

Dislocated interests and climate change

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PERSPECTIVE

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Steven J Davis¹ and Noah Diffenbaugh²¹ Department of Earth System Science, University of California, Irvine, Croul Hall, Irvine, CA 92697, USA² Department of Earth System Science and Woods Institute for the Environment, Stanford University, Stanford, CA 94305, USAE-mail: sjdavis@uci.edu**Keywords:** climate change, responsibility, commons dilemma, equity, economics, fossil fuel emissions**Abstract**

The predicted effects of climate change on surface temperatures are now emergent and quantifiable. The recent letter by Hansen and Sato (2016 *Environ. Res. Lett.* **11** 034009) adds to a growing number of studies showing that warming over the past four decades has shifted the distribution of temperatures higher almost everywhere, with the largest relative effects on summer temperatures in developing regions such as Africa, South America, southeast Asia, and the Middle East (e.g., Diffenbaugh and Scherer 2011 *Clim. Change* **107** 615–24; Anderson 2011 *Clim. Change* **108** 581; Mahlstein *et al* 2012 *Geophys. Res. Lett.* **39** L21711). Hansen and Sato emphasize that although these regions are warming disproportionately, their role in causing climate change—measured by cumulative historical CO₂ emissions produced—is small compared to the US and Europe, where the relative change in temperatures has been less. This spatial and temporal mismatch of climate change impacts and the burning of fossil fuels is a critical dislocation of interests that, as the authors note, has ‘substantial implications for global energy and climate policies.’ Here, we place Hansen and Sato’s ‘national responsibilities’ into a broader conceptual framework of problematically dislocated interests, and briefly discuss the related challenges for global climate mitigation efforts.

The separation of climate warming and cumulative historical CO₂ emissions occurs in dimensions of both space and time. Developed countries like the US and Europe built up and now operate their economies using mostly fossil energy. As Hansen and Sato point out, the economic benefits of this fossil energy—and its attendant CO₂ emissions—accrued in developed countries over generations, but the climatic changes are becoming acute in the present generation, and in less-developed regions.

The difficulty of benefits and costs separated in time is well known, and concerns of intergenerational equity have been treated in detail by an estimable group of economists and moral philosophers (e.g., [5, 6–8]), including specifically the discounting of future climate impacts (e.g., [9–11]). As Hansen and Sato observe, the delay between CO₂ emissions and resultant climate warming separates past benefits from present impacts, just as current benefits are dislocated from future impacts.

Although physical proximity is known to affect moral decision making (e.g., [12, 13]), the separation

of economic benefits and climate impacts in space has received less attention (see [14–16]). This may be related to the fact that our experience with global public goods like the atmosphere is limited; historically, environmental problems have tended to be localized and seldom crossed multiple international borders [17]. Yet, as Hansen and Sato observe, emissions of CO₂ and other greenhouse gases have a global effect on climate, and may disproportionately impact regions on different continents from where they are produced. This is in part because the relative magnitude of warming is a function of both the absolute warming and the baseline variability (e.g., [2]). As a result, although much of the largest absolute warming has occurred in the mid- and high-latitudes [18], the relative warming has been greatest in areas of low temperature variability [2–4], which tend to be low-latitude areas that also exhibit high human vulnerability and/or high biodiversity [19–21].

The level and strength of organizations is another dimension along which interests are commonly separated. For example, those receiving benefits from fossil

energy or suffering impacts of climate change may be multinational corporations or national governments, whereas the impacts of climate change may fall most heavily on individual persons or local governments. Perhaps related to this, national governments have met regularly since 1992 to negotiate and coordinate their responses to climate change under the auspices of the United Nations Framework Convention on Climate Change [22], but much of the concrete recent progress in both mitigation and adaptation has been at the sub-national level, including individual and joint city and state initiatives (e.g., [23, 24–27]). Analysts have recently begun considering the distinct interests of corporations (e.g., [28, 29–32]) and even certain individuals (e.g., [33]).

