FOIA Number: 2017-1095-F

FOIA MARKER

This is not a textual record. This is used as an administrative marker by the William J. Clinton Presidential Library Staff.

Collection/Record Group: Clinton Presidential Records

Subgroup/Office of Origin: Council of Economic Advisers

Series/Staff Member: Joseph Stiglitz

Subseries:

OA/ID Number: 9569

FolderID:

Folder Title:
[Workplan of Intergovernmental Panel on Climate Change Notes and Correspondence] [Unfoldered]

Stack:	Row:	Section:	Shelf:	Position:
S	20	5	9	3

C. WORKPLAN OF THE IPCC REORGANIZED WORKING GROUP III

Explanatory Notes

Scope of Work

The efforts of the newly reconstituted Working Group III of IPCC will be carried out in the manner described in this work plan. Attached, and forming part of the work plan are the outline of the themes to be considered in the Working Group III Second Assessment Report (SAR) (Annex D) and the time-line for completion of various phases of the work (Annex G).

The Working Group will, in accordance with its Terms of Reference (see Annex C), prepare a comprehensive technical assessment of the socio-economics of mitigation of climate change, the impacts of climate change and adaptation to climate change over both the short and long term and at the regional and global levels. This contrasts with the work of Working Group II, which will be assessing the economic impacts on particular economic sectors at a more local level. Nevertheless, considerable collaboration between the two working groups will be necessary.

As reflected in United Nations General Assembly document A/AC.237/30 the chair of the Intergovernmental Negotiating Committee (INC) for the Framework Convention on Climate Change has requested that IPCC prepare, in time for the first meeting of the Conference of the Parties to the Convention (COP), "an evaluation of current scenarios of greenhouse gas[1] emissions and removals by sinks". The proposed time line addresses this request and assumes that the first meeting of the COP will take place in the spring of 1995. If this turns out not to be the case, the timing of activities shown that relate to the evaluation of scenarios would be adjusted accordingly. This element of the work is expected to build heavily on the work of the 1992 IPCC Update, which contained six greenhouse gas emissions scenarios. It is suggested that this work be carried out by examining the major assumptions made in developing the original scenarios and, based on whatever new information is available, assessing the validity and appropriateness of those assumptions and making recommendations on the need for updated or new scenarios. If it is agreed that new scenarios are needed, actions will have to be taken to develop them for the Second Assessment Report. The work on responding to the INC request will be closely co-ordinated with that on the same issue for the SAR by involving the same group of contributors. The IPCC Bureau is seeking clarification of the other elements of the INC's request, which raise cross-cutting issues which Working Group III may need to consider.

In evaluating scenarios and in developing its scientific and technical assessment, the Working Group proposes to undertake a number of specific activities, which are described in this work plan.

Principal Considerations

The work of the Working Group will be carried out with the following considerations in mind:

a) It will place the socio-economic perspectives of climate change in the context of sustainable development. In particular, and in accordance with the Framework Convention on Climate Change, the work of the Working Group will be comprehensive, cover all relevant sources, sinks and reservoirs of greenhouse gases and adaptation and comprise all economic sectors.

b) Institution and endogenous capacity building in developing countries will be integrated into the work programme.

[1] *Throughout this document, the term "greenhouse gas" is as defined in Article 1 of the Framework Convention on Climate Change*

c) The work of the Working Group will not stand in isolation from other IPCC activities. Consultation and co-ordination with the activities of the other Working Groups will be carried out to the greatest extent possible.

d) The work will, to the greatest extent possible, build on existing work, recognizing that the IPCC role is one of assessing existing knowledge for the Second Assessment Report.

e) The activities of the Working Group will take into account the special situations of developing countries and economies in transition and will be carried out at a pace and be of a type that allows for the full involvement of these countries.

f) The work will be carried out in as cost-efficient a manner as possible, bearing in mind the limited resource capacity of IPCC and all member countries. This implies close co-operation with other bodies working in the same fields in order to avoid duplication of effort.

