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Steering Committee for the Workshop
on the Control of Chloroflurocarbons

First session
London, 17-18 September 1985

REPORT OF THE STEERING COMMITTEE MEETING

INTRODUCTION

1. In accordance with part I paragraph 6 of the Governing Council decision 13/18 dated 24 May 1985 and in accordance with the annex to that decision, the first meeting of the Steering Committee for the Workshop on Chlorofluorocarbons was held at the headquarters of the United Kingdom Department of the Environment on 17 and 18 September 1985.

I. ORGANIZATIONAL MATTERS

A. Opening

2. The first meeting of the Steering Committee was opened by the UNEP Secretariat. Mr. Daniel Gruffydd Jones, Head of the United Kingdom Central Directorate of Environmental Protection welcomed participants on behalf of the United Kingdom Government which hosted the meeting. In his opening statement he stated that the need to control chlorofluorocarbons was no longer questioned, but there were still divergent views on how control could best be achieved. Now that the Convention for the Protection of the Ozone Layer had been agreed it was necessary to consider all the various options for controlling chlorofluorocarbons so that a protocol could be prepared.

B. Attendance

3. The first meeting of the Steering Committee was attended by experts from Brazil, Egypt, India, Norway, United Kingdom, United States of America, EEC and UNEP (list of participants attached - Annex I).

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C. Election of Officers

4. At the opening of the meeting, the Steering Committee unanimously elected Miss Fiona McConnell, Head of the Environmental Protection International Division in the United Kingdom's Department of the Environment as Chairman.

D. Organization of the meeting

5. The Steering Committee agreed on the agenda (UNEP/WG.131/1).

E. Overview of the latest Scientific Findings

6. Prior to the commencement of discussions, the UNEP Secretariat presented an assessment of the risk to the Ozone Layer according to the latest scientific information. A paper prepared by the UNEP Secretariat on this subject was distributed to the Steering Committee members (Annex II to the Report).

F. Discussion and Selection of Topics for Workshop, Discussion and Selection of Papers to be Commissioned and Allocation of Responsibilities for Commissioning of Papers

7. Various papers and questions which had been proposed by some of the Steering Committee members and other signatories to the Vienna Convention as topics that might be addressed in the Workshop on CFCs had been circulated for consideration by the Steering Committee. During discussion of agenda items 4, 5 and 6, agreement was reached on the topics to be covered by the Workshop which are listed in Annex III.

G. Timetable of Preparation of Papers for Workshop: Organization of Possible Second Meeting of Steering Committee; Organization of Workshop

8. It was agreed that the workshop should be held in two parts as this would allow greater discussion and a more detailed consideration of the papers to be produced. However, during discussions, reservations were expressed regarding this approach.

9. A sub-group was established with the aim of preparing a timetable of preparation of papers for workshop and for organization of workshop. The sub-group prepared the timetable which is attached to this report as Annex IV.

10. It was agreed that the second meeting of the Steering Committee, hosted by the Commission of the European Communities, will be held in Brussels on 6 December 1985.

11. The expert from Brazil stated that one of the objectives of the workshop should be to stimulate the exchange of ideas and scientific data on the CFC question between all countries and, in that sense, expressed the view that, within the resources made available for the workshop, provision should be made to cover the costs of participants from developing countries who would submit papers for the workshop. This point was welcomed and agreed upon, in principle, by the Steering Committee, which will come back to this question during its second meeting, when a more precise schedule of resources and expenses will be available.

12. It was decided that the format of the workshop should be restricted to that agreed by the Steering Committee with any relevant papers not falling within this format being tabled as background information only.

13. It was agreed that individual papers for the workshop should not exceed 20 pages in length with any necessary supporting information being attached as annexes.

14. It was agreed that the final report of each phase of the workshop should be restricted to a factual account of discussions, drawing attention to areas of agreement and form the basis for the work of Ad Hoc Working Group of Legal and Technical Experts to elaborate a protocol on chlorofluorocarbons (Vienna Group). The final report of each phase of the workshop should be distributed to the Vienna Group.