Finally, economic linkages confound efforts to cleanly and wholly assign the benefits of fossil energy or the impacts of climate change. As Hansen and Sato mention, globalization now allows a consumer in the US or Europe to share the economic benefits of cheap fossil energy used to manufacture goods in China [34]. Another example, not mentioned by them, is that an Australian coal exporter may also indirectly profit from the sale of those same Chinese goods [35]. On the other hand, the impacts of more frequent natural disasters can also be expected to eventually ripple through the global economy (e.g., [36, 37]). Economic linkages often also bridge time and organizational level. For instance, increasing the well-being of a person in the present tends to increase the well-being of that person's children in the future, and profits of a corporation may flow both to its individual employees or to the global competitiveness of the countries in which it operates.

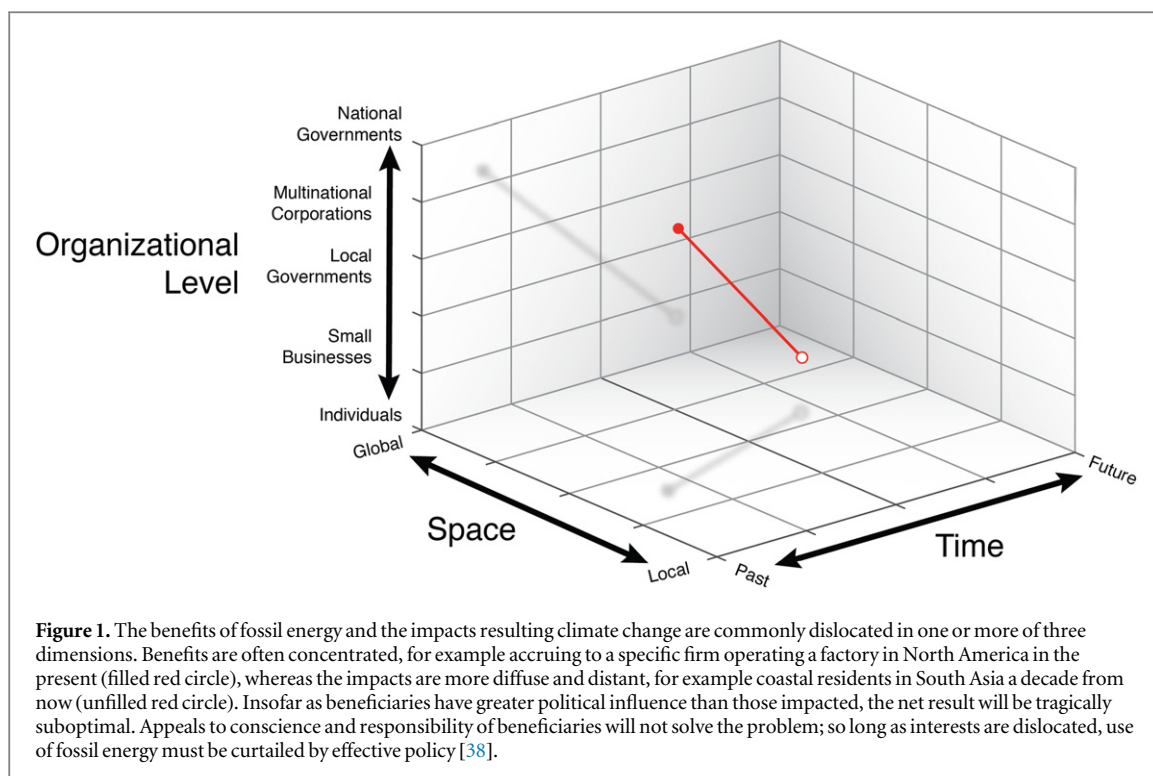
It should also be noted that interests need not be dislocated along these dimensions to pose serious problems. For instance, if an individual in the present can benefit at the immediate expense of a group of people standing nearby (i.e. with no dislocation in time, space, or organizational level), a tragedy of the commons may still arise [38]. But the dislocation of benefits and costs across time, space or organizational level makes it much more difficult to recognize the tragedy and adopt the policies necessary to avoid it.

