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The Climate Convention and the latest scientific understanding of Climate Change

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The Climate Convention was signed by over 160 countries at the Earth Summit in Rio in 1992. After ratification by over 50 countries it came into force on the 21 March 1994.

The Convention is built on an acknowledgement that 'change in the Earth's climate and its adverse effects are a common concern of humankind' and a concern 'that human activities have been substantially increasing the atmospheric concentration of greenhouse gases, that these increases enhance the natural greenhouse effect, and that this will result on average in an additional warming of the earth's surface and atmosphere and may adversely affect natural ecosystems and humankind.'

The Convention notes that there are many uncertainties in predictions of climate change, particularly with respect to the timing, magnitude and regional patterns thereof' but expresses a determination 'to protect the climate system for present and future generations', and states that the parties to the Convention 'should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects.' It goes on to explain 'where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures.

The scientific understanding of global warming and of climate change and the uncertainties in that understanding, as published by the Intergovernmental Panel on Climate Change (IPCC) in its 1990 report, form the basis of these Convention statements.

The Objective of the Convention, in Article 2, states, 'The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.'

This Objective is a key statement and presents a large challenge to the world scientific community to establish, firstly the nature and extent of likely regional climate change due to

human activities, secondly how greenhouse gas concentrations might be stabilised and thirdly the likely impacts of climate change especially on human communities.

The IPCC is preparing further reports to be published in 1994 and 1995 to address the scientific issues raised by the Climate Convention Objective. The 1995 report will be fully comprehensive dealing with all relevant scientific areas. In the 1994 report, particular consideration will be given to future profiles of the emission of greenhouse gases which would lead to stabilisation of their concentrations in the atmosphere.

For carbon dioxide, because of the complex exchanges which occur on a variety of time scales between all parts of the climate system (atmosphere, ocean and land biosphere), sophisticated models of the carbon cycle have been developed to estimate its concentration in the atmosphere under different scenarios of emissions from fossil fuel sources. In Fig 1 several scenarios are shown for the emissions of carbon dioxide next century; one (IS92a) is from the 1992 IPCC report (ref 1), the other three have been developed by the World Energy Council (WEC) (ref 2). The corresponding atmospheric concentrations of carbon dioxide as estimated by a climate model developed by Professor T. Wigley (ref 3) are shown in Fig. 2, together with the concentrations which would result from a profile of carbon dioxide emissions kept beyond the year 2000 at a constant value of 7.1 Gt of carbon per annum.

Conclusions to be drawn from Fig.2 are:

1. Emission scenarios IS92a, WEC-A and WEC-B all lead to continuing increase in carbon dioxide concentrations throughout next century and before the year 2100 to concentrations which are more than double the pre-industrial value of 280 ppm.

2. Stabilisation of global carbon dioxide emissions following the year 2000 does not lead to stabilisation of concentrations next century (or in fact for several hundred years).

3. The WEC-C emissions scenario leads to stabilisation of the atmospheric carbon dioxide concentration by the end of next century and is therefore one emission scenario which would meet that particular requirement of the Climate Convention. The IPCC is exploring further emission scenarios which also meet that requirement of the Convention. All of them demand eventual reduction of carbon dioxide emissions substantially below today's levels. The IPCC is also seeking more precise quantification of the likely impacts of climate change, so that appropriate choices regarding future energy policy can be made in ways that are consistent with the Conventions's objective.

The Convention recognises that the action demanded by the Convention will involve both developed and developing countries (although developed countries will need to 'take the lead in combating climate change and the adverse effects thereof'), will involve the need for technology development together with technology transfer from developed to developing countries, and will require the setting of appropriate targets for greenhouse gas emissions (together with mechanisms for sharing out emissions between countries and different economic sectors).

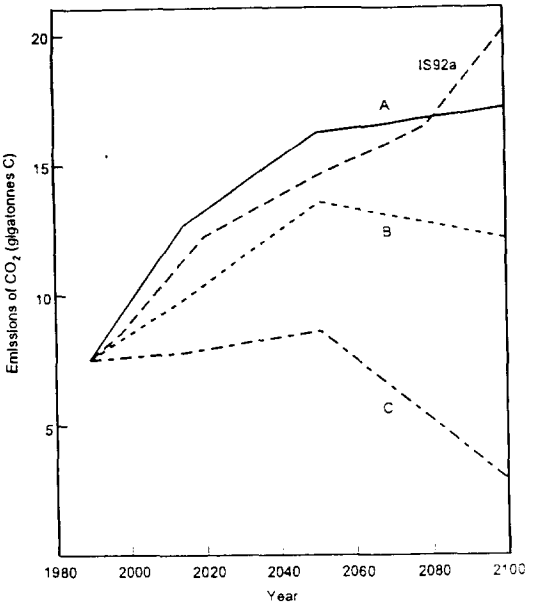

Fig.1

Scenarios of carbon dioxide emissions next century from energy generation for IPPC scenarios IS92a and WEC scenarios A,B and C. WEC scenario A assumes high economic growth especially in developing countries, WEC-B assumes moderate economic growth. All scenarios assume that there will be significant environmental and economic pressures to achieve major improvements in energy efficiency compared to historic performance; WEC-C assumes the application of very strong pressure to reduce emissions in order to combat global warming. For further details see ref.4.

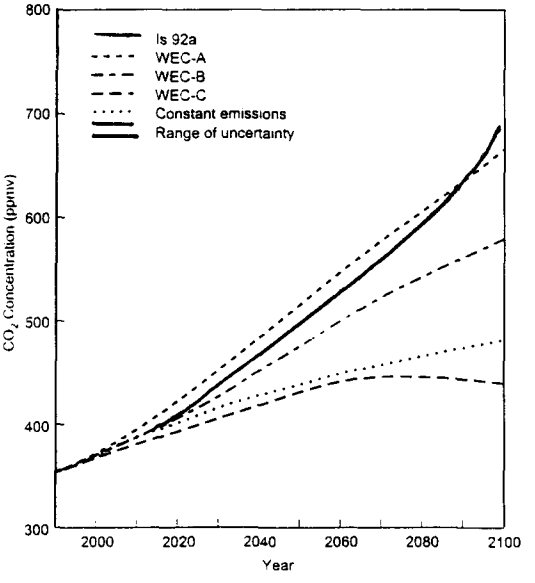

Fig.2

Concentrations of carbon dioxide in the atmosphere resulting from the emissions scenarios of Fig.1 together with IPCC (ref1) assumptions concerning emissions from deforestation. The shaded area around the curve for the IS92a scenario provides an estimate of the uncertainty in the model computations. Similar uncertainty applies to the other scenarios. For further details see ref.4.

References:

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