific portion of the conference.

One proposal was made to the effect that there should be 3 short statements of a general nature prepared as part of the Scientific Conference Statement, designed for possible ~~acceptance~~ *consideration* by Ministers, which should address:

- (1) climate change and its impact (based on IPCC WG I Report);
 - (2) use of climatic information (data and analysis) in assisting social and economic development;
- and (3) priority areas for further scientific work.

4. Preparation of the Draft Declaration

Many delegations suggested that a draft proposal by Norway be the basis for discussions since it was short and succinct. However, a representative of the developing countries pointed out that considering that the Norwegian paper was only distributed that day, it should be considered alongside the draft from the Secretariat. This was agreed. Discussion then started section by section. Following discussion of the preambular paragraphs, it was agreed to have an open-ended Drafting Group prepare a revised text. Mexico and Norway agreed to co-chair the Drafting Group, to work simultaneously with the plenary consideration of other paragraphs.

Subsequently, other sections were referred by the plenary to the Drafting Group, to assist with the work as a sub-group of plenary.

As a result of extensive discussions a revised draft Declaration was prepared, with some bracketed text and some alternative formulations. This compilation is annexed to this report.

It was agreed that the Secretariat would further edit the text with no substantive changes and would distribute this in all official languages as rapidly as possible.

5. Date and Place of Next Meeting

It was also agreed that a further consultation on the Ministerial Declaration will be required before the Ministerial part of the SWOC. It was agreed that such a meeting be convened in Geneva in November of second 1990 with a view to having as close as possible to an agreed text in official languages by Monday morning, 5 November 1990 for consideration by Ministers.

6. Closure of the Session

*Alpha resumed discussion
revised alt text w/ bracket
not all discussed in plenary
Some del
Several have concern - not sufficient
attention to energy sector
largest sector. new
world protocol on energy,
production: specific targets
should include at target,
offsets opposite*

*3-4
note
day
- 2 conf
Topic*

COMMENTS ON NORWEGIAN NON-PAPER BY ENVIRONMENTAL NGOS.
(27 SEPTEMBER 1990)

*STABILIZATION AND REDUCTION OF GREENHOUSE GASES

PARAGRAPH 19 : REPLACE WITH -

WE AGREE THAT THE OVERRIDING GLOBAL OBJECTIVE MUST BE TO STABILIZE AND REDUCE GREENHOUSE GAS CONCENTRATIONS AS SOON AS POSSIBLE.

PARAGRAPH 21, LINE 1 : REPLACE "GREENHOUSE GAS EMISSIONS" WITH
CO2 EMISSIONS AND EMISSIONS OF OTHER GREENHOUSE GASES NOT
CONTROLLED BY THE MONTREAL PROTOCOL

* SPECIAL SITUATION OF DEVELOPING COUNTRIES

PARAGRAPH 24, ADD NEW LAST SENTENCE :

WE FURTHER STRESS THAT EXPANDING DEBT RELIEF FOR DEVELOPING COUNTRIES IS CRUCIAL TO THEIR SUSTAINABLE DEVELOPMENT AND AN EFFECTIVE RESPONSE TO CLIMATE CHANGE.

*ROLE OF AGRICULTURE, MINING AND WASTE MANAGEMENT

NEW PARAGRAPH : (ROLE OF AGRICULTURE, MINING AND WASTE MANAGEMENT)

WE NOTE THAT EMISSIONS OF GREENHOUSE GASES FROM THE AGRICULTURE, MINING AND WASTE SECTORS (SUCH AS METHANE AND N2O) WILL BECOME INCREASINGLY IMPORTANT CONTRIBUTORS TO CLIMATE CHANGE.

WE CALL ON ALL COUNTRIES TO TAKE STEPS THAT CAN BE IMPLEMENTED IMMEDIATELY TO REDUCE THESE EMISSIONS, SUCH AS IMPROVEMENTS IN PLANT FERTILIZER AND LIVESTOCK FEEDING PRACTICES, GAS EXTRACTION AND DISTRIBUTION , AND IN WASTE MANAGEMENT. PARALLEL EFFORTS MUST ALSO BE MADE TO INTENSIFY RESEARCH ON THE SOURCES OF METHANE AND N2O AND DEVELOPMENT OF LONGER TERM CONTROL STRATEGIES.

*FORESTRY

PARAGRAPH 34; LINE 2, AFTER "CLIMATIC STABILITY," INSERT

"AS WELL AS FOR THE PROTECTION OF BIOLOGICAL DIVERSITY, WATER QUALITY, SOIL STABILIZATION AND THE INTERESTS OF INDIGENOUS PEOPLES;"

INSERT FOURTH PARAGRAPH :

WE CALL ON ALL COUNTRIES TO DEVELOP AND IMPLEMENT POLICIES AIMED AT THE CONSERVATION AND SUSTAINABLE MANAGEMENT OF FORESTS, AND TO

INTEGRATE FOREST MANAGEMENT SOLUTIONS WITH POLICIES ON ENVIRONMENT, AGRICULTURE, TRANSPORTATION, ENERGY, POVERTY AND LANDLESSNESS.

*GLOBAL FRAMEWORK CONVENTION ON CLIMATE CHANGE

PARAGRAPH 37 : INSERT A NEW SECOND SENTENCE.

WE FURTHER ENDORSE THE DECISIONS OF THE WMO EXECUTIVE COUNCIL (RESOLUTION 8 (EC-XL II)) AND THE UNEP GOVERNING COUNCIL (SS.II./3 CLIMATE CHANGE) REQUESTING THE SECRETARY-GENERAL OF THE WMO AND THE EXECUTIVE DIRECTOR OF UNEP TO CONVENE THE FIRST OPEN-ENDED NEGOTIATING SESSION ON A FRAMEWORK CONVENTION ON CLIMATE CHANGE NOT LATER THAN FEBRUARY 1991.

(LINE 9) REPLACE "OTHER RELEVANT" WITH "ASSOCIATED".

PRECAUTIONARY MEASURES

Paragraph 17

- Insert a final sentence : "In preparing Environmental Impact Assessments Climate Change impacts should be taken into account".

Paragraph 18

- Insert a final sentence : "Ozone depleting substances that are also greenhouse gases and are not controlled by the Montreal Protocol should be phased out as soon as possible.

Paragraph 18, line 7

- Replace "review" with "changes"
- After "practices" insert "and reducing air pollution from fossil fuel combustion".

STABILIZATION AND REDUCTION OF GREENHOUSE GASES

Paragraph 23, line 3

After "the form of" replace the remaining text with "the Convention, and/or associated legal instruments which should be negotiated simultaneously with the Convention".

SPECIAL SITUATION OF DEVELOPING COUNTRIES

Paragraph 24, page 3, line 1

After "additional" insert "financial and technical"

New Paragraph

Between Paragraphs 24 and 26 insert a new paragraph as follows: "We recommend that existing institutions for development and financial assistance, trade and monetary policy, including the World Bank and other Multilateral Development Banks, the International Monetary Fund, the General Agreement on Tariffs and Trade, Bilateral Assistance Programmes, the relevant United Nations organizations should give greater attention to Climate Change issues within their environmental and other relevant programmes. An independent assessment of the current programmes of the above institutions should be carried out as soon as possible in order to determine the extent to which their activities and the economic policies they promote contribute indirectly or directly to climate change.