Activities of the Working Group

The Working Group will prepare a report comprising its contribution to the IPCC Second Assessment Report and containing a technical assessment of the state of knowledge of the socio-economics of climate change mitigation, adaptation and impacts, taking into account the factors described in part (a) of the Terms of Reference of the Working Group. It is proposed that the structure of this report follow the proposed outline of the themes shown in Annex D.

The Working Group will also prepare a report, in time for the first meeting of the Conference of the Parties to the Convention, on the validity, appropriateness and utility of existing net greenhouse gas emissions scenarios based on the factors described in part (b) of the Terms of Reference of the Working Group. An update of this report, including any new scenarios that it is agreed should be developed, will be included in the Group's contribution to the IPCC SAR.

The preparation of both reports would be carried out as follows, using the dates indicated in the time line in accordance with the procedures described in the IPCC proposal for procedures for preparation, review and adoption of IPCC reports:

- The Bureau of the Working Group will ask governments and participating organizations to identify experts in their countries who could be involved as part of teams of lead authors, contributors, and expert reviewers for each report. Governments will also be asked to identify IPCC contacts for the purpose of co-ordinating later review by their governments.

- The Bureau of the Working Group will ask governments to suggest themes, dates and locations for IPCC workshops that could be held to review the scenarios and the scientific and technical work that is being assessed, bearing in mind the principal considerations noted above and the IPCC workshop policy. For reasons of economy and to avoid overlap and duplication, the Bureau will co-ordinate with other IPCC Working Groups and international organizations in conducting these workshops.

- Based on the suggestions of governments and participating organizations, the Bureau will meet with the Chair of IPCC and possibly with some of the experts identified, to decide on the detailed contents of each section of the reports, assign teams of lead authors for each section, and decide on which workshops should be held. The Bureau will also decide, from the perspective of Working Group III, whether IPCC co-sponsorship should be extended to other workshops, seminars or meetings.

- Lead authors will undertake preparation of the first drafts of each section and submit them to the Co-chairs, bearing in mind the tasks and responsibilities identified for contributors and themselves.

- The first drafts will be circulated for peer review to the specialists. Referenced material will be made available by the Co-chairs, who will collect the comments of the reviewers and make them available to the lead authors. Lead authors will then revise the drafts and if time permits in the schedule indicated in the time line, Co-chairs will circulate the revised drafts again for review.

- The revised drafts will be sent to governments and participating organizations for review.

- The summary for policy makers will be approved at a meeting of the Working Group in Plenary session and adopted by the Panel.

ANNEX C

TERMS OF REFERENCE OF IPCC WORKING GROUP III

Working Group III should deal with cross-cutting economic and other issues related to climate change. Two issues have been identified below at this stage. The IPCC may add other issues at subsequent plenary sessions. The Working Group shall establish its work plan for tasks (a) and (b) below, which shall be available to the IPCC for subsequent review as its work proceeds.

(a) Technical assessments of the socio-economics of impacts, adaptation and mitigation of climate change over both the short and long term and at the regional and global levels. The work plan should, inter alia, consider the following topics: top-down and bottom up economic modelling while taking into account assumptions, variables and applicability to and in different national economic circumstances; the evolution of technological change; methods for risk assessment; methods for the generic assessment of response instruments provided, however, that none of these tasks shall involve the Working Group in making policy judgements.

(b) The Working Group should consider and develop as necessary a range of internally consistent scenarios for future emissions based on reasonable economic, demographic and technological projections, and taking account of gaps and uncertainties in available knowledge, especially concerning the evolution of socio-economic development and technology; where possible, policy assumptions should reflect their economic and social consequences. The scenarios are intended to assist Working Groups I and II in their assessment of a range of future changes of atmospheric composition, resulting climate changes, and their impacts.

This work should be carried out in consultation with Working Groups I and II.

A peer review process should be incorporated in the preparation of the reports of the Working Group.

