

Editorial

The benefits of climate policy[☆]

Climate policy is a divisive issue and views vary widely amongst governments, business and other parts of civil society about how we should deal with it. Mitigation—or reduction in greenhouse gas (ghg) emissions and concentrations—is the key pillar of international climate policy negotiations and of national climate policies. Recently, interest has grown in adaptation to projected climatic changes as a complementary policy response. Nevertheless, much of the policy and analytical discourse to date has been characterized by asymmetric attention to the *costs* of mitigation commitments on the one hand, and, more recently, the potential *benefits* of adaptation on the other. Analysis of the benefits of mitigation has been dominated by attention to near-term secondary or ancillary benefits of greenhouse gas abatement measures in related domains such as air pollution and public health. There is also only very limited analysis of the costs of adaptation.

What has received too little attention in climate policy debates is estimation of the *direct benefits* of greenhouse gas mitigation through avoided climatic change and the reduced likelihood of any ensuing net adverse impacts. The problem is not so much the lack of research, but of efforts to pull available work into some coherent measure or set of measures that aid policymakers and the public in thinking about the potential benefits of mitigation. For example, how do the potential benefits of mitigation in terms of avoided impacts compare with mitigation costs and with ancillary benefits? It would appear that critical policy decisions—with regard to how much and how fast to cut greenhouse gas emissions—could be better informed by assessment of what is at stake for natural and human systems. If we were to focus in on those systems that are particularly vulnerable to climate change, key questions would seem to include: what are the trade-offs between alternative mitigation strategies, or in moving from today's more limited climate policies towards significant and rapid emission reductions in the coming decades?

The assessment of global mitigation policy benefits is complicated for several reasons. Mitigation costs and ancillary benefits of mitigation or adaptation benefits and costs accrue at the same location (or region) as those in which mitigation or adaptation actions are undertaken. However, there is no such link between where mitigation actions and the related set of reduced impacts occur. This is because mitigation measures undertaken anywhere in the world will influence global greenhouse gas concentrations, which will then translate into changes in climate and associated impacts. Local or regional actions to reduce emissions result in dispersed benefits. Therefore, meaningful comparisons of costs and direct benefits of mitigation can only be possible at a global level.

A number of other issues also bring into question the straightforward application of a benefit–cost analysis to mitigation policy decisions. Benefits in terms of avoided impacts tend to accrue much later than the costs of mitigation commitments, raising the issue of the choice of appropriate discount rate. In addition, there are ethical judgements embedded in aggregation and valuation of impacts across widely different world regions, market and non-market systems. Impact assessments also have their own associated uncertainties and may not be sensitive in a measurable way to the tweaking in the climate system that results from mitigation commitments of differing levels of stringency, especially if they only occur in the near-term. Furthermore, impact assessments generally only assess responses to changes in mean climate, and not those associated with changes in variability or with the risk of non-linearities and surprises. Finally, the inherent uncertainty embedded in any prediction of the chain of events that starts with ghg emissions leading to changes in the atmosphere and eventually to climate change and climate impacts raises questions about how much can be said about benefits with confidence. Working with the ubiquitous uncertainty then leads us away from a standard benefit–cost framework to something that resembles more of a risk assessment framework.

So what can be meaningfully conveyed to policymakers about the direct benefits of climate policy? This was the question posed to a group of leading experts on climate modelling, impacts research and policy at a

[☆]The views expressed in this paper are those of the authors and do not necessarily represent the views of the OECD or its member countries.

workshop held at the OECD in December 2002. The goal was not to come up with monetized or even physical estimates of direct benefits, but rather to survey available information to work towards an eventual framework which could improve accounting for benefits to facilitate goal-setting for international policies. The papers in this Special Issue represent a subset of the contributions at the OECD workshop and have been significantly modified in the follow-up peer review process as well as in consultations with workshop participants.

This issue is organized in three parts, each with three papers. The first part provides a review of literature on the sectoral and regional impacts of climate change, with the aim of informing the discussion on benefits. The first paper, by Samuel Hitz and Joel Smith (Hitz and Smith, 2004) assesses the general shape of the damage curve which expresses globally aggregated impacts in particular sectors as a function of changes in climate, expressed through increase in global mean temperature (GMT). Based on a review of studies in sea level rise, agriculture, water resources, human health, energy, and terrestrial and marine ecosystems among others, Hitz and Smith find a consistent pattern of progressively adverse impacts across all sectors analysed beyond a 3–4°C increase in GMT. At lower levels of climate change however, the relationships range from increasing adverse impacts (in coastal resources, biodiversity, and possibly marine ecosystem productivity), to parabolic relationships where beneficial impacts are experienced at low to moderate levels of climate change (agriculture, terrestrial ecosystem productivity), to no consistent pattern (water, health, energy). The second paper, by Rik Leemans and Bas Eickhout (Leemans and Eickhout, 2004) uses the IMAGE integrated assessment model to assess the impacts on ecosystems at both low and moderate to high levels (as well as implied rates) of climate change. Leemans and Eickhout conclude that even small levels of climate change will have significant impacts on temperature limited ecosystems, such as the tundra, and on diversity of species within ecosystems. Risks to regional and global ecosystems increase rapidly above a 1–2°C increase in GMT over the course of this century, mainly due to the inability of forest ecosystems to adapt to such rates of temperature increase. In the third paper of this set, Nicholls and Lowe (2004) examine the possible benefits of mitigation for coastal zones. Their key conclusion is that there is a long-term commitment to sea level rise due to thermal lags in the ocean system. This is not to say that near term mitigation is inconsequential for coastal zones, just that its benefits will manifest themselves only in the next century and beyond. Also, the coastal zone benefits of mitigation will be largely “delayed” rather than “avoided” impacts, providing more time for the planning and implementation of effective adaptation measures.