Paragraph 26, last line

Replace "Protocols" with "Legal instruments"

ECONOMIC INSTRUMENTS

Paragraph 31, Sub-section (iii)

Add at end of sentence "Such as deforestation and certain agricultural practices".

ROLE OF THE ENERGY AND TRANSPORT SECTOR

Add last sentence "We also strongly encourage the aggressive development and commercialization of renewable energy".

TECHNOLOGY DEVELOPMENT

Line 8

Replace "green" with "renewable energy".



WMO



UNEP

INTERGOVERNMENTAL PANEL
ON CLIMATE CHANGE

IPCC FIRST ASSESSMENT REPORT

OVERVIEW

31 AUGUST 1990

PREFACE
TO THE IPCC OVERVIEW

The IPCC First Assessment Report consists of

- * this IPCC Overview,
- * the Policymakers Summaries of the three IPCC Working Groups (concerned with assessment respectively of the science, impacts and response strategies) and the IPCC Special Committee on the Participation of Developing Countries, and
- * the three reports of the Working Groups.

The Overview brings together material from the four Policymakers Summaries. It presents conclusions, proposes lines of possible action (including suggestions as to the factors which might form the basis for negotiations) and outlines further work which is required for a more complete understanding of the problems of climate change resulting from human activities.

Because the Overview cannot reflect all aspects of the problem which are presented in the three full reports of the Working Groups and the four Policymakers Summaries, it should be read in conjunction with them.

The issues, options and strategies presented in the Report are intended to assist policymakers and future negotiators in their respective tasks. Further consideration of the Report should be given by every government as it cuts across different sectors in all countries. It should be noted that the Report reflects the technical assessment of experts rather than government positions, particularly those governments that could not participate in all Working Groups of IPCC.

This Overview reflects the conclusions of the reports of (i) the three IPCC Working Groups on science, impacts, and response strategies, and (ii) the Policymakers Summaries of the IPCC Working Groups and the IPCC Special Committee on the Participation of Developing Countries.

1. SCIENCE

This section is structured similarly to the Policymakers Summary of Working Group I.

We are certain of the following:

- * There is a natural greenhouse effect which already keeps the Earth warmer than it would otherwise be.
- * Emissions resulting from human activities are substantially increasing the atmospheric concentrations of the greenhouse gases, carbon dioxide, methane, chlorofluorocarbons (CFCs) and nitrous oxide. These increases will enhance the greenhouse effect, resulting on average in an additional warming of the Earth's surface. The main greenhouse gas, water vapour, will increase in response to global warming and further enhance it.

Lindzen

We calculate with confidence that:

- * Some gases are potentially more effective than others at changing climate, and their relative effectiveness can be estimated. Carbon dioxide has been responsible for over half of the enhanced greenhouse effect in the past, and is likely to remain so in the future.
- * Atmospheric concentrations of the long-lived gases (carbon dioxide, nitrous oxide and the CFCs) adjust only slowly to changes of emissions. Continued emissions of these gases at present rates would commit us to increased concentrations for centuries ahead. The longer emissions continue to increase at present-day rates, the greater reductions would have to be for concentrations to stabilize at a given level.
- * For the four scenarios of future emissions which IPCC has developed as assumptions (ranging from one where few or no steps are taken to limit emissions, viz., Scenario A or Business as Usual Scenario, through others with increasing levels of controls respectively called Scenarios B, C and D), there will be a doubling of equivalent carbon dioxide concentrations from pre-industrial levels by about 2025, 2040 and 2050 in Scenarios A, B, and C respectively (see the section "Which gases are the most important?" in the Policymakers Summary of Working Group I for a description of the concept of equivalent carbon dioxide). See the Appendix for a description of the IPCC emissions scenarios.

*Business as Usual
Doubling by 2025.*

- * Stabilization of equivalent carbon dioxide concentrations at about twice the pre-industrial level would occur under Scenario D towards the end of the next century. Immediate reductions of over 60% in the net (sources minus sinks) emissions from human activities of long-lived gases would achieve stabilization of concentration at today's levels; methane concentrations would be stabilized with a 15-20% reduction.

- * The human-caused emissions of carbon dioxide are much smaller than the natural exchange rates of carbon dioxide between the atmosphere and the oceans, and between the atmosphere and the terrestrial system. The natural exchange rates were, however, in close balance before human-induced emissions began; the steady anthropogenic emissions into the atmosphere represent a significant disturbance of the natural carbon cycle.

Business-As-Usual

Based on current model results, we predict:

- * An average rate of increase of global mean temperature during the next century of about 0.3°C per decade (with an uncertainty range of 0.2-0.5°C per decade) assuming the IPCC Scenario A (Business as Usual) emissions of greenhouse gases; this is a more rapid increase than seen over the past 10,000 years. This will result in a likely increase in the global mean temperature of about 1°C above the present value by 2025 (about 2°C above that in the pre-industrial period), and 3°C above today's value before the end of the next century (about 4°C above pre-industrial). The rise will not be steady because of other factors.

- * Under the other IPCC emissions scenarios which assume progressively increasing levels of controls, rates of increase in global mean temperature of about 0.2°C per decade (Scenario B), just above 0.1°C per decade (Scenario C) and about 0.1°C per decade (Scenario D). The rise will not be steady because of other factors.

- * Land surfaces warm more rapidly than the oceans, and higher northern latitudes warm more than the global mean in winter.

- * The oceans act as a heat sink and thus delay the full effect of a greenhouse warming. Therefore, we would be committed to a further temperature rise which would progressively become apparent in the ensuing decades and centuries. Models predict that as greenhouse gases increase, the realized temperature rise at any given time is between 50 and 80% of the committed temperature rise.

- * Under the IPCC Scenario A (Business as Usual) emissions, an average rate of global mean sea-level rise of about 6 cm per decade over the next century (with an uncertainty range of 3-10 cm per decade), mainly due to thermal expansion of the oceans and the melting of some land ice. The predicted rise is about 20 cm in global mean sea level by 2030, and

Reduction of 60% req'd
for stabilization at
current levels.

0.3°C / decade.

↑ 1°C by 2025
↑ 3°C by end next
century

** Huntsville **
Not smooth / not
steady

Q: what has land
surface done

Sea Level Rise:

20 cm by 2030

Pl 56 cm by 2090

65 cm by the end of the next century. There will be significant regional variations.

With regard to uncertainties, we note that:

- * There are many uncertainties in our predictions particularly with regard to the timing, magnitude and regional patterns of climate change, especially changes in precipitation.

- These uncertainties are due to our incomplete understanding of sources and sinks of greenhouse gases and the responses of clouds, oceans and polar ice sheets to a change of the radiative forcing caused by increasing greenhouse gas concentrations.

- These processes are already partially understood, and we are confident that the uncertainties can be reduced by further research. However, the complexity of the system means that we cannot rule out surprises.

Our judgement is that:

0.3-0.6° over last
100 yrs

5 warmest yrs in
1980's

10-20 cm ↑ in sea level

- * Global mean surface air temperature has increased by 0.3 to 0.6°C over the last 100 years, with the five global-average warmest years being in the 1980's. Over the same period global sea-level increased by 10 to 20 cm. These increases have not been smooth in time, nor uniform over the globe.

- * The size of the warming over the last century is broadly consistent with the prediction by climate models, but is also of the same magnitude as natural climate variability. If the sole cause of the observed warming were the human-made greenhouse effect, then the implied climate sensitivity would be near the lower end of the range inferred from models. Thus the observed increase could be largely due to this natural variability; alternatively this variability and other human factors could have offset a still larger human-induced greenhouse warming. The unequivocal detection of the enhanced greenhouse effect from observations is not likely for a decade or more.

