

Baggage: the Case for Climate Mitigation

Adapt to species loss, ice sheet disintegration, increased intensity of floods, storms, droughts and fires? Such talk is disingenuous and futile. For the sake of justice and equity, for our children, grandchildren and nature we have no choice but to focus on mitigation.

James Hansen

On 24 June 1812, Napoleon invaded Russia but with no clear idea of what he intended to do. His motives, one can assume, included the usual testosterone-driven potpourri of territorial expansion, plunder, power, adventure, and glory. The opponent was said to be the Czar of Russia, Alexander I, a mercurial sort much given to religious zealotry and the conviction that he was but a humble instrument of God, or vice versa.

From the beginning the campaign was difficult. Water, forage for horses, and food were scarce. Storms turned roads into quagmires one day and the next soldiers baked in the extreme summer heat. To make matters worse, a confused Alexander did not give adequate opportunity for manly combat. Instead, the Russian armies, led by the capable General Mikhail Barclay de Tolly, avoided battle by retreating eastward toward Moscow, drawing Napoleon's Grande Armée deeper into the endless Russian plains. The result was to lengthen French supply lines rendering them vulnerable to attack and the normal breakdowns of horse-drawn transport. Only on 7 September did Barclay's replacement—the elderly General Mikhail Kutuzov—

deign to give combat on the outskirts of Moscow at the village of Borodino. The battle distinguished neither general, but Napoleon prevailed in a manner of speaking and the way to Moscow lay open.

On arrival, however, Napoleon and his Grande Armée discovered two-thirds of the city had been burned by the retreating Russians and the exotic glories, pleasures, and practical usefulness of Moscow were thereby greatly diminished. Nonetheless they set about with considerable alacrity to loot what remained and settled in to a relatively uneventful 5-week occupation. With no enemy willing to give battle, and longing for the delights of warmer, safer, and more civilized places, Napoleon decided to go home. A considerably less grand Grande Armée departed Moscow on 19 October weighed down with everything of value that its soldiers could haul—jewelry, women's finery, household furnishings, artwork, musical instruments—booty of every sort and description. One participant saw "soldiers wheeling barrows loaded with everything they had been able to pile on them . . . their senseless greed had closed their eyes to the fact that two thousand miles and many battles lay between them and their destination" (de Ségur 1980).

The long journey home was not Napoleon's finest hour. First, by its brutality and arrogance the Grande Armée had managed to ignite the hostility of the Russian peasantry, a fairly difficult thing to do. The result was unending guerrilla attacks on

Napoleon's flanks and rear. Second, winter set in with a vengeance. Temperatures plummeted below zero and stayed there. Under assault by peasant guerillas, the Russian army, and bitter cold, the once-formidable soldiers began to shed their plunder. Roads westward were littered with candelabras, women's finery, furniture, artwork, and assorted treasures for hundreds of miles. As the situation became desperate, Napoleon's soldiers became more like a mob and threw away everything that was not absolutely essential to life and limb and the westward stampede. For most, however, it was too late. Of the nearly 600,000 men who invaded Russia, fewer than 100,000 got out alive.

The story is perhaps useful to illustrate what harsh reality can do to clarify priorities. Sometimes you can not take it all with you. Wishful thinking and denial do not change the weather. Sometimes you get out of a jam by the narrowest of margins, if you get out at all. But it is always smarter to avoid trouble in the first place.

The awareness that humans could alter the climate of Earth has dawned slowly on our consciousness. In 1896, Svante Arrhenius deflected his anguish over a failed marriage into remarkably tedious and, as it turned out, accurate calculations about the effect of CO₂ emissions on climate. It was an oddly therapeutic thing to do but it had no more effect on public attention than the smallest cloud on a distant horizon. Another 69 years would pass before scientists warned a U.S. president of the potential for

serious climate disruption and still another 30 years before the first report from the Intergovernmental Panel on Climate Change.

Facing climate destabilization, our choices are said to be adaptation, mitigation, and suffering. The suffering from climate-change-driven weather events and rising seas has already begun and will likely grow more extreme in decades ahead but is beyond the scope of this article. Accordingly I will consider only adaptation and mitigation. The advocates of each appear to come from different scientific backgrounds. Adaptationists, I think, come mostly from backgrounds in wildlife conservation, agriculture, urban planning, and landscape architecture, whereas mitigationists represent the various branches of atmospheric and climate science. The differences are telling.

