
Book Reviews

The Economics of Global Warming

by WILLIAM R. CLINE
Washington: Institute for International
Economics, 1992
pp. 399

This is an interesting and important book. It presents a very long term global social benefit-cost analysis of global warming. Numerous studies of the national and global costs of limiting emissions of greenhouse gases have been published. The only previous study to attempt an economic estimate of the benefits of avoiding global warming was limited to the United States.¹

Cline begins with a review of the scientific basis for the greenhouse effect. As an economist, he finds the logic and science of the greenhouse effect compelling although not conclusive. Since carbon dioxide accumulation in the atmosphere is essentially irreversible over periods of centuries, Cline argues that analyses of global warming policy should consider a period of 250 to 300 years.² Over

this planning horizon, the central estimate of global warming is approximately 10°C and the upper bound is close to 18°C.

Estimates of the benefits of limiting global warming are developed in Chapter 3. Benefits are estimated for agriculture, forestry, species loss, sea-level rise, electricity demand, non-electric heating, human amenity, human life, human morbidity, migration, hurricanes, construction, leisure activities, water supply, urban infrastructure, and air pollution. Although Cline recognizes the need to estimate the benefits for every country, most of the benefits are estimated only for the United States due to data limitations. The damages due to very long term warming are estimated at 6 to 12% of GNP for the United States.

1/ Nordhaus, William D. (1991) "To Slow or Not to Slow: The Economics of the Greenhouse Effect," *The Economic Journal*, 101:6:920-37.

2/ The prospect of increased deep-ocean mixing toward the end of this horizon of 250 to 300 years holds the possibility of a partial reversal of the buildup of carbon dioxide in the atmosphere, thereby providing a natural terminal date for the planning period (pp. 33-34).

The principal econometric models used to estimate the costs of reducing carbon dioxide emissions in the United States and globally are reviewed in Chapter 4. He synthesizes the results by estimating a regression equation relating the percentage reduction in GNP to the target reduction in carbon emissions expressed as a percentage from the model results. The synthesis suggests that a global freeze on carbon dioxide emissions would cost about 1.5 to 2.5% of world GNP in the first half of the next century.

Engineering studies of options to reduce carbon dioxide emissions in the United States are reviewed in Chapter 5. These studies suggest that carbon dioxide emissions can be cut by 20 to 25% at no net cost. Forestry measures are estimated to be able to reduce carbon dioxide emissions by 20% at a cost of less than 0.1% of GNP. These measures yield no further carbon dioxide reductions after 35 years.

The econometric, engineering and forestry options are integrated into estimates of the cost of reducing carbon dioxide emissions by specified percentages by given dates. The greater the reduction in carbon dioxide emissions the higher the cost, and the longer the period available to achieve a given target the lower the cost. The costs range from zero for a 20% reduction, to 3.6% of GNP for a 90% reduction by 2050.

Chapter 6 discusses the appropriate social discount rate for global warming analyses. Very long term effects are important in global warming analyses. Long term impacts are not important when discount rates of 5 to 10% are used. Therefore these discount rates are not appropriate for global warming analyses. Cline proposes a social discount rate of 1.5%. This is based on the social rate of time preference for the consumption effects and a shadow price of capital for the investment effects.

The benefit-cost analysis of global warming over the period to 2275 is presented in Chapter 7. The central case estimates yield a benefit cost ratio of 0.74. Sensitivity analyses indicate that combinations of lower social time preference and greater greenhouse damage support aggressive abatement action, while

with higher discount rates and less serious damage, action is not economically justified. Using the central assumptions and weighting the outcomes to take account of risk aversion, the benefit-cost analysis finds that aggressive abatement action is warranted.

Chapter 8 discusses the challenges involved in developing international policy toward global warming. Free riders, possible winners and losers, adaptation strategies, technological change, developing country participation, China, OPEC, and other potential barriers to an international agreement are addressed. Carbon taxes and tradeable permits for carbon dioxide are analysed as policies for combatting global warming.

Policies Cline advocates to address global warming are divided into two phases. The first phase being a "best efforts" international commitment to limit carbon emissions in 2000 to 1990 levels. Policies recommended for this phase include moderate carbon taxes (\$40 per ton), removing existing subsidies to carbon emissions (coal and electricity subsidies), low-cost forestry measures, and transfer of resources to developing countries to assist with the reduction of their carbon emissions.

