

A Multi-Gas Approach to Climate Policy

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This paper addresses four questions: (1) What are the implications of a multi-gas approach when designing policies for reducing greenhouse gas (GHG) emissions? (2) How sensitive is the optimal mix of mitigation options to the choice of global warming potentials (GWPs)? (3) Are there alternative approaches, which provide a more logical justification for action? (4) If so, what are their strengths and weaknesses?

We begin by adopting the 100-year GWPs recommended by the IPCC. Incorporating the two major non-CO₂ greenhouse gases (CH₄ and N₂O) increases the size of the required reduction, but it also expands the portfolio of mitigation options. For the Kyoto Protocol, we find that a multi-gas approach benefits all Annex B regions with the exception of the former Soviet Union and Eastern Europe. It also turns out that the optimal mix of mitigation options is sensitive to the time horizon used to calculate the GWPs.

Given the lack of a rationale for choosing one set of GWPs over another, we examined two alternatives for establishing quantitative tradeoffs between gases. The first was based on cost-effectiveness analysis (minimizing the costs of prescribed limits on temperature change); the second on benefit-cost analysis. Both the cost-effectiveness and the benefit-cost perspective highlight the shortcomings of GWPs for establishing equivalence among gases. Not only do the relative prices vary over time, but also they are sensitive to the ultimate goal.

Ideally, the relative importance of the individual gases would be the product of an analysis which minimized the discounted present value of damages and mitigation costs. Unfortunately, given the current state of knowledge regarding potential damages, such an approach may be premature. If indeed this is the case, focusing on temperature change may have distinct advantages over GWPs. It could serve as a useful temporary surrogate for benefit-cost analysis.