ANNEX D

OUTLINE OF THE THEMES TO BE CONSIDERED IN THE WORKING GROUP III SECOND ASSESSMENT REPORT

PREFACE

The preface will outline the mandate and terms of reference of the working group, describe how it went about producing the report, what the intended audience of the report is and the purposes for which the report should be used. The preface will note that none of the tasks shall involve the Working Group making policy judgements. Each chapter will also place the socio-economic perspectives of climate change in the context of sustainable development. The working group should analyze the issues as broadly as possible recognizing the Rio Declaration on Environment and Development, Agenda 21 and in particular the Framework Convention on Climate Change, as adopted.

EXECUTIVE SUMMARY

SUMMARY FOR POLICY-MAKERS

THE SECOND ASSESSMENT REPORT

The SAR consists of three parts. The first part addresses the scope of the assessment, and the remaining two parts address the mandate of the Working Group.

PART I: SCOPE OF THE ASSESSMENT

This assessment will include, inter alia, the socio-economic perspectives of climate change, the nature of the interactions between economic activity and climate change, and emissions scenarios. The assessment will address the global nature of the problem, taking into account particularly the circumstances of countries vulnerable to the impacts of climate change and to the impacts of response measures. In addition, it will cover a scientific evaluation of the appropriateness of the methodologies used for the analysis, including the socio-economic assumptions underlying existing modelling frameworks, its relations to observable data such as national accounts figures (GDP). To fulfil the scope of the analysis, existing supplementary indicators will be assessed.

PART II: THE SOCIO-ECONOMICS OF IMPACTS, ADAPTATION AND MITIGATION OF CLIMATE CHANGE

The mandate of the Working Group states that it should undertake "Technical assessments of the socio-economics of impacts, adaptation and mitigation of climate change over both the short and long term and at the regional and global levels. The work plan should, inter alia, consider the following topics: top-down and bottom up economic modelling...; the evolution of technological change; methods for risk assessment; methods for the generic assessment of response instruments...". For each theme in this part, a key question to be answered that addresses this section of the mandate has been identified.

CHAPTER 1: SOCIO-ECONOMIC FRAMEWORK FOR DECISION-MAKING

Key Question: How do we take socio-economic factors into account when making decisions about the climate change issue? The issues addressed under this theme will include, inter alia:

Socio-economics of climate change in relation to the need for sustainable development

Decision-making under uncertainty

The socio-economic factors to be considered when making decisions in the short and long term.

Risk assessment including, inter alia, discussion of the following questions:

What methods can be used to assess risk and what levels of confidence can be attached to such methods?
What are the perceptions of and responses to risk?
What are possible response measures?
What are the risks of inaction and of undertaking "no-cost" or cost effective "low-cost" response measures and of taking more far reaching response measures? (This section should take into account sequential decision-making, portfolio analysis, benefits and costs of taking action early versus late, and the long-term implications of short-term decisions).

Equity considerations including, inter alia:

Varying contributions between regions for past emissions, the "free rider" problem, efficiency and consumption patterns, inter-regional and inter-generational equity and the question of the time lags between the incurring of costs, the accruing of benefits and/or disbenefits.

Methods and applications of cost-benefit analysis including, inter alia:

Concepts such as opportunity costs, trade-offs, marginal costs and marginal benefits, limitations of cost-benefit analysis and consideration of alternative methodologies, and the value and importance of non-market factors such as biodiversity, long-term discounting, public perceptions, social well-being, thresholds and irreversibilities.

The value of information including, inter alia, discussion of the following:

Significant efforts are being undertaken every year on global climate research in the area of natural sciences. Where are the highest potential payoffs for likely future decisions? What are the most critical uncertainties, including scientific uncertainties? What kinds of research can reduce them and reinforce society's ability to confront uncertainty? What is the value of this scientific research in terms of its ability to describe the linkages between the natural sciences and socio-economics? What are the predictable trends of scientific and technical progress in efficiency of use of different energy types with respect to carbon intensity and in the adaptation of species to new climatic situations?

Sociological considerations

CHAPTER 2: ASSESSING THE BENEFITS OF RESPONSES TO CLIMATE CHANGE

Key Question: What methods exist for assessing the economic and social benefits of action and inaction? The issues addressed under this theme will include, inter alia:

Methods for estimating benefits

The status-quo option. What would be the socio-economic impacts in the absence of any action to deal with the problem of increasing concentrations in the atmosphere of greenhouse gases and aerosols? How would the benefits vary with different degrees and timing of actions to limit climate change?