After further scientific confirmation of global warming, or approximately a decade, implementation of more costly measures would begin. During this second phase, higher and internationally more uniform carbon taxes or carbon emissions quotas with trading are recommended. The allocation of the quotas or tax revenues would reflect the need to transfer resources to developing countries. At a later date trade penalties or other sanctions may be needed to reinforce compliance.

It is easy to find fault with particular aspects of the analysis, such as extrapolation of the global benefits of control from estimates of damages avoided in the United States, but given that this is only the second attempt at a benefit-cost analysis of global warming, it is not surprising that improvements are possible. Cline has made a number of significant contributions, including the time frame for the analysis, the social discount rate, and the consideration of risk aversion. I strongly recom-

mend the book to anyone interested in the topic.

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Diagnosis of Energy Systems in Developing Countries

by J. GIROD
Commission of European Communities, 1991
pp.254

This book summarises work done on the energy systems of developing countries under the auspices of the Cooperative programme on energy and development (Coped), an activity of the OECD. The members of Coped include agencies in Arab Countries, Thailand, Brazil, Senegal, Argentina, Mexico, China, and India, as well as France and the United Kingdom. The book discusses the methodology of the works sponsored by Coped and is illustrated by examples of individual studies. The book is translated from the French.

The term "diagnosis" covers the technical and quantitative aspects of energy use, the microeconomics of trade and commerce in energy commodities together with the sociological aspects. The discussions are, accordingly, wide ranging. In the developing countries many important fuels, charcoal, for example, are sold and traded in ways which can escape the conventional statistical collections of government agencies. Several of the examples reveal the complexity of trade and commerce in these societies, often more complex than those in western industrialised countries.

Many of the systems are described in terms of *filières*. These identify and quantify the steps between production, marketing, processing and end use of an energy commodity. A *filière* is more than a simple chain of transactions: it also identifies the economic value added in each of these steps. These details are of importance because with traditional fuels in these societies the economic value to the communi-

ties may, again, not be revealed by standard compilations of economic data. Chapter 1, "Orientations and stages of the energy diagnosis," describes this complex context.

Chapter 2, "The household sector," uses a study of household energy consumption in Thailand as an example. Urban households are classified by location: Bangkok, or municipalities or villages, and by the type of household, whether the household is a family dwelling or also a place of business. Rural households are classified by region and whether or not the householders are farmers. The levels of use of the principal fuels – wood, charcoal, LPG, and electricity – in each of these classifications are discussed. As to be expected, the more expensive fuels are used more by the better off sections of society. Growth in demand of each fuel is driven by the rapid social and economic changes now taking place in Thai society. The electric 'rice cooker' is becoming a common feature of urban society. Because of the use of these appliances at similar times of day they are already posing a load problem for the electric utilities!

The following four chapters follow a similar pattern. They discuss the service sector (with energy consumption in hospitals and hotels in Thailand as the example), the agriculture sector with reference to studies in Argentina and Colombia, the industrial sector (with the example of a cement works in Brazil), and the transportation sector with examples from several countries.

Part two of the book, the energy supply diagnosis, gives several examples of the use of the *filière* concept. These include coal in Brazil, gas in Mexico, paddy – rice grains, straw and husk – in an Indian village, and charcoal in Dakar. The structure of energy markets is then discussed, using these and other examples of the *filière* analysis. To be effective, recommendations on energy policies for the developing countries must recognise these structural aspects.

There is one surprising omission in the book and by implication in the studies that have been done to date. There is no discussion of environmental aspects of energy use in these

countries and only a very brief mention of possible resource depletion in connection with the use of charcoal. Is it that, as some have said, that these countries cannot afford the luxury of environmental concerns, or that the studies themselves never addressed environmental problems? in the context of the recent discussions at the Earth Summit it would now seem essential to expand the *filière* concept in any future studies to include environmental effects.

This book would be of primary interest to specialists in the field of economics and energy policies of developing countries. It gives good

summaries of important studies in a number of areas and provides a useful entrée to the extensive literature on these topics. The general discussions of the methodology are, however, lengthy and academic. One sometimes wonders what is being said, though this may be a consequence of the translation. It is, thus, not a book for the general reader. It should however be in the libraries of institutions with interests in the economic and social problems of developing countries.

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