15. It was decided that papers for the workshop should be prepared covering the various topics listed in Annex III. The UNEP Secretariat accepted responsibility for co-ordinating the preparation of papers under topic I. The United States of America, accepted responsibility for co-ordinating the preparation of topics 2, 5, 6 (a) and 6 (d), the Commission of the European Communities of 4 and 6 (b) and the United Kingdom of 3 and 6 (c) respectively and to approach technical experts to commission relevant papers.

16. The representative of the Commission of European Communities expressed its willingness to support the first phase of the UNEP workshop and undertook to investigate the possibilities of arranging a venue in one of the countries of the Community, if possible a residential hotel with conference facilities. The Commission agreed to report on progress in securing a venue to UNEP as soon as possible. The representative of the United States of America said that his country would be prepared to host the second phase of the UNEP workshop and would identify a suitable venue in the United States for this purpose. It was agreed that each phase of the workshop should extend over five days.

II. RECOMMENDATIONS

17. The Steering Committee makes the following recommendations to the Executive Director:

(a) Following the Final Act of the Conference of Plenipotentiaries on the Protection of the Ozone Layer signed at Vienna on 22 March 1985, in particular paragraph 2 of the Resolution on a Protocol Concerning Chlorofluorocarbons, the secretariat should send to all the participants of the Conference of Plenipotentiaries on the Protection of the Ozone Layer a letter requesting them to provide UNEP with the background factual data on their current production capacity, production, use, emissions, trade and current regulation of chlorofluorocarbons.

(b) To convene the second meeting of the Steering Committee on 6 December 1985 in Brussels at the kind invitation of the Commission of European Communities.

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(c) Letters of invitation to all countries for the workshop meetings to be prepared and sent by the UNEP secretariat. By these letters the countries not represented on the Steering Committee should be invited to note the arrangements agreed by the Steering Committee and to contact the organizations or countries responsible for the preparation of topics for the workshop should they wish to contribute on specific items.

(d) That UNEP convene the first meeting of the Ad Hoc Working Group of Legal and Technical Experts to elaborate a protocol on chlorofluorocarbons in early November 1986 with a view to a second meeting in February 1987 and the Diplomatic Conference in April.

III. ADOPTION OF THE REPORT AND CLOSURE OF THE MEETING

18. With the agreement of the Steering Committee, Miss McConnell handed over the Chairmanship of the Steering Committee to Mr. David Perridge, Principal in the Environmental Protection International Division in the United Kingdom's Department of the Environment. The Steering Committee then considered the draft report presented by the Secretariat and adopted it after various amendments. Following the customary exchange of courtesies Mr. Perridge declared the session closed.

Annex I

LIST OF PARTICIPANTS

Brazil	Mr. S. Duarte	Ministry of Foreign Affairs
Egypt	Mr. O. Metwally	Egyptian Embassy, London
India	Mr. B.B. Tarei	Indian High Commission, London
Norway	Mr. P. Bakken	Ministry of the Environment
United Kingdom	Miss F. McConnel	Department of the Environment
	Mr. D.L. Perridge	Department of the Environment
Observers	Mr. S. Bickel	Department of Trade and Industry
	Mr. A. Howson	Department of Trade and Industry
	Dr. G.J. Jenkins	Department of the Environment
	Mr. A. Sinfield	Department of the Environment
United States of America	Ambassador R. Benedick	State Department
	Mr. J. Hoffman	Environmental Protection Agency
Observer	Mr. J. Losey	Environmental Protection Agency
Commission of the European Communities	Mr. G. Del Bino	Directorate General XI
United Nations Environment Programme	Mrs. I. Rummel-Bulska	Programme Officer Environmental Law Unit
	Mr. P. Usher	Programme Officer, Environmental Assessment Service

Annex II

ASSESSMENT OF RISKS TO THE OZONE LAYER

Prepared by
UNEP

I. THE UNEP ROLE IN THE RISKS TO THE OZONE LAYER ISSUE

The question of possible depletion of ozone and its consequences first became an issue of serious concern in the early 1970's when it was postulated that certain substances of anthropogenic origin, particularly fluorocarbons, could by catalytic action deplete the earth's ozone shield. As ozone is the principal absorber of damaging ultra violet radiation which is known to have adverse consequences for human and animal health, agricultural yields and other biological processes, the issue was an obvious candidate for closer examination by the United Nations Environment Programme.