Methods based on market impacts - for example, adaptation through trade, market agents, migration of population and economic activity.

Methods based on non-market impacts such as ecological and social impacts.

Major issues in estimating benefits

An assessment of the state of knowledge related to issues involved in estimating benefits, including, inter alia, distinguishing between short-term and long-term impacts; the relationship of impacts to the degree, timing and predictability of climate change; techniques for valuing impacts on ecosystems; hard-to-define values such as aesthetics, impacts on land use, impacts on biological diversity and other environmental problems, social well-being; and modelling limits dealing with thresholds, irreversibilities and time horizons.

Methods for estimating the costs of human adaptation

CHAPTER 3: EVALUATING THE COSTS OF MITIGATION OF GREENHOUSE GAS EMISSIONS BY SOURCES AND REMOVAL BY SINKS

Key question: What are economic, social and environmental contributions to understanding, both conceptually and empirically, the costs of mitigation of greenhouse gas emissions? The issues addressed under this theme will include, inter alia:

Variables for measuring costs

A discussion of costs from a long-term perspective, including, inter alia, measures such as social welfare, health and other environmental effects, real incomes, trade, productivity, and income transfers among regions.

Assumptions in empirical analysis including, inter alia:

- Modelling assumptions including uncertainties and ranges
- Technological change
- Macro-economic and demographic assumptions such as productivity growth, population and labour force change and structural change in economies
- Consumption patterns
- Fuel supply schedules, including the potential of renewable fuel and energy technologies, demand and supply elasticities and exchange rates
- Land use

Policy instruments, and their potential effects, for domestic and regional use including, inter alia:

- Economic instruments such as taxes, subsidies, tradeable permits, tradeable absorption obligations, user charges and deposit-refund schemes
- Regulatory instruments including technology-based and performance-based
- Other instruments such as land use programmes and public awareness and education programmes

Modelling Methods

A description of various types of models (eg. "top down" and "bottom up") according to purpose, and a discussion of their relative strengths and weaknesses, including, inter alia, a discussion of data limitations and limitations of model applications, the reasons for differences in the predictions made by them and ways to evaluate those results, and the integration of modelling techniques (eg. bottom up studies of new technologies). The appropriateness of the modelling methods should be discussed in relation to the problems of developing countries and should reflect the concerns and special conditions of developing countries. The models should include as many different policy instruments as possible. Possible other issues include dynamic versus static models, econometric

versus parametric models, perfect versus limited foresight in models, the treatment of international trade, model time horizons and how various modelling techniques could be integrated. Different policy options will be used to derive model outputs.

Model Comparisons

A comparison of results including, inter alia, distributional impacts and reasons for differences, the impact of response measures by industrialized countries on developing countries and a survey of the degree of dependency of countries on the production, exportation and consumption of fossil fuel and associated energy-intensive products. A special effort will be made to incorporate developing country studies.

Major issues of cost estimation

Potential topics include, inter alia, unilateral versus multilateral responses, with trading allowed or not; the timing of responses and the amounts of reductions; and other matters such as eliminating subsidies and recycling revenues.

Topics for future work

A discussion of the types of future research needed such as the integration of bottom up studies into macroeconomic and general equilibrium models, research into the impacts of sustainable development practices, and identification of future work needs, particularly regarding the needs of developing countries.

CHAPTER 4: GENERIC ASSESSMENT OF RESPONSE OPTIONS

Key question: What methods exist for assessing the net costs and effectiveness of different response options in a comprehensive manner?

The discussion of cost evaluation in each of these sections should incorporate a discussion of net costs and should include complementary socio-economic effects, both negative and positive, on such elements as GDP, employment levels, the balance of trade, economic structure, and the environment. The issues addressed under this theme will include, inter alia:

Adaptation options

A discussion of different options for developed countries, developing countries and those with special circumstances (e.g. low lying, arid, and countries in transition).