- * Measurements from ice cores going back 160,000 years show that the Earth's temperature closely paralleled the amount of carbon dioxide and methane in the atmosphere. Although we do not know the details of cause and effect, calculations indicate that changes in these greenhouse gases were part, but not all, of the reasons for the large (5-7°C) global temperature swings between ice ages and interglacial periods.

- * Natural sources and sinks of greenhouse gases are sensitive to a change in climate. Although many of the response (feedback) processes are poorly understood, it appears that, as climate warms, these feedbacks will lead to an overall

*Natural balance will
exacerbate.*

increase, rather than a decrease, in natural greenhouse gas abundances. For this reason, climate change is likely to be greater than the estimates given above.

2. IMPACTS

The report of Working Group II on impacts is based on the work of a number of subgroups, using independent studies which have used different methodologies. Based on the existing literature, the studies have used several scenarios to assess the potential impacts of climate change. These have the features of:

- i) an effective doubling of CO₂ in the atmosphere between now and 2025 to 2050;
- ii) a consequent increase of global mean temperature in the range of 1.5°C to 4°-5°C;
- iii) an unequal global distribution of this temperature increase, namely a smaller increase of half the global mean in the tropical regions and a larger increase of twice the global mean in the polar regions; and
- iv) a sea-level rise of about 0.3-0.5 m by 2050 and about 1 m by 2100, together with a rise in the temperature of the surface ocean layer of between 0.2° and 2.5°C.

These scenarios pre-date, but are in line with, the assessment of Working Group I which, for Scenario A (Business as Usual) has estimated the magnitude of sea-level rise at about 20 cm by 2030 and about 65 cm by the end of the next century. Working Group I has also predicted the increase in global mean temperatures to be about 1°C above the present value by 2025 and 3°C before the end of the next century.

*I p.e.
concludes*

Any predicted effects of climate change must be viewed in the context of our present dynamic and changing world. Large-scale natural events such as El Niño can cause significant impacts on agriculture and human settlement. The predicted population explosion will produce severe impacts on land use and on the demands for energy, fresh water, food and housing, which will vary from region to region according to national incomes and rates of development. In many cases, the impacts will be felt most severely in regions already under stress, mainly the developing countries. Human-induced climate change due to continued uncontrolled emissions will accentuate these impacts. For instance, climate change, pollution and ultraviolet-B radiation from ozone depletion can interact, reinforcing their damaging effects on materials and organisms. Increases in atmospheric concentrations of greenhouse gases may lead to irreversible change in the climate which could be detectable by the end of this century.

Comprehensive estimates of the physical and biological effects of climate change at the regional level are difficult.

Confidence in regional estimates of critical climatic factors is low. This is particularly true of precipitation and soil moisture, where there is considerable disagreement between various general circulation model and palaeoanalog results. Moreover, there are several scientific uncertainties regarding the relationship between climate change and biological effects and between these effects and socioeconomic consequences.

This impact study part of the Overview does not attempt to anticipate any adaptation, technological innovation or any other measures to diminish the adverse effects of climate change that will take place in the same time frame. This is especially important for heavily managed sectors, e.g., agriculture, forestry and public health.

Finally, the issue of timing and rates of change need to be considered; there will be lags between:

- i) emissions of greenhouse gases and doubling of concentrations;
- ii) doubling of greenhouse gas concentrations and change in climate;
- iii) changes in climate and resultant physical and biological effects; and
- iv) changes in physical and ecological effects and resultant socioeconomic (including ecological) consequences. The shorter the lags, the less the ability to cope and the greater the socioeconomic impacts.

There is uncertainty related to these time lags. The changes will not be steady and surprises cannot be ruled out. The severity of the impacts will depend to a large degree on the rate of climate change.

Despite these uncertainties, Working Group II has been able to reach some major conclusions. These are presented below.

2.1 Agriculture and forestry

Sufficient evidence is now available from a variety of different studies to indicate that changes of climate would have an important effect on agriculture and livestock. Studies have not yet conclusively determined whether, on average, global agricultural potential will increase or decrease. Negative impacts could be felt at the regional level as a result of changes in weather and pests associated with climate change, and changes in ground-level ozone associated with pollutants, necessitating innovations in technology and agricultural management practices. There may be severe effects in some regions, particularly decline in production in regions of high present-day vulnerability that are least able to adjust. These include Brazil, Peru, the Sahel Region of Africa, Southeast Asia,

and the Asian region of the USSR and China. There is a possibility that potential productivity of high and mid latitudes may increase because of a prolonged growing season, but it is not likely to open up large new areas for production and it will be mainly confined to the Northern Hemisphere.

Patterns of agricultural trade could be altered by decreased cereal production in some of the currently high-production areas, such as western Europe, southern USA, parts of South America and western Australia. Horticultural production in mid-latitude regions may be reduced. On the other hand, cereal production could increase in northern Europe. Policy responses directed to breeding new plant cultivars, and agricultural management designed to cope with changed climate conditions, could lessen the severity of regional impacts. On the balance, the evidence suggests that in the face of estimated changes of climate, food production at the global level can be maintained at essentially the same level as would have occurred without climate change; however, the cost of achieving this is unclear. Nonetheless, climate change may intensify difficulties in coping with rapid population growth. An increase or change in UV-B radiation at ground level resulting from the depletion of stratospheric ozone will have a negative impact on crops and livestock.

The rotation period of forests is long and current forests will mature and decline during a climate in which they are increasingly more poorly adapted. Actual impacts depend on the physiological adaptability of trees and the host-parasite relationship. Large losses from both factors in the form of forest declines can occur. Losses from wildfire will be increasingly extensive. The climate zones which control species distribution will move poleward and to higher elevations. Managed forests require large inputs in terms of choice of seedlot and spacing, thinning and protection. They provide a variety of products from fuel to food.

The degree of dependency on products varies among countries, as does the ability to cope with and to withstand loss. The most sensitive areas will be where species are close to their biological limits in terms of temperature and moisture. This is likely to be, for example, in semi-arid areas. Social stresses can be expected to increase and consequent anthropogenic damage to forests may occur. These increased and non-sustainable uses will place more pressure on forest investments, forest conservation and sound forest management.

2.2 Natural terrestrial ecosystems

Natural terrestrial ecosystems could face significant consequences as a result of the global increases in the atmospheric concentrations of greenhouse gases and the associated climatic changes. Projected changes in temperature and precipitation suggest that climatic zones could shift several hundred kilometres towards the poles over the next fifty years. Flora and fauna would lag behind these climatic shifts, surviving in their present location and, therefore, could find themselves

in a different climatic regime. These regimes may be more or less hospitable and, therefore, could increase productivity for some species and decrease that of others. Ecosystems are not expected to move as a single unit, but would have a new structure as a consequence of alterations in distribution and abundance of species.

The rate of projected climate changes is the major factor determining the type and degree of climatic impacts on natural terrestrial ecosystems. These rates are likely to be faster than the ability of some species to respond and responses may be sudden or gradual.

Some species could be lost owing to increased stress leading to a reduction of global biological diversity. Increased incidence of disturbances such as pest outbreaks and fire are likely to occur in some areas and these could enhance projected ecosystem changes.