The task fell to the Outer Limits Programme of the Environmental Assessment Service which was also taking an interest in another 'Outer Limit', the modification of climate as a consequence of increasing carbon dioxide in the atmosphere. The term Outer Limit being used to denote the limit to which the environment might be perturbed by human action without serious adverse consequences occurring.

A World Plan of Action on the Ozone Layer was drawn up by a Meeting of Experts in 1977 to be implemented by United Nations bodies, specialized agencies, international, national, inter-governmental and non-governmental organizations and scientific institutions. UNEP's designated role was of a broad co-ordinative and catalytic nature aimed at the integration and co-ordination of research efforts. To fulfil this role, UNEP established a Co-ordinating Committee on the Ozone Layer (CCOL) composed of representatives of the agencies and non-governmental organizations participating in the World Plan of Action as well as representatives of countries which have major scientific programmes contributing to the Plan.

The CCOL met first in November 1977 and then again a year later where it made its first assessment of ozone layer depletion and its impact. At periodic intervals, consistent with suspected advances in the understanding of the ozone layer issue, the committee is convened and currently have met seven times. The report of each meeting, consisting of a review of ongoing and planned research results, and assessment of ozone layer modification and its impacts based on the research results, recommendations for future research and information on production and use of chlorofluorocarbons 11 and 12 supplied by the Chemical Manufacturers Association, is published in the periodic UNEP Ozone Layer Bulletin. UNEP has associated itself with several international and national programmes concerning ozone and which complement the UNEP assessment programme. Currently underway, is a joint assessment of the state of the ozone layer with NASA, WMO and several other organizations. The assessment report is near completion and reference will be made to some of its preliminary findings of this assessment in Part III of this paper.

As previously mentioned, UNEP has also been concerned with the carbon dioxide/climate question. Originally perceived as a separate issue, it has become apparent that trace gases other than carbon dioxide have an impact on climate processes and also that carbon dioxide itself plays an important role in determining stratospheric ozone concentrations. The climatic impact of a vertical redistribution of ozone as well as changing concentrations of radiatively-active gases enhancing of the greenhouse effect have made the two issues indivisible. A parallel assessment programme concerned with the impact of radiatively-active gases on climate is currently being undertaken jointly by UNEP, WMO and ICSU and a second assessment is planned for October 1985 in Villach, Austria. The climate assessment is carried out at five-yearly intervals and as yet, no mechanism analogous to the CCOL process has been established to co-ordinate the programme.

The Assessments of ozone layer modification and its impact, carried out by the CCOL and others, while acknowledging the incomplete knowledge of the issue were convincing enough in their estimation of the potential problems for the UNEP Governing Council at its ninth session in May 1981 to instruct the Organization to initiate work aimed at the elaboration of a global framework convention for the protection of the ozone layer. As the programme was moving towards a consideration of managerial options aimed at protection of the ozone layer, the main programme responsibility moved to the Environmental Law Unit from the Environmental Assessment Service, which however would continue to monitor and report scientific progress. The ELU established an ad-hoc Working Group of Legal and Technical Experts for the purpose of elaborating a global framework convention for the protection of the ozone layer. The Working Group met seven times and succeeded in drafting a text of a Convention for the Protection of the Ozone Layer which included two technical annexes on Research and Systematic Observation and on Information Exchange. The Convention and its Annexes were ratified at a Diplomatic Conference in Vienna in March 1985. The desirability of elaborating a protocol to the convention concerned with Chlorofluorocarbons was raised by the UNEP Governing Council at its thirteenth session and it decided that to help facilitate this, workshops on chlorofluorocarbons, to examine such issues as production, production capacity emissions and uses of CFC's, controls, substitutes and alternative technology and the costs of such actions, should be convened. A time table of activities leading to the adoption of a protocol to the ozone convention by the next session of the Governing Council, scheduled for May 1987, was suggested by an ad-hoc meeting of interested parties which took place during the thirteenth session of the Governing Council in May 1985. The schedule includes the holding of two workshops on CFC's, two meetings of the Vienna Group to elaborate a protocol on CFC's, an assessment meeting on the state of the ozone layer and another on the impacts of its modification, the expected outcome would be the convening of a diplomatic conference in early 1987 to adopt a protocol.