The argument for adaptation to the effects of climate change rests on a chain of logic that goes something like the following:

1. Climate change is real, but will be
2. slow and moderate enough to permit orderly adaptation to changes
3. that we can foresee and comprehend and that
4. will, in a few decades, plateau around a new, manageable stable state,
5. leaving the gains of the modern world mostly intact, albeit powered by advanced technology (wind, solar, and as yet undreamed fixes).

In other words, the developed world can adapt to climatic changes without sacrificing much. The targets for adaptation include developing heat and drought-tolerant crops for agriculture, changing architectural standards to withstand greater heat and larger storms, and modifying infrastructure to accommodate larger storm events and prolonged heat and drought (Morello & Goodman 2009). These are imminently sensible and obvious measures we must take. But beyond some point there are limits to what can be done and the places

in which such measures can be effective. With predicted changes in temperature and rainfall and sea-level rise it is not likely that we can “promote ecosystem resiliency” or adapt to such changes with “no regrets” as some suggest. To the contrary, ecological resilience and biological diversity will almost surely decline as climatic changes now underway accelerate, and going forward we will surely have a great many regrets of the “why did we not do more to stop it earlier” sort.

Accordingly, more extreme adaptive measures called “geoengineering” are being discussed. These include proposals to fertilize oceans with iron to increase carbon uptake or injecting SO₂ into the upper atmosphere to increase the reflective albedo and thereby provide temporary cooling. But because the effects of geoengineering are largely unstudied and its risks largely unknown, it is a “true option of last resort” in the words of Victor et al. (2009). These authors conclude that “the best and safest strategy for reversing climate change is to halt the buildup of greenhouse gases.”

Proponents of mitigation, then, give priority to limiting the emission of heat-trapping gases as quickly as possible to reduce the eventual severity of climatic disruption. The essence of the case for mitigation is as follows:

1. Growing scientific evidence indicates the effects of climate change will be greater and will occur faster than previously thought;
2. the duration of climate effects will last thousands of years, not decades;
3. the race to avoid causing irreversible changes that would seriously damage or destroy civilization is a close one; and
4. the effects of climate destabilization can be contained perhaps only by emergency action to stabilize and then reduce CO₂ levels.

Practically, *climate mitigation* means reversing the addition of car-

bon to the atmosphere by making a rapid transition to energy efficiency and renewable energy. Arguments for mitigation, in other words, are rather like those for turning the water off in an overflowing tub before mopping. Those advocating mitigation believe we are in a race to reduce the forcing effects of heat-trapping gases before we cross various thresholds—some known, some unknown—tipping us into irretrievable disaster beyond the ameliorative effects of any conceivable adaptation.

Of course, neither adaptation nor mitigation alone will be sufficient and sometimes they may overlap. But in a world of limited resources, money, and time, we will be forced to choose between the two. In making such choices, the major issues in dispute have to do with estimates of the pace, scale, and duration of climatic disruption. And here the scientific evidence tilts the balance strongly toward mitigation for five reasons.

First, the record shows that climate change is occurring much faster than previously thought, will affect virtually every aspect of life in every corner of Earth, and will last far longer than we once believed (Archer 2009; Solomon et al. 2009). The small cloud that Arrhenius saw on the distant horizon in 1896 has grown into a massive storm dead ahead. The effects of climatic destabilization, in other words, will be global, pervasive, and permanent, and will steadily—or rapidly—worsen. Given the roughly 30-year lag between what comes out of our tail pipes and smokestacks, the climate-change-driven weather effects we are now seeing are being driven by emissions that occurred in the late 1970s. What is in store 30 years ahead when the forcing effects of our present 387 ppm CO₂ are manifest? Or what will it be like further out, when, say, the warming and acidifying effects of 450 ppm CO₂ or higher on the oceans have significantly diminished their capacities to absorb carbon? No one knows for certain, but trends in predictive

climate science suggest that effects will be much worse than once thought.

The implications for response strategies to climate change are striking. For example, it is now obvious that impacts will change with higher levels of climate forcing, which is to say that impacts will often occur faster than we can anticipate and will become manifest in surprising ways. To what climatic conditions do we adapt? What happens when previous adaptive measures become obsolete, as they will? Similarly, at every level of climate forcing the changes will be difficult to anticipate, which raises questions of where and when to intervene effectively in complex, nonlinear ecological and social systems. Are there places in which no amount of adaptation will work for long? Given what is now known about the pace of sea-level rise, for example, what adaptive strategies can possibly work in New Orleans or South Florida, or much of the U.S. East Coast or in those regions that will likely become progressively much hotter and dryer and perhaps one day mostly uninhabitable?