Consequences of CO₂ enrichment and climate change for natural terrestrial ecosystems could be modified by other environmental factors, both natural and man-induced (e.g. by air pollution).

Most at risk are those communities in which the options for adaptability are limited (e.g. montane, alpine, polar, island and coastal communities, remnant vegetation, and heritage sites and reserves) and those communities where climatic changes add to existing stresses. The socioeconomic consequences of these impacts will be significant, especially for those regions of the globe where societies and related economies are dependent on natural terrestrial ecosystems for their welfare. Changes in the availability of food, fuel, medicine, construction material and income are possible as these ecosystems are changed. Important fibre products could also be affected in some regions.

2.3 Hydrology and water resources

Relatively small climate changes can cause large water resource problems in many areas, especially arid and semi-arid regions and those humid areas where demand or pollution has led to water scarcity. Little is known about regional details of greenhouse-gas-induced hydrometeorological change. It appears that many areas will have increased precipitation, soil moisture and water storage, thus altering patterns of agricultural, ecosystem and other water use. Water availability will decrease in other areas, a most important factor for already marginal situations, such as the Sahelian zone in Africa. This has significant implications for agriculture, for water storage and distribution, and for generation of hydroelectric power. In some limited areas, for example, under an assumed scenario of a 1°C to 2°C temperature increase, coupled with a 10% reduction in precipitation, a 40-70% reduction in annual runoff could occur. Regions such as southern Asia, that are dependent on unregulated river systems, are particularly vulnerable to hydrometeorological change. On the other hand, regions such as the western USSR and

western United States that have large regulated water resource systems are less sensitive to the range of hydrometeorological changes in the assumed scenario. In addition to changes in water supply, water demand may also change through human efforts to conserve, and through improved growth efficiency of plants in a higher CO₂ environment. Net socioeconomic consequences must consider both supply and demand for water. Future design in water resource engineering will need to take possible impacts into account when considering structures with a life span to the end of the next century. Where precipitation increases, water management practices, such as urban storm drainage systems, may require upgrading in capacity. Change in drought risk represents potentially the most serious impact of climate change on agriculture at both regional and global levels.

2.4 Human settlements, energy, transport, and industrial sectors, human health and air quality

The most vulnerable human settlements are those especially exposed to natural hazards, e.g. coastal or river flooding, severe drought, landslides, severe wind storms and tropical cyclones. The most vulnerable populations are in developing countries, in the lower-income groups: residents of coastal lowlands and islands, populations in semi-arid grasslands, and the urban poor in squatter settlements, slums and shanty towns, especially in megacities. In coastal lowlands such as in Bangladesh, China and Egypt, as well as in small island nations, inundation due to sea-level rise and storm surges could lead to significant movements of people. Major health impacts are possible, especially in large urban areas, owing to changes in availability of water and food and increased health problems due to heat stress spreading of infections. Changes in precipitation and temperature could radically alter the patterns of vector-borne and viral diseases by shifting them to higher latitudes, thus putting large populations at risk. As similar events have in the past, these changes could initiate large migrations of people, leading over a number of years to severe disruptions of settlement patterns and social instability in some areas.

Global warming can be expected to affect the availability of water resources and biomass, both major sources of energy in many developing countries. These effects are likely to differ between and within regions with some areas losing and others gaining water and biomass. Such changes in areas which lose water may jeopardize energy supply and materials essential for human habitation and energy. Moreover, climate change itself is also likely to have different effects between regions on the availability of other forms of renewable energy such as wind and solar power. In developed countries some of the greatest impacts on the energy, transport and industrial sectors may be determined by policy responses to climate change such as fuel regulations, emission fees or policies promoting greater use of mass transit. In developing countries, climate-related changes in the availability and price of production resources such as energy, water, food and fibre may affect the competitive position of many industries.

Global warming and increased ultraviolet radiation resulting from depletion of stratospheric ozone may produce adverse impacts on air quality such as increases in ground-level ozone in some polluted urban areas. An increase of ultraviolet-B radiation intensity at the Earth's surface would increase the risk of damage to the eye and skin and may disrupt the marine food chain.

2.5 Oceans and coastal zones

*{ Global warming will accelerate sea-level rise, modify ocean circulation and change marine ecosystems, with considerable socioeconomic consequences. These effects will be added to present trends of rising sea-level, and other effects that have already stressed coastal resources, such as pollution and over-harvesting. A 30-50 cm sea-level rise (projected by 2050) will threaten low islands and coastal zones. A 1 m rise by 2100 would render some island countries uninhabitable, displace tens of millions of people, seriously threaten low-lying urban areas, flood productive land, contaminate fresh water supplies and change coastlines. All of these impacts would be exacerbated if droughts and storms become more severe. Coastal protection would involve very significant costs. Rapid sea-level rise would change coastal ecology and threaten many important fisheries. Reductions in sea ice will benefit shipping, but seriously impact on ice-dependent marine mammals and birds.

Impacts on the global oceans will include changes in the heat balance, shifts in ocean circulation which will affect the capacity of the ocean to absorb heat and CO₂ and changes in upwelling zones associated with fisheries. Effects will vary by geographic zones, with changes in habitats, a decrease in biological diversity and shifts in marine organisms and productive zones, including commercially important species. Such regional shifts in fisheries will have major socioeconomic impacts.

2.6 Seasonal snow cover, ice and permafrost

The global areal extent and volume of elements of the terrestrial cryosphere (seasonal snow cover, near-surface layers of permafrost and some masses of ice) will be substantially reduced. These reductions, when reflected regionally could have significant impacts on related ecosystems and social and economic activities. Compounding these impacts in some regions is that, as a result of the associated climatic warming positive feedbacks, the reductions could be sudden rather than gradual.

The areal coverage of seasonal snow and its duration are projected to decrease in most regions, particularly at mid latitudes, with some regions at high latitudes possibly experiencing increases in seasonal snow cover. Changes in the volume of snow cover, or the length of the snow cover season, will have both positive and negative impacts on regional water resources (as a result of changes in the volume and the timing of runoff from snowmelt), on regional transportation (road, marine, air and rail), and on recreation sectors.

Globally, the ice contained in glaciers and ice sheets is projected to decrease, with regional responses complicated by the effect of increased snowfall in some areas which could lead to accumulation of ice. Glacial recession will have significant implications for local and regional water resources, and thus impact on water availability and on hydroelectric power potential. Glacial recession and loss of ice from ice sheets will also contribute to sea-level rise. Permafrost, which currently underlies 20-25% of the land mass of the Northern Hemisphere, could experience significant degradation within the next 40-50 years. Projected increases in the thickness of the freeze-thaw (active) layer above the permafrost and a recession of permafrost to higher latitudes and altitudes could lead to increases in terrain instability, erosion and landslides in those areas which currently contain permafrost. As a result, overlying ecosystems could be significantly altered and the integrity of man-made structures and facilities reduced, thereby influencing existing human settlements and development opportunities.

3. RESPONSE STRATEGIES

The consideration of climate change response strategies presents formidable difficulties for policymakers. The information available to make sound policy analyses is inadequate because of :

- (a) uncertainty with respect to how effective specific response options or groups of options would be in actually averting potential climate change;
- (b) uncertainty with respect to the costs, effects on economic growth, and other economic and social implications of specific response options or groups of options.

The IPCC recommends a programme for the development and implementation of global, comprehensive and phased action for the resolution of the global warming problem under a flexible and progressive approach.