II. THE OZONE LAYER ISSUE

The earth's ozone layer is the layer of atmospheric ozone above the planetary boundary layer. Most of the ozone is found in the stratosphere between twenty five and forty kilometres above the earth's surface. Ozone is produced by combination of atomic and molecular oxygen at altitudes above 25 kilometers providing a global source of ozone of about 50,000 metric tons per year. 1 per cent of the ozone created in the stratosphere is removed by transport to the troposphere where it is eventually destroyed by chemical modification or at the surface of the earth. The remaining 99 per cent is destroyed by photodissociation or by chemical reaction in the stratosphere reforming ozone into molecular oxygen. There is a dynamic balance among the processes which form and remote ozone which can be upset by changes in the composition of trace gases in the atmosphere known to affect ozone concentrations. Chief among these are oxides of nitrogen and chlorine, oxidation products of hydrocarbons such as methane, and carbon dioxide.

The importance of ozone rests with its ability to absorb harmful solar radiation particularly ultraviolet-B radiation of wavelengths between 190 and 320 nanometres. Less stratospheric ozone implies less absorption of UV-B allowing more solar radiation to reach the earth's surface. UV-B is known to be harmful to human health in that it induces several forms of skin cancer and may possibly be linked with melanoma skin cancer, a particularly virulent form of the disease invariably fatal if not promptly treated. UV-B is also suspected of disrupting the body's immunological system.

Plant growth is also retarded by increased UV-B incidence and important food crops can be subject to reduced yields. Other terrestrial and marine plants and animals are also susceptible to radiation damage. It is calculated that a depletion of the ozone layer by 1 per cent can result in a 2 per cent increase in UV-B reaching the earth and that an increase of 1 per cent UV-B increases the incidence of skin diseases by again 2 per cent. Thus, these radiation amplification factor (RAF) and biological amplification factor (BAF) can increase the occurrences of skin cancer by about fourfold for only a 1 per cent ozone layer decrease.

Initial concerns involved the possibility of ozone depletion caused by injections of oxides of nitrogen and water vapour into the lower stratosphere by supersonic transport aircraft and by the catalytic dissociation of ozone by chlorine radicals consequential to increasing use of chlorofluorocarbons, a family of chlorine containing chemicals with wide industrial application as refrigerants, foam-blowing agents, propellants in aerosol cans and solvents. By 1977, some eighteen hundred million pounds of CFC 11 and CFC 12 were being produced annually and were increasing in abundance by about 12 per cent per year. The chemicals, inert, non-toxic, non-reactive in the troposhere and relatively cheap to produce appeared ideal substances for the uses to which they were put. However, due to their inertness in the troposhere and long atmospheric lifetime, exceeding a hundred years in some cases, CFC's can migrate into the stratosphere where they release active chlorine which by catalytic reaction destroys ozone. One chlorine atom has been calculated to affect the recombination of between 10^4 and 10^5 atoms of ozone. This is because the chlorine atoms released by photodissociation react with ozone to form the chlorine monoxide radical which, in turns, combines with atomic ozygen to regenerate the chlorine atom and make it again available to continue the catalytic cycle.