Mitigation options

A discussion of mitigation measures which should reflect, for example, the concept of comprehensiveness (all greenhouse gases and sinks and sectors), including, inter alia, reducing emissions by correcting market and government policy shortcomings, eliminating subsidies and barriers, dissemination of information and technology co-operation, and introducing economic instruments.

Methods for assessing the effectiveness of options including, inter alia, the use of models and the extent to which models incorporate the full range of options and conditions

Comparison within and between mitigation and adaptation response options

The comparison should include, inter alia, their cost effectiveness, their influence on innovation and promoting environmentally sound technologies, their influence on other environmental matters, their ease of administration monitoring and enforcement, their capacities to cope with uncertainties, their data requirements and equity and sustainable development considerations.

Technological change

A discussion of the factors determining technological change as a driving force for, as well as a way to control net greenhouse gas emissions (e.g. renewable energy, low energy systems, carbon sequestration, etc.), taking into account the penetration, diffusion and transfer of technology and the different dynamics in developed and developing countries; and which of these factors can be influenced and how.

Internationally-coordinated instruments

A discussion of mechanisms such as "joint implementation", carbon leakages (shifts of carbon-intensive activities) linked to demographics, consumption patterns and economic growth of industrialized and developing countries, assistance and trade aspects, and the possibilities and difficulties of internationally co-ordinated instruments.

PART III: EMISSIONS SCENARIOS

CHAPTER 5: CONSIDERATIONS OF CONSISTENT SCENARIOS

The mandate of the Working Group states that it "should consider...a range of internally consistent scenarios for future emissions based on reasonable economic, demographic and technological projections." With this in mind, the key question to be answered is "Which issues and uncertainties about key variables may critically affect future net greenhouse gas emissions and aerosol concentrations?" The issues addressed under this theme will include, inter alia:

Types of models for scenario development and their application

The assumptions made in developing existing scenarios

A discussion of the key assumptions concerning, inter alia, economic growth, demographics, consumption patterns, technological change, energy prices and supply, international trade flows, distributional issues, social change, sustainable development, land use, and non-greenhouse gas environmental constraints such as acid rain.

The relative importance and sensitivity of different variables in determining future emissions and sinks

The relationships among key variables

The sensitivity of these variables, most notably to government actions

The relationship of scenarios to the emissions inventory methodology developed by Working Group I

- A number of country studies are being completed and could make a useful contribution to scenario analysis

The degree of uncertainty including, inter alia, a discussion of the following questions:

- What are the gaps and uncertainties in available knowledge about these factors and their influences on emissions?
- What does the extent of this uncertainty tell us about the validity of current scenarios? How do existing IPCC scenarios compare with other existing scenarios? Are new scenarios required?
- What are likely to be the impacts of this uncertainty on short and long-term future emission scenarios?

Model structures for analysis of scenarios including, inter alia, a discussion of the following questions:

- How useful are current models in terms of their regional detail, solution algorithms and data?

- What are the characteristics of current models?

- The sensitivity and flexibility of models to technical and structural assumptions

The appropriate uses, capabilities, and limitations of emissions scenarios in scientific assessment and policy-making

An assessment of the need for future work on scenarios to serve the needs of climate modelling, planning of response measures, and provision of information to the Conference of Parties to the Framework Convention on Climate Change

rec'd 8/29/94

cc: SK

August 24, 1994

Professors Joseph E. Stiglitz and José Goldemberg
Executive Office of the President
Council of Economic Advisers
Washington, D.C. 20500
U.S.A.

Dear Professors Stiglitz and Goldemberg:

I have just been able to review the draft for the IPCC Working Group III Writing Team 1. It is a very good introductory chapter to the report. I thank you for your great trouble.

I have some comments and suggestions, which I send to you with this facsimile. I look forward to seeing you again at Geneva.

Best regards.

