



United Nations
Environment
Programme



Distr.
LIMITED

UNEP/WG. 151/Background 3
1 December 1986

Original: ENGLISH

Ad Hoc Working Group of Legal and
Technical Experts for the Elaboration
of a Protocol on the control of
chlorofluorocarbons to the Vienna
Convention for the Protection of the
Ozone Layer (Vienna Group)

Executive Summary of the Assessment
of Ozone Layer Modification - February 1986

Submitted by

UNEP Co-ordinating Committee
on the Ozone Layer

EXECUTIVE SUMMARY

The ozone layer protects the biosphere from the harmful effects of solar ultraviolet radiation, controls the structure of the stratosphere and influences the Earth's climate.

There is now compelling observational evidence for increases in the concentrations of most atmospheric trace gases which control ozone. These increases are likely due to man's activities. The gases include methane, nitrous oxide, chlorofluorocarbons (CFCs) 11 and 12, carbon tetrachloride, methyl chloroform and other halocarbons.

These gases are the precursors to the hydrogen, nitrogen and chlorine oxides which catalyse the destruction of ozone in the stratosphere by a series of chemical reactions. The reactions involving these oxides are highly coupled and the species interact with one another. Consequently, the effect of individual trace gases on ozone cannot be considered in isolation. Carbon monoxide and carbon dioxide, which are also increasing, can affect ozone indirectly.

The annual statistics on CFCs 11 and 12, produced for the companies reporting to the Chemical Manufacturers Association (CMA), show that in 1984 the production of CFCs 11 and 12 was 312 and 382 kilo-tonnes respectively. These figures represent increases of 7.1% and 7.5% for CFCs 11 and 12 compared with 1983. The 1984 production is close to that reported in 1977. The production figures for countries not reporting to CMA are unavailable.

Mathematical models of the atmosphere which include projected continuation of the currently observed increases in nitrous oxide, methane and carbon dioxide predict decreases of less than 3% in the global average total ozone in the next 70 years, if the sustained rate of increase of CFCs 11 and 12 release is less than 1.5% per year. Even when predicted changes in total ozone are small, a significant vertical and latitudinal redistribution of ozone is predicted, which alters stratospheric structure. Typical predictions suggest that ozone at 40 km would be depleted by 30-70% and that the total ozone

concentrations and their simulations. An accurate estimate of future changes in precursor gas concentrations is of vital importance for reliable predictions of ozone change. Ultimately, however, our predictive capability will be tested by measurement of the changes taking place in the atmosphere. This will require careful measurement of critical species to be carried out over long periods.

The observed increases of the chlorofluorocarbons, of methane and of nitrous oxide also have direct implications for the Earth's radiative balance through an enhancement of the greenhouse effect. These gases absorb infrared radiation in a part of the spectrum in which the atmosphere is otherwise transparent. The calculated cumulative effect of the increase in all trace gases for the period 1850-1980 is a warming in the range of 0.3-1K. At present, changes in carbon dioxide and in other trace gases are thought to be contributing about equally to greenhouse warming. Estimates indicate that the greenhouse warming predicted to occur in the next 50 years should be about twice that calculated for the previous 130 years.

In summary, there continues to be concern that both the total amount and the vertical distribution of atmospheric ozone, the temperature structure, and climate, will be modified by changes in the atmospheric concentrations of several trace substances, specifically chlorofluorocarbons, carbon dioxide, methane and nitrous oxide. Thus the two issues of ozone modification and climate change should be considered together.

Footnote:

The Co-ordinating Committee on the Ozone Layer, at its eighth session, did not discuss the relationship between changing concentrations of total column ozone and solar UV-B flux at the earth's surface. The CCOL noted the importance of this relationship in view of the risk to human health and the environment should UV-B incidence increase. The subject will be considered at the UNEP/EPA Conference on Health and Environmental Effects of Ozone Modification and Climate Change in June 1986 and will be included in the CCOL Assessment of Effects of Ozone Layer Modification to be undertaken in August 1986.