Later concerns have included the risk of increasing nitrous oxide release from soils through the increasing use of nitrogen fertilizers, and the response of the ozone layer to increasing levels of methane and carbon dioxide. There is compelling evidence that the composition of the atmosphere is changing. Atmospheric concentrations of CFC's 11 and 12, carbon dioxide, methane and nitrous oxide are currently rising at 5-7 per cent, 0.5 per cent, 1-2 per cent and 0.2 per cent per year respectively. Several other halocarbons also have increasing concentrations, for example CFC-113 and methyl chloroform are currently rising at about 15 per cent and 6 per cent per year respectively.

Over the past twenty years, predictions of ozone layer depletion has fluctuated widely, from highs of 15-20 per cent to lows of 3-5 per cent. The impact of projected fleets of supersonic transport was calculated in 1971 to cause an ozone depletion of 10 per cent, a calculated ozone increase of 4 per cent in 1978 and a depletion of about 7 per cent in 1981. The uncertainty of the scientists engaged on atmospheric modelling and ozone predictions reflected the growing pains in the programmes to bring about an understanding of stratospheric photochemistry. Laboratory measurements of chemical and photochemical rate parameters and the inclusion of a broad range of reactions previously overlooked has resulted in a major refinement of atmospheric models. Although it must be stated that a far from complete knowledge of all the factors involved is available, particularly with regard to long-term estimates of growth in chemical use, the employment of substitute substances and to changes in technological processes. However, it is believed that the main chemical reactions affecting atmospheric ozone have been identified and are reasonably accurately simulated in atmospheric models which currently take into account about 150 chemical reactions and dynamical processes. The uncertainties in chemical rate parameters which previously limited accuracy in model calculations of species concentrations and ozone perturbations have been considerably reduced, from a factor of about ten less than a decade ago to, currently ± 10 per cent. There are still major difficulties to be solved; a comparison of theory and observation show inconsistencies which cannot be accommodated within the uncertainty limits of the rate parameters and there has not, as yet, been a systematic search undertaken for unidentified chemical processes which might be important; there is an incomplete knowledge of processes incorporating nitrous oxide and oxides of chlorine chemistry; and there are many uncertainties in the understanding of slow chemical reactions and the mechanisms of chemical interactions. Even so, it is encouraging to note that over the past four years predictions have remained generally constant and that intense scientific investigation has not led to the discovery of fundamentally new catalytic cycles, radical or reservoir species which might disturb predictions.

Analysis of total column ozone recorded by the UNEP supported Global Ozone Observing System (GOOS) gave no evidence of statistically significant trends during the decade of the 1970's but a statistically significant ozone depletion of 2-3 per cent per decade has been observed in the upper stratosphere (32-42 km). This is consistent with one-dimensional model theory. Measurements of ozone depletion remain difficult to make due to the insensitivity of current instrumentation and the difficulty of distinguishing the ozone depletion signal out of the noise of natural seasonal and latitudinal variability and of solar events and volcanic action (atmospheric hydrogen chloride increased by 40,000 tonnes after the El Chichon eruption substantially contributing to the stratospheric chlorine budget and equivalent to a sizeable fraction of the annual CFC production).

Although investigation of the atmosphere relative to ozone has revealed the increasing complexity of the issue, particularly in the realization of the highly coupled nature of the reactions and processes which can result in ozone modification, nothing has been discovered to disturb the basic premise, identified some two decades ago, that the ozone layer is likely to be depleted if concentrations of trace gases, particularly chlorine containing substances, continue to increase. While science cannot easily demonstrate that ozone layer depletion is a fact and neither will it be able to do so within the immediate future, refinement of chemical theory points unwaveringly toward the existence of a problem of ozone layer modification and impacts for man and his environment that are universally bad.