* A major dilemma of the issue of climate change due to increasing emission of greenhouse gases in the atmosphere is that actions may be required well before many of the specific issues that are and will be raised can be analyzed more thoroughly by further research.

* The CFCs are being phased out to protect the stratospheric ozone layer. This action will also effectively slow down the rate of increase of radiative forcing of greenhouse gases in the atmosphere. Every effort should be made to find replacements that have little or no greenhouse warming potential or ozone depletion potential rather than the HCFCs and HFCs that are now being considered.

* The single largest anthropogenic source of radiative forcing is energy production and use. The energy sector accounts for an estimated 46% (with an uncertainty range of 38-54%) of the enhanced radiative forcing resulting from human activities.

* It is noted that emissions due to fossil fuel combustion amounts to about 70-90% of the total anthropogenic emissions of CO₂ into the atmosphere, whereas the remaining 10-30% is due to human use of terrestrial ecosystems. A major decrease of the rate of deforestation as well as an increase in afforestation would contribute significantly to slowing the rate of CO₂ concentrations increase in the atmosphere; but it would be well below that required to stop it. This underlines that when forestry measures have been introduced, other measures to limit or reduce greenhouse emissions should not be neglected.

3.1 Roles of industrialized and developing countries

* Industrialized and developing countries have a common but varied responsibility in dealing with the problem of climate change and its adverse effects. The former should take the lead in two ways:

i. A major part of emissions affecting the atmosphere at present originates in industrialized countries where the scope for change is greatest. Industrialized countries should adopt domestic measures to limit climate change by adapting their own economies in line with future agreements to limit emissions.

ii. To co-operate with developing countries in international action, without standing in the way of the latter's development by contributing additional financial resources, by appropriate transfer of technology, by engaging in close co-operation in scientific observation, analysis and research, and finally by means of technical co-operation geared to forestalling and managing environmental problems.

* Sustainable development¹ in industrialized as well as developing countries requires proper concern for environmental protection as the basis for continued economic growth. Environmental considerations must be systematically integrated into all plans for development. The right balance must be struck between economic growth and environmental objectives.

* Emissions from developing countries are growing in order to meet their development requirements and thus, over time, are likely to represent an increasingly significant percentage of

¹ Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs and does not imply in any way encroachment upon national sovereignty. (Annex II to decision 15/2 of the 15th session of the UNEP Governing Council, Nairobi, May 1989).

global emissions. As the greenhouse gas emissions in developing countries are increasing with their population and economic growth, rapid transfer, on a preferential basis, to developing countries, of technologies which help to monitor, limit or adapt to climate change, without hindering their economic development, is an urgent requirement. Developing countries should, within the limits feasible, take measures to suitably adapt their economies. Recognizing the poverty that prevails among the populations of developing countries, it is natural that achieving economic growth is given priority by them. Narrowing the gap between the industrialized and developing world would provide a basis for a full partnership of all nations in the world and would assist developing countries in dealing with the climate change issue.

3.2 Options

* The climate scenario studies of Working Groups I and III outline control policies on emissions that would slow global warming from the presently predicted value of about 0.3°C per decade to about 0.1°C per decade (see Appendix).

* The potentially serious consequences of climate change give sufficient reasons to begin adopting response strategies that can be justified immediately even in the face of significant uncertainties. The response strategies include:

- phasing out of CFC emissions and careful assessment of the greenhouse gas potential of proposed substitutes;
- efficiency improvements and conservation in energy supply, conversion and end use, in particular through improving diffusion of energy-efficient technologies, improving the efficiency of mass-produced goods, reviewing energy-related price and tariff systems to better reflect environmental costs;
- sustainable forest management and afforestation;
- use of cleaner, more efficient energy sources with lower or no emissions of greenhouse gases;
- review of agriculture practices.

* There is no single quick-fix technological option for limiting greenhouse gas emissions. Phased and flexible response strategies should be designed to enhance relevant technological research, development and deployment, including improvement and reassessment of existing technologies. Such strategies should involve opportunities for international co-operation. A comprehensive strategy addressing all aspects of the problem and reflecting environmental, economic and social costs and benefits is necessary.

* Because a large, projected increase in world population will be a major factor in causing the projected increase in global

greenhouse gases, it is essential that global climate change strategies take into account the need to deal with the issue of the rate of growth of the world population.

* Subject to their particular circumstances, individual nations, or groups of nations, may wish to consider taking steps now to attempt to limit, stabilize or reduce the emission of greenhouse gases resulting from human activities and prevent the destruction and improve the effectiveness of sinks. One option that governments may wish to consider is the setting of targets for CO₂ and other greenhouse gases.

* A large number of options were preliminarily assessed by IPCC Working Group III. It appears that some of these options may be economically and socially feasible for implementation in the near-term while others, because they are not yet technically or economically viable, may be more appropriate for implementation in the longer term. In general, the Working Group found that the most effective response strategies, especially in the short term, are those which are:

- o beneficial for reasons other than climate change and justifiable in their own right, for example increased energy efficiency and lower greenhouse gas emission technologies, better management of forests, and other natural resources, and reductions in emissions of CFCs and other ozone depleting substances that are also radiatively important gases;
- o economically efficient and cost effective, in particular those that use market-based mechanisms;
- o able to serve multiple social, economic and environmental purposes;
- o flexible and phased, so that they can be easily modified to respond to increased understanding of scientific, technological and economic aspects of climate change;
- o compatible with economic growth and the concept of sustainable development;
- o administratively practical and effective in terms of application, monitoring and enforcement;
- o reflecting obligations of both industrialized and developing countries in addressing this issue, while recognizing the special needs of developing countries, in particular in the areas of financing and technology.

The degree to which options are viable will also vary considerably depending on the region or country involved. For each country, the implications of specific options will depend on its social, environmental and economic context. Only through careful analysis of all available options will it be possible to

determine which are best suited to the circumstances of a particular country or region. Initially, the highest priority should be to review existing policies with a view to minimizing conflicts with the goals of climate change strategies. New policies will be required.

* In the long-term perspective, work should begin on defining criteria for selection of appropriate options which would reflect the impacts of climate change and its costs and benefits on the one hand, and social and economic costs and benefits of the options on the other.

* Consideration of measures for reducing the impacts of global climate change should begin as soon as possible, particularly with regard to disaster preparedness policies, coastal zone management and control measures for desertification, many of these being justified in their own right. Measures to limit or adapt to climate change should be as cost-effective as possible while taking into account important social implications. Limitation and adaptation should be considered as an integrated package.

* { Assessing areas at risk from sea-level rise and developing comprehensive management plans to reduce future vulnerability of populations and coastal developments and ecosystems as part of coastal zone management plans should begin as soon as possible.

* Environmental objectives can be pursued through regulations and/or through market based economic instruments. The latter, through their encouragement of flexible selection of abatement measures, tend to encourage innovation and the development of improved technologies and practices for reducing emissions and therefore frequently offer the possibility of achieving environmental improvements at lower costs than through regulatory mechanisms. It is not likely, however, that economic instruments will be applicable to all circumstances.

* Three factors are considered as potential barriers to the operation of markets and/or the achievement of environmental objectives through market mechanisms. These are:

- i) information problems, which can often cause markets to produce less effective or unfavourable environmental outcomes;
- ii) existing measures and institutions, which can encourage individuals to behave in environmentally damaging ways; and
- iii) balancing competing objectives (social, environmental and economic).