The second part of this Special Issue consists of a trilogy of papers that address key analytical issues relevant to the discussion on benefits, but which are not explicitly accounted for in the global impact assessments outlined by Hitz and Smith, Leemans and Eickhout, and Nicholls and Lowe. In his paper Stephen Schneider (2004) raises the issue of low probability, high consequence events which are almost always left out of standard impact assessments. Through examples from ocean circulation and atmosphere–biosphere interactions Schneider demonstrates that the response of coupled systems to external forcing, such as increases in ghg emissions and climate change, can push the system from one equilibrium to another—thereby leading to non-linear, abrupt changes. Schneider further argues that the harder and faster a system is disturbed, the higher is the likelihood of such abrupt events, which could even be catastrophic. Thus, among the benefits of early and stringent ghg mitigation could be a reduction in the likelihood of such high consequence events. Next, Richard Tol, Tom Downing, Onno Kuik and Joel Smith (Tol et al., 2004) assess distributional aspects of climate change impacts and conclude that the distribution of adverse climate impacts is heavily skewed towards the poor in the near future, and will deteriorate for more than a century before becoming more egalitarian. Therefore another metric of assessing the benefits of mitigation policies could be based on their equity or social justice implications. In the next paper, John Callaway (2004) points to the lack of consistent approaches to incorporate adaptation and its associated costs in estimates of damages due to climate change and the benefits of reducing ghg emissions. Some studies impose adaptation assumptions exogenously to their modelling framework, while analyses that do include endogenous adjustments often do not fully capture the complexity of linkages between how climatic changes might intersect with investment, production, and consumption decisions in climate-sensitive sectors to mediate the net observed impacts.

The third part can be viewed as the other bookend for this Special Issue. It consists of two broader reflections or viewpoints on this entire discussion on global mitigation policy benefits. First, based on a review of the papers in this issue, Gary Yohe (2004) concludes that research has not yet advanced to a point where it can offer decision-makers with reliable estimates of global benefits, particularly in monetary terms so that they could be compared to the costs of mitigation. Instead of the cost–benefit paradigm Yohe suggests a risk based precautionary approach as a guide to climate policy. In the final paper, Henry Jacoby (2004) shares Yohe’s concern that estimation of benefits in a single (monetary) metric would not be feasible, given the incommensurable nature of benefits estimates. Jacoby however observes that in any policy choice explicit or

implicit benefit–cost considerations are inescapable. Decisions about a climate response—stringent or relaxed policies now, tight or loose constraints in the future—do imply some weight of the likely climate benefits from these various strategies. Jacoby therefore recommends the construction of a portfolio of benefits measures to include physical and economic metrics of change and structured to provide transparency about embedded assumptions when viewing any particular set of estimates.

In its Third Assessment Report the IPCC concluded that “comprehensive, quantitative estimates of the benefits of stabilization at various levels of atmospheric greenhouse gases do not yet exist” (Watson et al., 2001, p. 22). The papers presented in this Special Issue do not provide such quantitative estimates, but they certainly offer some illuminating insights on several pieces of this puzzle, while at the same time uncovering new complexities and challenges. Impacts information across a range of sectors has been meticulously synthesized to yield damage curves as a function of climate change. Some sectors exhibit monotonically increasing damages, with some others showing parabolic relationships, and still others—usually those that are not well-studied in the literature—with no clear patterns. At the same time, we recognize that such estimates fail to incorporate a number of critical considerations. These include potentially far more significant impacts of low probability, high consequence events in the distant future, irreversible changes in some systems or sectors, or impacts on social equity in the near and middle term. Nor do we have a good handle on defining the precise range of activities that fall under the purview of adaptation, and how to factor adaptation and its costs into estimates of benefits.

Yet, we also share Jacoby’s perspective that lacking systematic and open discussion of the benefits of avoided impacts would only encourage their implicit consideration in policy-making. Inevitably without reference to a clear body of literature, consideration of mitigation benefits will be left in the eye of the beholder—leaving the treatment of benefits in the policy process to be inconsistent and opaque. It is in this spirit that the OECD intends to pursue follow-up work on some of the components that could facilitate a more systematic exploration of this topic. We will begin to develop the portfolio of benefits measures referred to by Jacoby to include both physical and economic metrics of change. In particular, using GMT as a common metric for assessing change associated with mitigation, we will

begin to construct “bottom-up” regional estimates of mitigation benefits for a variety of different climate-sensitive systems. While necessarily partial, such an approach should provide a small step forward on this difficult topic. We are mindful of course of the complexity of the challenge ahead and our expectations remain modest. Nevertheless, we are confident that the approach will provide some new insights for policy-makers on the types of trade-offs implied by alternative global mitigation strategies and, importantly, on the benefits of action.

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