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III. RECENT SCIENTIFIC UNDERSTANDING

UNEP, has over the past year been closely involved with the assessment of the state of the ozone layer. While recent research tends to confirm many of the original concerns, additional issues are now emerging. These principally concern the possibility of a redistribution of ozone within the vertical column and the possibility of a non-linear relationship existing between increasing levels of chlorine and ozone depletion such that at high concentrations of stratospheric chlorine a depletion of ozone in excess of 10 per cent might occur.

With respect to climate, previous investigations have concentrated on the carbon dioxide issue which was calculated to increase global temperatures by about 2°C by the latter part of the next century by reason of the greenhouse effect. This effect represents the balance between incoming and reflected solar radiation, and outgoing longwave radiation at the top of the atmosphere.

The difference between longwave emission at the surface and longwave emission to space at the top of the atmosphere represents the greenhouse effect. Water vapour and carbon dioxide currently account for about ninety per cent of the effect with ozone, methane and nitrous oxide responsible for the remainder. Without the greenhouse effect, surface temperature would be about thirty-two degrees kelvin cooler than they actually are.

When concentrations of radiatively active gases increase, radiation to space is diminished. To maintain the balance discussed earlier, the surface/troposphere system must warm. However, solar absorption by radiatively-active gases can either add to or ameliorate the greenhouse effect depending on the altitude of absorption, for example stratospheric absorption reduces radiation reaching the earth, resulting in cooling.

Model calculations predict not only a depletion of ozone, but also, a redistribution of ozone in the vertical column consistent with the effect of increasing concentrations of methane and through aircraft emissions in the upper troposphere. Higher ozone concentrations in the troposphere are likely to have important climatic effects as it is an efficient radiatively-active gas.

Stratospheric ozone reduction would modify surface temperature in two ways. It would produce surface warming as a consequence of allowing increased solar radiation to penetrate to the troposphere but because the stratosphere would be cooler because of reduced ozone absorption of solar radiation, there would be less heat thermodynamically transferred to the troposphere. The two effects roughly cancel each other. Increased carbon dioxide in the troposphere significantly increases surface temperatures but as a nett emitter of infra-red radiation in the stratosphere, it would cool the stratosphere showing down the rate at which ozone dissociates. The nett increase in ozone would reduce incoming solar radiation reaching the surface, implying a cooling effect.

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Recent concern has focused on as yet unexplained rise in atmospheric methane. Possibly the result of changed rice cultivation patterns in Asia and of increased cattle-keeping, it is thus, not easy to forecast future concentrations. As a radiatively-active gas, it contributes significantly to the greenhouse effect and in reaction with the hydroxyl radical reduces the rate of scavaging of ozone by CFC's and other trace gases leading to a nett increase in tropospheric ozone.

Subsonic aircraft operating in the upper troposphere and lower stratosphere are also responsible for increasing tropospheric ozone and thus influencing climate. It is estimated that aircraft emissions in the Northern Hemisphere increase ozone by more than 15 per cent causing an indirect temperature effect of 0.07°K.

Chlorofluorocarbons are themselves extremely efficient radiative gases and because of their long lifetimes have the potential for substantial climatic impacts on time scales of several hundred years.

Carbon monoxide, water vapour, aerosols and clouds are other factors which might impact upon climate and have to be taken into account.

Recent calculations suggest that tropospheric warming attributable to trace gases other than carbon dioxide will be equivalent to that for carbon dioxide alone. The nett effect is likely to be a nominal doubling of carbon dioxide by 2030 and a resultant average temperature increase of between 1.5°C and 4.5°C.