Thus, we highlight four other dislocations that we believe are of special concern for climate-energy policy:

(1) Future impacts versus current benefits (energy consumption): The countries where future climatic changes are expected to be greatest also tend to be the countries where increases in energy consumption in the present will have the greatest marginal benefit to well-being, and ultimately to resilience to those climate impacts. Access to modern energy services is critical for escaping poverty (e.g., [39]) and thereby building adaptive capacity to climate change impacts [40]. Expansion of fossil energy in

such developing regions thus poses a difficult intertemporal dilemma.

- (2) Future impacts versus current benefits (fossil fuel extraction): Some of the developing countries where future climatic changes are expected to be greatest have substantial capacity to benefit from additional extraction of fossil fuels today. For instance, despite large oil reserves, more than 30% of the population in countries like Libya, Nigeria, Venezuela, and Turkmenistan live in poverty [41]. And despite the difficulties such resource-rich countries face in developing robust economies (e.g., [42]), future impacts of climate change will be weighed against the economic benefits of further fossil fuel extraction in the present.
- (3) Future impacts versus current benefits (ability to pay): By virtue of their still-developing economies, some of the countries where future climatic changes are expected to be greatest also have the least capacity to tolerate the higher energy prices associated with a carbon tax or other climate policies. Although renewable energy technologies are becoming more affordable, leveled costs of new fossil fuel-based electricity generating capacity are often still less than low-carbon alternatives [43], and the fact that renewables are frequently not dispatchable poses an additional challenge to reliability in developing regions where the existing energy infrastructure is poor. Climate policy that makes fossil energy more expensive thus imposes an economic burden in the present in order to diminish the burden of impacts in the future. But in the global marketplace, it may be difficult to prevent those present costs from falling disproportionately on those with the least leverage and ability to pay.
- (4) Individual impacts versus corporate benefits. In 2015, three of the ten 'most profitable companies in the world' (measured by net income from continuing operations) were in the oil and gas sector [44]. This is one indication that the economic benefits of continued fossil energy use may be accruing disproportionately to a small number of corporations [45]. In many cases, special interests also benefit from regressive, politically entrenched fossil energy subsidies that divert resources away from other investments in public welfare and also away from energy sources whose prices better reflect their market value [46, 47]. And while litigation against these companies may ultimately succeed in collecting damages and perhaps even hastening the decarbonization of the energy system [48, 49], the irreversible [50], globally-distributed impacts of climate change on natural ecosystems and generations of individuals will never be fully remedied. Although individuals also benefit directly and indirectly from fossil energy, and corporations may suffer some impacts from



climate change, the concern is that in each case the benefits are distributed much differently than the eventual impacts.

As these examples suggest, the most problematic dislocations of interests are where benefits are concentrated in time, space, and parties (e.g., here, now, to this company), while impacts are diffused widely across those dimensions (e.g., everyone living on Earth for the next thousand years; figure 1). This reflects a fundamental tendency of policies to serve better organized groups at the expense of less organized ones [51]. While it is tempting to decry the beneficiaries as villains and appeal to their consciences, ultimately the remedy must be structural [38]: policies that explicitly and effectively reconcile the dislocated interests, such as the carbon tax suggested by Hansen and Sato. But the specific details of such a policy are not easy: How burdensome should the policy be, and where should we impose it? How can we compensate for global market forces that may redistribute the burden of the policy inequitably? And where interests are dislocated across generations, political boundaries, or groups with divergent political influence, can such policies ever be implemented? These are critical questions facing policy makers and the research community. There is no policy that will perfectly align the interests of all parties across all dimensions, but dislocations in time, space and organizational level must be recognized and addressed if we are to successfully avoid dangerous climate change.

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