Sincerely yours,

Akihiro Amano

Akihiro Amano

August 23, 1994

Comments on "WRITING TEAM1: SCOPE OF THE ASSESSMENT"

Akihiro Amano

The present reviewer finds this draft for the Scope Chapter quite illuminating, covering very appropriate topics in an well-organized manner. The following pages present some comments of the reviewer, listed according to the order of the discussions in the draft. He hopes that due considerations will be given to them in the final version.

1. On page 9 and elsewhere, a familiar decomposition equation for greenhouse gas emissions is shown. It shows that changes in GHG emissions can be decomposed into four factors: (a) changes in GHG intensity of energy use, (b) changes in energy intensity of output, (c) changes in output per capita, and (d) changes in population. (The same equation appears on page 100.) A paper by Y. Ogawa summarizes interesting findings within this framework. (Cf. Yoshiki Ogawa, "Analyses of Factors Affecting Carbon Dioxide Emissions Due to Past Energy Consumption Around the World," in Barry P. Jones and Edward F. Wheeler, eds., *Greenhouse Research Initiatives in the ESCAP Region: Energy*, Proceedings of a conference, Bangkok, 21-23 August 1992, ABARE, Australia, 1991.) A reference to this paper might be appropriate.

On page 75, however, it seems that a different decomposition scheme is called for. That is, by focusing on CO_2 emissions the methods of reducing CO_2 emissions are classified into three types: (a) reducing emissions from energy supply (e.g., fuel switching and increased conversion efficiency), (b) increasing end-use efficiency, and (c) shifting consumption patterns away from energy-intensive goods and services. These different approaches suggest that there exists a more general framework which can indicate various important channels through which we can influence CO_2 emissions. For example, we can write

$$\begin{aligned} &CO_2 \text{ emissions} \\ &= \Sigma_h \,(\text{Carb. Emis}_h/\text{Prim. Energy}_h)(\text{Prim. Energy}_h/\text{Tot. Prim. Energy}) \\ &\quad \times \Sigma_i \,(\text{Prim. Energy}_i/\text{Second. Energy}_i)(\text{Second. Energy}_i/\text{Tot. Second. Energy}) \end{aligned}$$

$\times \Sigma_j(\text{Second. Energy}_j/\text{Output}_j)(\text{Output}_j/\text{Tot. Output})$

$\times \Sigma_k(\text{Output}_k/\text{Population}_k)(\text{Population}_k/\text{Tot. Population})$

$\times$ Population.

Thus, a reduction of carbon emissions is possible through

(1) a reduction of carbon intensity of primary energy h through technological change or carbon-fixing;

(2) use of a less carbon-intensive technique for the production of primary energy h through price inducements;

(3) a reduction in the share of carbon intensive energy in primary energy supply;

(4) a reduction of carbon intensity of secondary energy i through technological change or carbon-fixing;

(5) use of a less carbon-intensive technique for the production of secondary energy i through price inducements;

(6) a reduction in the share of carbon intensive energy in secondary energy supply;

(7) a reduction of secondary energy intensity for output j through technological change or carbon-fixing;

(8) use of a less carbon-intensive technique for the production of output j through price inducements; or

(9) a reduction in the share of carbon intensive output in total output through price inducements to demand.

This kind of explanation can illuminate important nodes upon which we can operate, such as (a) energy conversion or energy end-use; (b) choice of techniques or technological change; (c) exogenous effects or endogenous, price-induced effects; and (d) supply-side (choice of production methods) or demand-side (composition of inputs or outputs).

2. The last sentence of 2) on page 17 seems to neglect the experiences in Nordic countries after 1990. Or, does it mean to say "an *international* carbon-tax scheme"?

3. The content of the third paragraph of 3) on page 17 does not seem to fit the title of this sub-section. It seems to be better included under 1) on the previous page.

4. Section 1.3 on page 19 attempts to cover important cost items of global warming. As I summarized in my earlier contributing memorandum to the Writing Team 1, Fankhauser and Cline also estimated the magnitudes of various damage items other

than covered in this draft. The items not covered in this draft are, for example, migration, Hurricanes, Construction, Leisure activities, Urban infra-structures, Air pollution, etc. There seems to be no reason to disregard them, even though they need not be mentioned item by item.