Calculations of steady state ozone modification depend extensively on the scenario chosen. For example, if methane continues to increase at a substantial rate, the combined effect of it and CFC's may never result in a decrease in column ozone. Although, of course, there would be significant differences in its vertical distribution through the column. In the hypothetical situation where CFC 11 and 12 emissions remained constant at their 1977 release rates, current calculations suggest a total ozone column reduction of about 3-5 per cent with 40 per cent reduction near 40 km. In fact, in the period 1977 to 1983, there has been a 21 per cent reduction in the production of these chemicals; the decrease representing a 51 per cent reduction in aerosol use but a 36 per cent increase in non-aerosol use. It is also of note the production of CFC 11 and 12 in 1983 rose by about 7 per cent compared with the previous year. In this connection, it is worth noting that should the release rate of CFC's reach twice their present level corresponding to a sustained growth in CFC emissions greater than 3 per cent per year or, if the concentration of chlorine species in the stratosphere reaches 15 ppbv and exceeds that of odd nitrogen in the stratosphere, then there will be a substantial reduction of ozone column regardless of increases in carbon dioxide, nitrous oxide and methane which may occur. Future CFC emission scenarios do not consider emission rates of this magnitude likely, but the diversity of halocarbons which might be employed in addition to or as substitutes for CFC 11 and 12 could lead to effective emission rates of greater than this.

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In summary, recent research confirms that ozone layer modification is likely and that the potential consequences are harmful. The nature of the threat presently lays increasing emphasis on possible climatic effects that are additive to those of carbon dioxide and other radiatively-active gases which are increasing in the atmosphere.

The possibility of high concentrates of stratospheric chlorine occurring as a consequence of increased CFC emissions exists, with an accompanying danger of major ozone depletion which could promote a significant risk to human health.

There are considerable uncertainties still to be resolved that only intensified research over time can address, but what is known, unequivocably advises prudence with regard to the uncontrolled emission of potential ozone depletion substances to the atmosphere. The elaboration of a Convention for the protection of the ozone layer was timely, and a close examination of production, use and emission of CFC's needs to be undertaken with a view to developing a protocol to the Convention which would form the basis of global regulatory action to limit the influence of chlorofluorocarbons on the earth's ozone shield.

Annex III

TOPICS FOR CFC WORKSHOP

PHASE I

TOPIC 1.

Background factual paper(s) on current production capacity, production, use, emissions, trade, and current regulation of CFCs separately by country and/or region.

TOPIC 2.

Under regulations or guidelines applied to date, projections of demand for CFCs, production capacity, production, use, trade and emissions and their concentration in the short term (up to the year 2000) and in the long-term, taking into account demand-increasing or demand-reducing technologies. Evaluation of methodologies for projecting demand, including for the short-term market-based studies and for the long-term analyses of GNP and population. Analysis of constraints to supply esn evaluating future production.

TOPIC 3.

Under regulations or guidelines applied to date, review of the costs and effects in terms of changes in production, use, emissions, production capacity and trade in CFCs and the demand for other products.

TOPIC 4.

On a sector by sector basis, identify the range of existing and developing technological options for control, their potential costs and effectiveness in terms of reducing demand, production, use, emissions, or capacity for producing CFCs.

TOPIC 5.

Estimates of the production, use and emission of substances other than CFCs that could modify the ozone layer sufficiently to affect possible control strategies for CFCs.

PHASE II

TOPIC 6.

Identify and analyse various possible regulatory strategies, including such new alternatives as quotas and financial incentives, in terms of their:

(a) Effects on the demand, production, and emissions of CFCs;

(b) Effects on the atmosphere and the environment including the use of model calculations of the effects of control measures;

(c) Cost effectiveness and, where possible, cost-benefit analysis; and

(d) Equity, trade impacts, and ease of implementation and monitoring.

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TIMETABLE FOR CFC WORKSHOP

		1985
1.	Report of SC sent out by UNEP under cover of letter inviting would be contributors to contact lead country	7 October
2.	List of papers and experts circulated by lead countries	7 November
		1986
3.	Peer-reviewed papers for first phase of Workshop and peer-reviewed methodologies for second phase submitted to lead country for circulation	
	(a) Non-English language	end February
	(b) English	end March
4.	Lead countries (with assistance of interested parties) draft overview papers (agreements, disagreements, sources of disagreement, major questions) and send to participants	end April
5.	First part of Workshop	end May
6.	Final papers for second phase of workshop circulated to participants	mid August
7.	Second phase of Workshop	early September
