

PERSPECTIVES FROM THE FIELD

The Inevitability of Global Climate Change: Lessons from Political and Economic Theory

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Despite the growing number empirical studies (and scientific consensus) pointing to the devastating impacts of global warming (Peterson, Stott, and Herring, 2012), the evolution of leading atmospheric scientists and scientific organizations (e.g., American Meteorological Society) into advocates for programs and policies that mitigate carbon-based emissions, the climate-related concerns of some business leaders, and the prominence given climate change in President Barack Obama's second inaugural address, we must recognize that fundamental climate policy change will not occur in the foreseeable future. Unfortunately, intransigence, disinterest, imaginary thinking, and inaction characterize both national and international political decision making when it comes to passing policies to reduce carbon emissions significantly.

The probability of inaction has grown even greater as the oil and gas industry has discovered abundant natural gas and oil shales and tar sands throughout North America. The majority of private-sector and government leaders and the American public will not support the transition to relatively expensive forms of alternative energy while abundant carbon-based resources remain immediately accessible for exploitation. Thus, the United States (US), and for that matter the globe, are caught in a *Hobson's choice* (the take-or-leave-it option said to originate with Thomas Hobson, a livery stable owner in Oxford, England). Notably, we either accept the choice of incremental and most likely ineffective policy

changes or the likelihood is that nothing will be achieved. Although a national carbon tax may be the optimal solution in the sense that we could equalize the costs between carbon-based energy sources and alternative energy sources (wind, tides, solar), it is very unlikely we can move towards a national carbon tax even if revenues are redistributed to the general public and no matter the potential of this option to expedite the transition towards a sustainable future. The simple fact is that such an option would violate the fundamental policy beliefs of a capitalist society . . . where redistribution is anathema.

Nonetheless, many within the scientific community (as well as many within the thought leadership of the US progressive civic community) faithfully carry on with their clarion cry against unconstrained carbon emissions in tandem with a grudgingly optimistic belief that it possible to bring about fundamental, timely change through better communication with the public and political and business leaders. We believe this optimism is largely wishful thinking (with some caveats noted at the end of this article) and that intractable barriers exist to comprehensive change of the level needed to stop climate change.

The optimism of civic organizations and elements of the scientific community is illustrated through a recent series of seminars hosted by the prestigious Commonwealth Club of California (fall 2012) wherein a number of well-known climatologists spoke on the challenges facing climate change policy advocacy but, as importantly, expressed their belief that human society retains the option of avoiding a future where carbon emissions have locked the globe into a series of cascading events for which there is no plausible, human-constructed escape. As well-known climatologist Dr. James Hansen stated at Climate One Ceremony awarding him the 2012 Stephen Schneider Climate Change Communications Award,

[To continue carbon emissions at current levels] . . . we would be setting the planet on a path to disasters. We can't say when the ice

sheets are going to melt enough to cause that large sea level rise, but, you know, we already can see with CO₂ in the atmosphere now which is about 390 or 300—between 390 and 395. But the system has *not* come to equilibrium with that, we know that the planet is now out of that equilibrium for about seven tenths of a watt per meter square, which means there's almost as much warming in the pipeline as that which has already occurred. And look what's happening with the eight tenths of a degree warming now. . . . We have to keep the climate close to the Holocene. Civilization developed during the last several thousand years the Holocene which was—we were not at the peak Holocene temperature at the pre-industrial, but now, we've probably reasoned out of the Holocene range. Because sea level, for example, is now going up 3.1 millimeters a year which is 3.1 meters per millennium. It's way out of the range that existed during the Holocene. So we're already a little bit above the Holocene. We've got to stay close to the Holocene if we want to have a stable climate. And that's what—and *that's still possible*, because there are lots of ways we can actually draw CO₂ out of the atmosphere with better agricultural practices and reforestation. So it's not an impossible problem, but the key thing is we've got to start to get *off* fossil fuels soon.