An initial response strategy may therefore be to address information problems directly and to review existing measures which may be barriers. For example, prior to possible adoption of a system of emission charges, countries should examine

existing subsidies and tax incentives on energy and other relevant greenhouse gas producing sectors.

* With respect to institutional mechanisms for providing financial co-operation and assistance to developing countries, a two track approach was considered:

- i) one track built on work underway or planned in existing institutions. Bilateral donors could further integrate and reinforce the environmental components of their assistance programmes and develop cofinancing arrangements with multilateral institutions while ensuring that this does not impose inappropriate environmental conditions.
- ii) parallel to this track the possibility of new mechanisms and facilities was considered. Some developing and industrialized countries suggested that new mechanisms directly related to a future climate convention and protocols that might be agreed upon, such as a new international fund, were required.

* Governments should undertake now:

- o accelerated and co-ordinated research programmes to reduce scientific and socioeconomic uncertainties with a view towards improving the basis for response strategies and measures;
- o review of planning in the fields of energy, industry, transportation, urban areas, coastal zones and resource use and management;
- o encouragement of beneficial behavioral and structural (e.g. transportation and housing infrastructure) changes;
- o expansion of the global ocean observing and monitoring systems.

It should be noted that no detailed assessments have been made as of yet of the economic costs and benefits, technological feasibility or market potential of the underlying policy assumptions.

4. PARTICIPATION OF DEVELOPING COUNTRIES

It is obvious that the impact on and the participation by the developing countries in the further development of a future strategy is essential. The IPCC has attempted to address this specific issue by establishing a Special Committee on the Participation of Developing Countries and requested it to identify factors inhibiting the full participation of the developing countries in IPCC and recommend remedial measures where possible. The Committee stressed that full participation

includes not only the physical presence at meetings but also the development of national competence to address all issues of concern such as the appreciation of the scientific basis of climate change, the potential impacts on society of such change and evaluations of practical response strategies for national/regional applications.

The factors that kept developing countries from fully participating were identified by the Special Committee as:

- o insufficient information;
- o insufficient communication;
- o limited human resources;
- o institutional difficulties;
- o limited financial resources.

On some of these factors, the IPCC Working Groups have developed policy options which are to be found in their respective reports.

* Developing countries will, in some cases, need additional financial resources for supporting their efforts to promote activities which contribute both to limiting greenhouse gas emissions and/or adapting to the adverse effects of climate change, while at the same time promote economic development. Areas of co-operation could include, inter alia:

- o efficient use of energy resources, the use of fossil fuels with lower greenhouse gas emission rates or non-fossil sources, the development of clean and renewable energy sources, such as: biomass, windpower, wave-power, hydroelectric and solar, wherever applicable;
- o increased rational utilization of forest products, sound forest management practices and agricultural techniques which reduce the negative effects on climate;
- o facilitating the development and transfer of clean and safe technologies in areas which could include:
 - the building and manufacturing industries;
 - public transport systems;
 - industry;
- o measures which enhance the capacity of developing countries to develop programmes to address climate change, including research and development activities and public awareness and education programmes, such as:
 - the development of the human resources necessary to tackle the problem of climate change and its adverse effects;

- the provision of study and training programmes in subjects and techniques related to climate change;
 - the provision of skilled personnel and the material necessary to organize education programmes to develop locally the skills necessary to assess climate change and combat its adverse effects;
 - the development of climate-related research programmes organized on a regional basis;
- o facilitating the participation of developing countries in fora and organizations such as: the International Geosphere-Biosphere Programme, the Land-Ocean Interactions in the Coastal Zone, the Biosphere Aspects of the Hydrological Cycle, the Global Change Impact on Agriculture and Society, the World Climate Programme, the Man and the Biosphere Programme;
 - o facilitating participation by developing countries in international fora on global climate change such as the IPCC;
 - o strengthening existing education and research institutions and the development of new ones at national and regional levels.
- * Further, co-operation and assistance for adaptive measures would be required, noting that for some regions and countries, adaptation rather than limitation activities are potentially most important.
- * The IPCC concludes that the recommendations of the Special Committee need not and should not await the outcome of future negotiations on a climate convention. It appeals to the multilateral and bilateral funding organizations to implement its recommendations. It further appeals to governments for continuing and increased contributions to the IPCC Trust Fund on an urgent basis.

5. INTERNATIONAL CO-OPERATION AND FUTURE WORK

* The measures noted above require a high degree of international co-operation with due respect for national sovereignty of states. The international negotiations on a framework convention should start as quickly as possible after presentation of this Report in line with Resolution SS II/3 Climate.C. (August 1990) of the UNEP Governing Council and Resolution 8 (EC-XLII, June 1990) of the WMO Executive Council. Many, essentially developing, countries stressed that the negotiations must be conducted in the forum, manner and with the timing to be decided by the UN General Assembly.

This convention, and any additional protocols that might be agreed upon, would provide a firm basis for effective cooperation to act on greenhouse gas emissions and adapt to any adverse effects of climate change. The convention should recognize climate change as a common concern of mankind and, at a minimum, contain general principles and obligations. It should be framed in such a way as to gain the adherence of the largest possible number and most suitably balanced range of countries while permitting timely action to be taken.

Key issues for negotiations will include the criteria, timing, legal form and incidence of any obligations to control the net emissions of greenhouse gases, how to address equitably the consequences for all, any institutional mechanisms including research and monitoring that may be required, and in particular, the requests of the developing countries for additional financial resources and for the transfer of technology on a preferential basis. The possible elements of a framework convention on climate change were identified and discussed by Working Group III in its legal measures topic paper, appended to its Policymakers Summary.

* The IPCC recommends that research regarding the science of climate change in general, technological development and the international economic implications, be intensified.

* Because climate change would affect, either directly or indirectly, almost every sector of society, broad global understanding of the issue will facilitate the adoption and the implementation of such response options as deemed necessary and appropriate. Further efforts to achieve such global understanding are urgently needed.

Emissions scenarios developed by IPCC

The IPCC used two methods to develop scenarios of future emissions:

- * One method used global models to develop four scenarios which were subsequently used by Working Group I to develop scenarios of future warming. All of these four scenarios assumed the same global economic growth rates taken from the World Bank projections and the same population growth estimates taken from the United Nations studies. The anthropogenic emissions of carbon dioxide and methane from these scenarios are shown in Figures 1 and 2 below.
- * The second method used studies of the energy and agriculture sectors submitted by over 21 countries and international organizations to estimate CO₂ emissions.

Both scenario approaches indicate that CO₂ emissions will grow from about 7 BtC (billion or 1000 million tonnes carbon) per year now to 12-15 BtC per year by the year 2025. Scenario A (Business as Usual) includes a partial phase-out of CFCs under the Montreal Protocol and lower CO₂ and CH₄ emissions than the Reference Scenario. The Reference Scenario developed through country and international studies of the energy and agriculture groups, includes higher CO₂ emissions and assumed a total CFC phase-out. The results indicate that the CO₂ equivalent concentrations and their effects on global climate are similar.

