THE CO_2 ISSUE – WHAT ARE THE REALISTIC OPTIONS? AN EDITORIAL

With the continuation of present energy growth and land use policies, there is a definite prospect that the global climate will be significantly perturbed early in the next century. A major cause for this could be the worldwide increase in atmospheric CO_2. Since the beginning of the industrial age the CO_2 level in the atmosphere is estimated to have increased by about 10–20%. The present CO_2 level of about 335 parts per million by volume (ppm) is expected to increase to about 380 ppm by the end of the century, perhaps reaching twice the pre-industrial estimate of about 290 ppm around AD 2050. The known fossil fuel resources are large enough to result in peak CO_2 levels 4 to 8 times the pre-industrial value within 2 to 3 centuries – assuming, of course, increased usage of these fuels. Such high levels will only slowly decline so that a CO_2 concentration perhaps twice the pre-industrial is likely to persist for over a thousand years.

Current climate model estimates give an average equilibrium global surface air temperature increase of 3 K ± 1.5 for a doubling of the atmospheric CO_2 concentration, with a 3–4 fold amplification in northern polar regions. If fossil fuel consumption is not restrained and if a substantial carbon storage in the biosphere does not occur, then the eventual global average temperature increase could be as high as 4–6 K. If, however, fossil fuel consumption could be kept at the present level, a 50% CO_2 increase, corresponding to an average temperature increase of 1–1.5 K, would still result in AD 2100. Such a gradual temperature increase over such a long time period is perhaps tolerable. If not, at least time is bought for taking remedial action. It is well to recall that other trace gases and perhaps also aerosols will contribute to the CO_2-warming effect lending a greater urgency to the CO_2 problem.

What can be done about the CO_2 issue? What are the realistic options? Consider the following possibilities, namely

> to let fossil fuel use, and hence CO_2 emission continue to grow at the historical exponential growth rate of 4.3%/yr.
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> to let fossil fuel use grow at a reduced rate,
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> to keep fossil fuel use at the present level, or
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> to reduce fossil fuel use.

Since the world energy economy will continue to be strongly dependent upon fossil fuel use for at least a transitional period of several decades, it is not realistic to expect to achieve a reduction in fossil fuel use at this time. Equally unrealistic would be a continued growth of fossil fuel use at the historical or even higher growth rate due to the fact that most countries will no longer find abundant fossil fuels on the energy market at a price

Climatic Change **3** (1980) 3–5. 0165–0009/80/0031–0003$00.30.

they can afford. There is little disagreement that for economic, environmental and a host of other reasons it is highly desirable to reduce the fossil fuel growth rate, and this is probably considered by many people as the most realistic option. What, if anything, speaks in favor of the stabilization of fossil fuel use at the present level?

In recent years a dozen or so economically and technically sound studies conducted for developed nations have shown that

> the overall energy consumption can be substantially reduced by the more efficient use of energy, which can result in savings in several energy sectors (by as much as 30–50%) without in any way jeopardizing prosperity, and that
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> non-fossil energy sources have the potential to make a significant contribution given sufficient time and appropriate institutional support.

These studies clearly show that the above strategies used in a complementary fashion could ensure continued growth of *end-use energy* for a number of years, until such time as primary energy consumption has reached an equilibrium.

Considering the stabilization of world fossil fuel use at the present level as a realistic option, appropriate allowances would have to be made for the disparate fossil fuel requirements of different countries on an equitable basis. It is of particular importance that the developed nations do not export their energy and environmental problems to the developing nations, for example, by making available energy-intensive technologies that are unsuitable for their infrastructure. Moreover, in order to reduce North–South tensions it is imperative that the developed countries use their high technological potential to reduce their share of total fossil fuel consumption so that the developing countries can attain a correspondingly larger share. The gaps in energy use and prosperity between the developed and developing world can only be narrowed by a voluntary change of attitude. This requires an atmosphere of mutual trust and the realization that the problems of energy and population growth, both in the developed and developing countries, are inseparably linked.

It is clear that the impacts of energy use and land use changes on climate, and thus on mankind, cannot be evaluated in isolation, but have to be seen within the context of overall ecological, economic and social developments. A broad systems approach is required to help define some 'threshold' value of CO_2-induced climatic change beyond which there would likely be a major disruption of the economic, social and political fabric of certain societies. An assessment of such a critical CO_2-level ahead of time could help to define those climatic changes which would be acceptable and those that should be averted if possible. The public and the decision makers need to be made aware of the various options open to them. Responsible decisions can only come from the clear perception of the realistic options.

Finally, it should be realized again that the climate system, with its non-linear coupled sub-systems, is so complex and still so poorly understood that the impacts of man's activities on climate cannot be predicted with much confidence at this time. The real

danger is that energy decisions based on such poor information may lock society into energy paths, devoid of any flexibility once energy systems with long market penetration times have been adopted. In the face of the existing uncertainties prudence dictates a cautious and flexible energy strategy. As a precautionary measure society should follow a low-climatic-risk energy and land use policy based on such realistic options as to

promote the more efficient end use of energy,

secure the expeditious development of energy sources that add little or no CO_2 to the atmosphere, and

reduce deforestation and promote reforestation and soil conservation.

The major bonus of such a low risk policy is that in the best case it may prevent climatic impacts altogether, and that in the worst case valuable time is gained to obtain better information to redirect policy. The good message of this pragmatic policy gives rise to modest optimism, since it is based on measures that make sense also for other than climatic reasons and should therefore be taken anyway.

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Note

For many ideas expressed above I am indebted to participants at the International Workshop on the Energy/Climate Interactions held in Münster, Germany, March 3–9, 1980. The Proceedings of this Workshop have been published by Reidel Publishing Co., Boston, in late 1980.