

Reducing greenhouse gas emissions by use of game theory

January 31 2011, By Melanie A. Farmer

Economist Scott Barrett is no fan of the Kyoto Protocol, the international agreement to reduce greenhouse gas emissions and get climate change under control. Barrett proposes a different approach: tackle the gigantic problem, one piece at a time.

“If we break up the problem into smaller pieces we’re more likely to have a dramatic impact in the end,” he says.

Barrett, the Lenfest-Earth Institute Professor of Natural Resource Economics with a joint appointment in the School of International and Public Affairs and the Earth Institute, is an expert in complex international negotiations.

He uses [game theory](#), which analyzes how people make decisions when the desired outcome depends on the choices of other people, to understand how treaties such as Kyoto can get countries to behave differently. He has advised a number of international organizations, including the United Nations and the World Bank, on health, climate and other global issues.

The Kyoto Protocol sets binding targets for 37 industrialized countries to reduce six greenhouse gases; those targets are set to expire next year. The United States is not a party. Barrett suggests it would be more productive if more agreements were negotiated focusing on individual gases and sectors—and in fact, such proposals are already on the table.

For example, the United States, Mexico and Canada have expressed their willingness to reduce hydrofluorocarbons or HFCs, which are used as refrigerants in air conditioners and cooling systems, under an existing treaty, the Montreal Protocol. HFCs are one of the six greenhouse gases in the Kyoto agreement.

The Montreal Protocol was adopted in 1987 to phase out chemicals like chlorofluorocarbons found in aerosol cans that were destroying the ozone layer. It is considered one of the most successful international agreements.

Barrett credits its success to its ingenious design, which incorporates carrot-and-stick incentives. The main “carrot” or reward is a payment to compensate developing countries for the additional costs of phasing out CFCs. The main “stick” is the threat to restrict trade to punish countries that are not party to the treaty.

Barrett says these incentives could control HFCs effectively, but would not work if applied across the board to reductions in the main greenhouse gas, carbon dioxide (CO₂), because they might spark a trade war. For instance, there would be a political uproar, and possible trade retaliation, if countries in the European Union and Japan restricted trade against the U.S. for not ratifying Kyoto.

Rather, he believes CO₂ emissions are best limited by focusing on individual sectors such as steel, aluminum, automobiles or electricity.

“The logic is partly that you can use the leverage you have for each piece to bring about the greatest amount of change,” Barrett says. “When you throw everything together—like what’s being done in the Kyoto Protocol—you lose that leverage.”

Barrett notes that the key problem with the [Kyoto Protocol](#) is that it has

no meaningful enforcement mechanism. “This whole approach can only succeed if you can enforce what countries agree to do,” he says. “We’ve been unable to figure out how to do that.”

As far as he’s concerned, it’s time for a new approach. “There are no silver bullets,” he says about his piecemeal strategy, “but this approach is better than Kyoto. Fortunately, the failure of the Copenhagen negotiations is causing people to be open to new proposals. I think we’re there now.” In 2009, international delegates to a climate summit in the Danish capital failed to agree on binding action to curb [greenhouse gas emissions](#).

Provided by Columbia University

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