5. On page 22, the first line of 1.3.1.3 reads, "A warmer climate implies both northward movement of forests and changes in forest composition." I am afraid this is a view of the people living in the northern hemisphere.

6. In Section 1.3.3 on pages 27-28, irreversibilities are treated as something parallel to catastrophic events. However, I understand that global warming itself is an irreversible phenomenon within a human time scale, because of cumulative effects of GHGs with a quite long time-lag. I should like to have the role of irreversibilities in the present context a little bit more clarified.

7. The sentence starting at the second line of page 29 reads, "For intertemporal planning, this implies that consumption per head should be the same for all generations." I wonder if this statement is correct. Consider a developmental path along which per capita income at the highest income bracket remains the same, whereas the per capita income level of the poorest bracket improves over time. Suppose also that income distribution ultimately becomes perfectly equal. This kind of situation is quite consistent with the max-min criterion, even though consumption per head would not naturally be the same for all generations except at the steady-state.

8. The draft quotes a view that justifies discounting the future on a basis of the possibility that future generations may not exist (the first paragraph on page 31). There are a couple of arguments, however, against such a view advanced by Clive Spash (see Clive L. Spash, "Economics, Ethics, and Long-Term Environmental Damages," *Environmental Ethics*, Vol. 15, No. 2, Summer 1993, pp. 117-132). It would be fair to mention this literature as well.

9. In discussing the sharing of tax burdens, it is stated, "As we have noted, it is possible to ascertain the economic benefits of mitigation, and these are likely to be quite unequally distributed." (The first paragraph on page 45.) There is a question, however, whether people in developing countries take the effects of mitigation as benefits to them, as they might consider that the mitigation simply restores the old

status quo which is naturally to be expected. This is the so-called initial point problem to be addressed somewhere.

10. In the middle of page 45, the implications of population policy for income distribution policies are discussed, and, in relation to that, the question of initial allocation of tradable permits is taken up. However, in the section where the tradable permit system is the main subject, the initial allocation has not been discussed. Since the discussion above only relates to the population problem, it seems to be necessary to give a full expositions concerning pros and cons of allotting or bidding or whatever methods of allocating the initial emission quotas somewhere. Or, we can explicitly mention that we leave it to other writing teams.

11. The last sentence in the first paragraph of page 48 reads, "Analyzing the optimal intertemporal structure of taxes, to minimize long run ambient levels of greenhouse gases, taking into account both intertemporal substitution and substitution across energy sources, is a complicated technical issue, that to date has not been adequately analyzed." Although much depends on what "adequately analyzed" means, there are many works such as those by Prof. Alan Manne and Dr. Richard Richels that addressed this problem squarely.

12. The word "emissions" in the second line from bottom of paragraph 3 on page 50 should read "concentration."

13. In the middle of the third paragraph on page 51, it is stated that countries with northern climate are likely to find costs of adaptation particularly small. Is this true in view of the fact that the increase in average temperature tends to be higher, the higher the latitude?

14. Discussions on climate engineering are always followed around by some sort of uneasiness (at least to me), because they seldom accompany discussions on environmental assessment of engineering options themselves. If they have other environmental costs (both direct and indirect) with unknown risks, it would be dangerous to build a feeling that they are something that one can rely upon when other options prove to be unexpectedly costly.

15. In discussing the United Nations Framework Convention on Climate Change, the draft touches upon the standard views concerning equity in a fairly abstract manner (the first paragraph on page 56). Readers will find it difficult, however, what "earlier discussions on principles of public finance" really mean in the present context. Discussions could be more explicit.

16. "Table 1" in the second line from the bottom of page 56 is missing. Are CITES and Basel Convention also included in this table?

17. In Section 1.4.6.4 the implications of international trade for the global and local impacts of costs of warming are discussed. This is, of course, an important topic. On the other hand, international trade in forest products may have been encouraging deforestation because international prices of forest products do not fully reflect their social costs. In order to have international prices reflect true social costs, importing countries could introduce import charges on tropical woods, and transfer the revenue to the exporting countries to finance environmental programs. Higher prices in importing countries can limit consumption, and lower international prices will limit excessive deforestation. This kind of discussion should be included somewhere (possibly in Section 1.8.5.3 on page 106).