Figure 1. Projected Man-Made CO₂ Emissions
(Billion or 1000 million tonnes carbon per year)

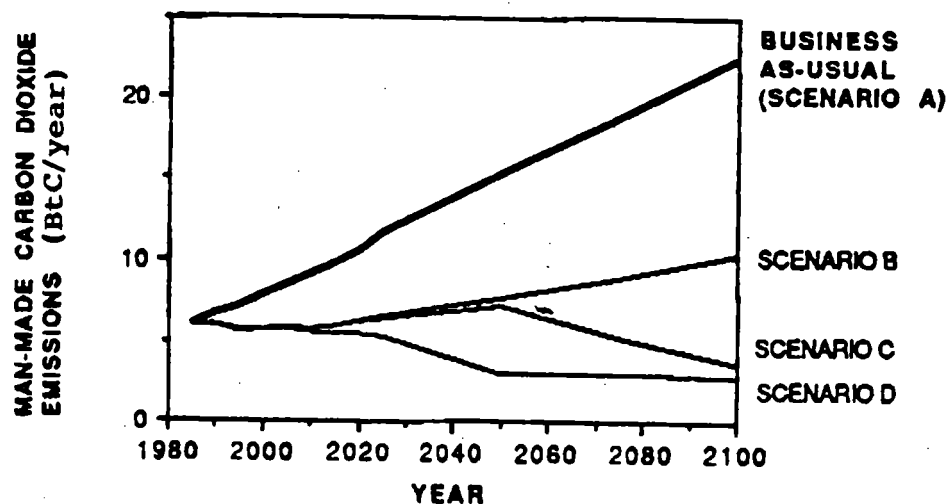
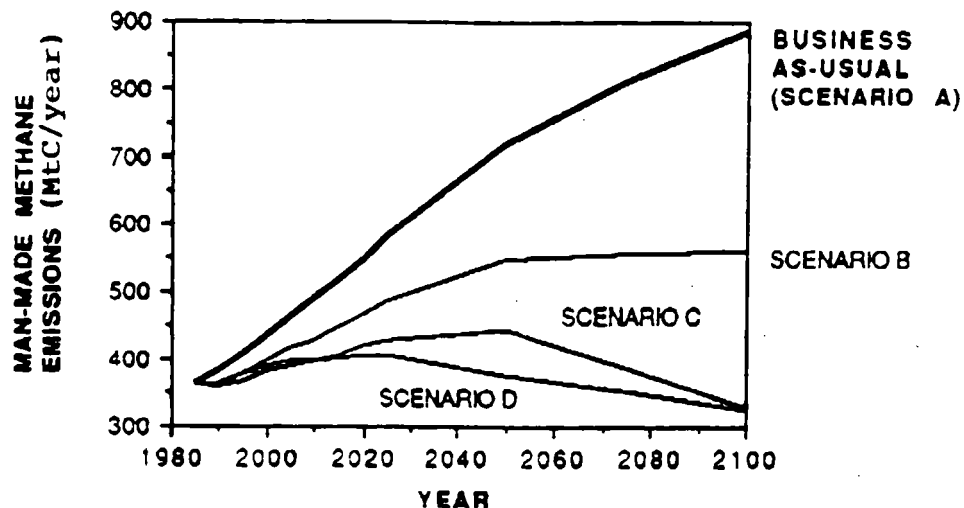


Figure 2. Projected Man-Made Methane Emissions
(Million tonnes carbon per year)



Method 1²

Scenario A (Business as Usual) assumes that few or no steps are taken to limit greenhouse gas emissions. Energy use and clearing of tropical forests continue and fossil fuels, in particular coal, remain the world's primary energy source. The Montreal Protocol comes into effect but without strengthening and with less than 100 percent compliance. Under this scenario, the equivalent of a doubling of pre-industrial CO₂ levels occurs, according to Working Group I, by around 2025.

Scenario B (Low Emissions Scenario) assumes that the energy supply mix of fossil fuels shifts towards natural gas, large

² All of the scenarios assumed some level of compliance with the Montreal Protocol but not with all of the (June 1990) amendments agreed to in London. The London amendments to the Montreal Protocol, when fully implemented, would result in a virtually complete elimination of production of fully halogenated CFCs, halons, carbon tetrachloride and methyl chloroform early in the 21st century. The Parties of the Protocol also call for later elimination of HCFCs. Thus, the assumptions of Scenarios A and B overestimate the radiative forcing potential of CFCs and halons. Additionally, the UN has provided recent population projections that estimate higher population than used in the global model scenarios (Scenarios A through D); use of these newer projections would increase future CO₂ emissions. Additionally, the Reference Scenario CO₂ emissions are higher than Scenario A (Business as Usual), suggesting Scenario A (Business as Usual) may be an underestimate.

efficiency increases are achieved, deforestation is reversed and emissions of CFCs are reduced by 50% from their 1986 levels. This results in an equivalent doubling of pre-industrial carbon dioxide by about 2040.

Scenario C (Control Policies Scenario) assumes that a shift towards renewable energies and safe nuclear energy takes place in the latter part of the next century, CFC gases are phased out and agricultural emissions (methane and nitrous oxide) are limited; an equivalent doubling of pre-industrial carbon dioxide will occur in about 2050.

Scenario D (Accelerated Policies Scenario) assumes that a rapid shift to renewable energies and safe nuclear energy takes place early in the next century, stringent emission controls in industrial countries and moderate growth of emissions in developing countries. This scenario, which assumes carbon dioxide emissions are reduced to 50% of 1985 levels, stabilizes equivalent carbon dioxide concentrations at about twice the pre-industrial levels towards the end of the next century.

Method 2 (see footnote 2 on previous page)

Using the second method, the so-called Reference Scenario was developed by the Energy and Industry Subgroup and Agriculture and Forestry Subgroup of Working Group III. Under the Reference Scenario, global CO₂ emissions from all sectors grow from approximately 7.0 BtC (per year) in 1985 to over 15 BtC (per year) in 2025. The energy contribution grows from about 5 BtC (per year) to over 12 BtC (per year). Primary energy demand more than doubles between 1985 and 2025 with an average growth rate of 2.1%. The per capita energy emissions in the industrialized countries increase from 3.1 tonnes carbon (TC) in 1985 to 4.7 TC in 2025; for the developing countries, they rise from 0.4 TC in 1985 to 0.8 TC in 2025.

Summary

All of the above scenarios provide a conceptual basis for considering possible future patterns of emissions and the broad responses that might affect those patterns. No full assessment was made of the total economic costs and benefits, technological feasibility, or market potential of the underlying policy assumptions. Because of the inherent limitations in our ability to estimate future rates of population and economic growth, individual behaviour, technological innovation, and other factors which are crucial for determining emission rates over the course of the next century, there is some uncertainty in the projections of greenhouse gas emissions. Reflecting these inherent difficulties, the IPCC's work on emissions scenarios are the best estimates at this time covering emissions over the next century, but continued work to develop improved assumptions and methods for scenario estimates will be useful to guide the development of response strategies.



WMO



UNEP

INTERGOVERNMENTAL PANEL
ON CLIMATE CHANGE

IPCC FIRST ASSESSMENT REPORT

OVERVIEW

31 AUGUST 1990

How to organize for the greenhouse

The sponsors of next week's conference at Geneva on climate change, the World Meteorological Organization and the UN Environmental Programme, should be careful not to push their luck by demanding too quick a treaty.