Second, the implications of the choice between adaptation and mitigation do not fall just on those able perhaps to adapt, for a time, to climatic destabilization but on those who lack the resources to adapt and to future generations who will have to live with the effects of whatever atmospheric chemistry we leave behind. The choice between mitigation and adaptation, in other words, is about ethics and justice in the starkest form. A few wealthy communities in the developed world may be able to avoid the worst for a time, but unless the emission of heat-trapping gases is soon reduced everywhere no one will be spared. And, more emphatically, the same can be said about future generations.

There is, third, a “stitch in time saves nine” kind of economic argument for giving priority to mitigation. Stabilizing climate now will be expensive and fraught with difficul-

ties for certain, but it will be much cheaper and easier to do it sooner than it will be later under much more economically difficult and ecologically harrowing conditions. Nicholas Stern (2007), for one, estimates “that if we don’t act [soon], the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever” (Stern 2007).

Fourth, efforts to adapt to climate change will run against institutional barriers, established regulations, building codes, and a human tendency to react to, rather than anticipate, events. There are, in economist Robert Repetto’s words, “many reasons to doubt whether adaptive measures will be timely and efficient, even in the U.S. where the capabilities exist” (Repetto 2008). In the best of all possible worlds, effective adaptation to the changes to which we are already committed would be complicated and difficult. In the real world of procrastination, denial, politics, and paradox, however, anything like thorough adaptation is not likely. It will, rather, be piecemeal, partial, sometimes counterproductive, wasteful, temporary, and ultimately mostly ineffective. In contrast, measures pressing energy efficiency and renewable energy—as complicated as they are—are much more straightforward and measurable, hence achievable. And they have the advantage of resolving the causes of the problem that has to do with anthropogenic changes in the carbon cycle.

Finally, beyond some fairly obvious and prudent measures, federal, state, and foundation support for climate adaptation give the appearance that we are doing something serious about the climatic catastrophe looming ahead. The political and media reality, however, is that efforts toward climatic adaptation will be used by those who wish to do as little as possible to block doing what is necessary to avert catastrophe.

Climate scientist James Hansen believes that “Our global climate is near-

ing tipping points. Changes are beginning to appear, and there is a potential for explosive changes with effects that would be irreversible—if we do not rapidly slow fossil-fuel emissions over the next few decades” (J. Hanson, personal communication). The conclusion in economist Nicholas Stern’s words is that “adaptation will be necessary on a major scale, but the stronger and the more timely the mitigation, the less will be the challenge of adaptation” (Stern 2009: 71). In other words, adaptation, must be a second priority to effective and rapid mitigation that contains the scale and scope of climatic destabilization. When they compete for funding and attention, the priority must be given to efforts toward a rapid transition to energy efficiency and deployment of renewable energy. Until we get our priorities right, the emission of greenhouse gases will continue to rise beyond the point to which humans could ever adapt. “The only true adaptation,” in George Woodwell’s words, “is mitigation” (G. Woodwell, personal communication).

Napoleon made a series of bad decisions, beginning with the one to invade Russia. But having done so and having gotten as far as Moscow in the fall of 1812, he made two decisions thereafter that proved fatal to his army and to the French empire. One was to tarry in Moscow for 5 weeks with the Russian winter approaching. The second was to permit his soldiers to load up with plunder that encumbered their escape, weighed down their knapsacks and wagons, undermined discipline, and diverted their attention from the serious business of escaping disaster.

Of course all metaphors and historical analogies have their limits. But rather like Napoleon’s *Grand Armée*, we, too, are in a race. For our part, we were first warned of climate change over a century ago and have lingered in increasingly dangerous territory in the belief that we can return to safer ground on our terms with all of the booty seized at the apogee of

fossil-fueled industrial era. It is not likely that we can do so and return to safer ground. According to Hansen et al. (2008) that means a rapid return to CO₂ levels of approximately 350–300 ppm. If we wait too long to prevent climate change we will, perhaps sooner than later, create conditions beyond reach of any conceivable adaptive measures. With sea-level rise now said to be on the order of 1–2 m by 2100, for example, we cannot save many low-lying places or many species. And sea levels and temperatures will not stabilize until long after the year 2100.

There will be unavoidable and tragic losses in the decades ahead, but far fewer if we act to contain the scope and scale of climate change now. That is to say that there is some baggage accumulated in the fossil-fuel era of our recent history that we cannot take with us. No matter what we do to adapt, we cannot save some coastal cities, we will lose many species, and ecosystems will

be dramatically altered by changes in temperature and rainfall. Our best course is to reduce the scale and scope of the problem with a sense of wartime urgency. And we better move quickly and smartly while the moving's good.

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