18. References would be useful for the last point mentioned in the first paragraph on page 64.

19. The argument in the third paragraph on page 64 depends on an implicit assumption that the timing of low-carbon or no-carbon energy sources becoming relatively cheaper is determined exogenously. If it is dependent upon control variables of policy options, i.e., if higher prices of carbon emissions now can hasten the introduction of low-carbon or no-carbon energy sources, then the optimal delay of emission limitation would become shorter.

20. There seem to be two sources of irreversibilities in relation to Section 1.5.3.1 on page 67: first, the fact that emission control investments involve sunk costs, and second, the fact that no action now leads to a higher atmospheric concentration of GHGs which after a long time-lag must bring about global warming. These two irreversibilities work in opposite directions with each other.

21. In the discussion of Section 1.5.3.3 on page 68, it is not quite clear what the phrase "direct expenditures on emission reductions" really implies. Just as we can argue whether direct regulations are more resource-efficient in inducing technological innovation than economic instruments, we can compare the resource-effectiveness of R&D expenditures with economic instruments (i.e., we compare the amount of resources devoted to R&D and economic costs involved in adopting economic measures with due allowance for discounting). Then, the efficient policy would not be of an either-or style, but would involve both at appropriate rates.

22. A sentence in the third paragraph on page 69 reads, "For example, the goal of stabilizing emissions would cost far less if averaging is allowed among different years along the path than if emissions must not rise in any year; to the atmosphere, what matters at any given time is total concentrations, not the emissions path." Two cautions are in order: first, there exists an uncertainty that postponed emission reduction efforts will not be carried out under expected conditions; second, when the time period of averaging is very long, benefits and costs can accrue to different generations. These two considerations would put certain constraints to the use of averaging.

23. Again, the problem of irreversibilities appears in Section 1.5.4.1.3 on page 69. Here, it is stated that in the absence of threshold damage effects, the dominant irreversibility is not in the climate system, but rather in commitments to capital stocks to control emissions. We would like to know the opinions of scientists on the importance of threshold damages. Would it be possible to ask some help from people in the Working Group II?

24. The argument in the last paragraph on page 71 presupposes an independent action of individual countries. It seems that emphasis should also be given to the importance of international approaches. Portfolio of policies to complement or to support those approaches might be quite different from one taken from an individual country point of view.

25. Another question concerning "no regrets policies" discussed in the last paragraph on page 72 would be whether they are enough (or conversely whether they would become too much if pursued all at once).

26. In 8th line of the third paragraph on page 76, the word "permits" should read "permit prices."

27. In 2nd line of the fourth paragraph on page 90, "industrial" should read "household."

28. The definition of "Sustainable Development" by the Brundtland Commission presented on page 99 appears insufficient by itself. One of the important elements of SD emphasized by the commission is intra-generational equity and especially the eradication of poverty. The last sentence in Section 1.8.5.4 on page 109 states exactly this.

29. The third and fourth paragraphs on page 106 just seem to highlight the usefulness of Joint Implementation in attaining "leapfrogging" earlier development paths, in decoupling energy use from economic growth, and in reducing deforestation in developing countries.

① Embedding equity issue into explicit social welfare context

Pareto efficiency
egalitarian social welfare function
Nozick
Rawls   Coase

② Hartwick – appropriate counterfactual
live between population / cumulate past
unit of analysis

③ If c.c. large enough, sustainable development

④ How to incorporate Rawls across generations / within
If ineq ↓ ⇒ more burden on future

⑤ Criticism of maxmin ⇒ criticism of Rawls

p.18 optimal value of oil extraction

p.19 implied assumptions about cc
generations vs individuals
$\delta \approx 0$
Weighted utility
Non separability in other contexts

p23 diff. between declining return on cap. & neg. return on capital
p 22
p 23 Not just current

32 moral legal issues in linear net

Distribution of costs among devel. countries,
e.g. for R+D