How does one seek to persuade the government of a country such as Uganda, where the incidence of AIDS among adults may exceed 10 per cent, that the prospect of global warming is an even more serious menace? Or a government such as that of the Soviet Union that economic growth and constitutional cohesion are less important than the avoidance of increased average surface temperature in other people's mid-latitudes? Or a government such as that of the United States, incapable on last week's evidence of charging its taxpayers for what they compel it by law to provide, that it should slap a tax on gasoline in the pursuit of atmospheric equilibrium when the same taxpayers reject the notion of an exactly similar tax targeted at economic survival? Evidently, a certain subtlety is required.

Subtlety, sadly, is not the strong suit of the organizers of next week's meeting at Geneva on climate change. The conference is almost calculated to evoke nothing tangible except howls of disappointment from the international environmentalist lobbyists who clamour for general adherence to a treaty for controlling greenhouse gases here and now. That is one reason why the organizers, the World Meteorological Organization (WMO) and the UN Environmental Programme (UNEP), should even at this late stage seek to exercise a calming influence on those attending. Another is that, because the excess greenhouse effect has indubitably come to stay, the more urgent need is to persuade constitutionally shortsighted governments to learn to look a century or so ahead. A third is that attempts to coerce governments into immediate action in causes of which they are not persuaded will usually leave them disaffected.

Yet at some stage there must be a treaty on greenhouse gases, preferably one to which all assent. All governments except those for the time being in crisis for other reasons agree with that.

So the trick that must be played on governments, in their own and their taxpayers' interests, is that they should start off with a common declaration of concern about global climate change — who in his senses could be unconcerned? — and that they should afterwards be compelled to make tangible (and monetary) commitments to the cause they have espoused. That is how the Montreal Protocol on ozone-unfriendly chemicals came about, with an initial declaration at Vienna. WMO and its friends are now saying that, with the precedent of Montreal, an inter-

national greenhouse convention could immediately spring into being. It would be more prudent to begin by collecting signatures for a general declaration. But next week is not the time for even that.

The meeting has a more specific purpose: to decide what to make of the reports of the three working groups of the Intergovernmental Panel on Climate Change (IPCC), which have been circulating in draft since June, to agree on the mechanism by which they should be rewritten and made to cohere with each other — and to keep IPCC in being. The first opportunity to sign a treaty will not come until February next year, at the intergovernmental conference arranged in Washington. The predictable protests that the Geneva meeting will have failed further to restrict the flow of motor cars will be beside the point.

There is nevertheless serious work to be done at Geneva. IPCC, like its three working groups, is a committee whose members are professionals, but which is not itself a professional organization. The result is that strong views flourish, but that the staff work is poorly done. Only that explains why IPCC's estimates of the consequences (called "impacts") of climate change, which anticipate by about a century the effects of carbon dioxide accumulation, have been put uncritically into circulation and uncritically accepted. It would help the greenhouse cause if IPCC could be reconstituted and only then renewed. The model should be UNSCEAR, the UN committee generating assessments of the hazards of ionizing radiation which is independent of its natural sponsor, the International Atomic Energy Agency. Getting WMO off IPCC's back would be a sufficient achievement for the Geneva meeting; finding more members carrying intellectual weight with the world at large, professional and otherwise, would be a bonus.

As things are, the outlook is not bright. Most of the influential governments at Geneva next week are likely to be preoccupied with other things — inflation, the Gulf, or both. They will be saying that it would have been better if the conference had been held a year ago, or if it could have been postponed. The only anchor is the diplomatic calendar; most of the people will turn up. Professionals' objectives at Geneva should be to reduce the greenhouse problem to its bare essentials, to get governments to agree that if there is a problem, something will have to be done. On such a platform, a convention could be built.

Date: October 1, 1990

To: Albert Gore Jr.

S, Leon Fuerth

From: Rick Adcock

Just got a call from Stockholm from Irving Mintzer, who's over there monitoring the developments in preparatory meetings for the 2nd World Climate Conference. Recall, that's the conference for which the IPCC prepared its reports. Recall also that Sununu has referred to the Working Group I (scientific) report as a political document (because he doesn't agree with it).

The 2nd World Climate Conference will occur in two parts. The first week will be a SCIENTIFIC AND TECHNICAL MEETING, and the first few days of the next week will be the MINISTERIAL MEETING.

Mintzer called to give me the heads-up that the US is busy torpedoing the 2nd WCC. Apparently what I'm about to describe happened over the weekend, and Mintzer will be spending the day trying to confirm the details... but for now, our best information is as follows (this information should be regarded as preliminary and it needs to be confirmed later today):

Obasi (head of WMO, whom you met several months ago) has apparently struck a deal with the US reps at the preparatory meeting -- in return for a US commitment to fund WMO's World Climate Research Program, Obasi has agreed to sever the link between the SCIENTIFIC/TECHNICAL MEETING and its reports, and the MINISTERIAL MEETING. This has the effect of keeping the WG1 scientific report (which is among the "reports" that will be presented at the SCIENTIFIC/TECHNICAL MEETING) from playing directly into the MINISTERIAL MEETING. As originally constructed, of course, the SCIENTIFIC/TECHNICAL MEETING was to evaluate the IPCC reports and pass them on the MINISTERIAL MEETING, where they were to be used as the basis for drafting the all- important ministerial statement, which is the substantive product of the 2nd WCC.

In addition, the US has orchestrated the development of a number of amendments to the ministerial statement, which means that the US wants the MINISTERIAL MEETING to turn into a 3-day shouting match about where the statement should say "might" and where it should say "will", rather than the ministers using the time to draft a consensus response strategy. In short, it sounds like the US is cleverly attempting to undermine the effectiveness of the 2nd WCC, in spite of the 2 years and 100's of thousands of man-hours spent preparing for the meeting through the IPCC process.

I asked Mintzer where Tolba was in all of this, but he claimed that the meeting is predominated by WMO, and Obasi is controlling it. US official spearheading this effort is J.R. Spradley, Spl. Ass. to U-Sec. of Comm for Int'l Env. Affairs.

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Quick Action Urged to Curb Global Warming

Associated Press

GENEVA, Oct. 29—The top U.N. environment official today urged immediate steps by industrialized countries to curb global warming, saying delay will only worsen a disaster looming over future generations.

Mostafa K. Tolba, head of the U.N. Environment Program, said a "complete change in attitudes and lifestyles" is needed to avert a danger "potentially more catastrophic than any other threat in human history."

A decade of research has made clear that only drastic reductions in emissions of carbon dioxide and other heat-trapping "greenhouse gases" will stop warming of the planet, Tolba told the opening session of a U.N. climate conference.

He said "large gaps in our knowledge" about the phenomenon should not be an excuse for inaction.

About 500 scientists attending the 10-day conference are expected to draft a new program proposing ways to fight the greenhouse effect.

A final meeting of about 80 ministers is expected to draw several heads of government, including Margaret Thatcher of Britain and France's Michel Rocard. The United States, still opposed to binding emission cuts, has sent a lower-level delegation.

The conference is supposed to launch formal negotiations on an international convention against global warming, to be ready for signing by mid-1992. Ministers are expected to provide the basis for the talks in a final declaration Nov. 7.

But Tolba said industrialized nations, which contribute three-quarters of all man-made greenhouse gases, must cut emissions even before a convention is in place. "The longer we delay, the worse the disaster will be for our children, and for our children's children," he said.

He said curbing emissions will be costly and requires great changes in "economic, legal and institutional systems." Developing countries would need more time and Western help.

"We are used to war and its price. We must now learn to live in peace, and to know and pay its price," said Federico Mayor, director-general of the U.N. Educational Scientific and Cultural Organization (UNESCO).

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