. . . We can't—we cannot burn all these fossil fuels without going to the ice-free state which means sea level 250 feet higher. And so it's just crazy, but somehow, I *never* made that sink in, and is now—then Bill McKibben. You know, I've talked with him frequently and he's a much better writer, and he wrote this article for *Rolling Stone*. He said the same thing but he said it in a much better way, and suddenly, he said, "The reserves that these oil companies are counting on their books and their stock prices are based on this, those are five times greater than what we can burn and still hope to have a livable planet." Then, suddenly, some people, started to realize, we've got a problem. (Hansen, 2013)

The comments by Dr. James Hansen et al. before the California Commonwealth Club (Hansen, 2012) reflect a sense of urgency but also an optimism that the US, as well as other nations, are still masters of their own fate. Indeed, we can fix the problem by moving off carbon-based fuels. Unfortunately, social science strongly suggests that the likelihood of timely solutions of a suf-

ficient scale to avoid climate-based catastrophe are unlikely.

Indeed, the most that can be hoped for is a series of incremental steps (moving to additional nuclear power plants, reforestation certain areas, changing from coal to natural gas, better coastal planning practices) that most likely will not prove sufficient to “keep the climate close to the Holocene.” Hence, the our best chance is that the vast majority of climatologists are wrong in their view that there is fundamental, anthropogenic climate change occurring, that warming will not produce the dire consequences expected, or that political and economically neutral solutions (i.e., new technologies enabling massive sequestration or massive use of adaptive strategies) can be developed that will dramatically reduce carbon emissions. Unfortunately, the third option of massive investment in new technology for sequestration runs up against the continuing budget debate regarding austerity versus new infrastructure investment. While Congress and the president *play the fiscal fiddle*, widespread long-term drought continues throughout much of the country, and longer-term problems such as the growing inability of the Colorado River to support population growth continue unattended.

Several lessons drawn from the social sciences literature suggest that the capacity for change is limited and that we are likely to find ourselves in a crisis situation that we cannot easily extract ourselves. This may be the first time in the history of humankind that we face a problem that we cannot muddle our way through. Indeed, our luck may have run out.

Lesson 1: The Nature of Collective Political Action Makes Agreement on a Comprehensive Strategy to Combat Carbon Emissions All But Impossible Barring a Fundamental Crisis

The writings of the seminal political economist Mancur Olsen (1971) on the nature of collective action describe through economic theory some of the primary barriers to the development and institution of the major changes necessary to reduce the level of carbon emissions immediately and

significantly. In particular, Olsen demonstrates the difficulty in markets providing “collective goods” such as highways and other types of infrastructure (such as non-carbon based energy technologies) that are available to all, including *free riders* (p. 76) (those that benefit from the investment of others with little or no cost to themselves). In this regard, there is little incentive for markets to provide goods or services that either may not pay off (in terms of profits) or whose benefits cannot be restricted to those that invest in them. This free-rider problem requires a governmental sovereign to intervene and to require taxpayers to provide collective goods (scientific research and subsidized development) via taxes. If government cannot act, in most situations collective goods such as alternative energy policies and concomitant technological solutions may simply not appear because the payoff is too low and the investment risk is too high.

Olsen also addresses the problem that smaller groups comprised of large, powerful economic interests have significant advantages over larger but more diffuse groups (such as the overall electorate) in enacting policies. For example, it is much easier for a relatively small group of large energy companies to pursue their immediate interest of retaining current policies that favor carbon-intensive energy sources over a larger coalition of scientists, activists, and significant but diffuse segments of the electorate. Larger, more loosely bound groups face serious organizational obstacles to gaining the sustained political momentum necessary to institute policies and programs that promote significant changes in the status quo, especially if the problem is profoundly complex and can be fully understood only by scientists with an advanced understanding of physics and mathematics and/or the rules of processing and rigorous manipulation of huge data sets through obtuse statistical methods.

In part, the dilemma rests in that members of smaller, more powerful groups can easily see the tangible benefits of their political investments. Exxon, Dutch Shell, or British Petroleum have no problem in seeing the advantages of locking the nation and the globe into a carbon-intensive future even as such companies speak glow-

ingly about their diverse energy portfolios that conveniently includes alternative energy technologies. Conversely, individuals of large, diffuse groups that support alternative energy sources must take on faith that their small, incremental actions such as purchasing solar panels or writing to their representatives in favor of reducing carbon emissions will produce any tangible, consequential outcome. Thus, it is not surprising that most citizens opt for inaction.

Recent events show the tenacity to which energy companies have retained their tax subsidies and the problems that President Obama has faced in enhancing investments in alternative energy technologies. Small, interest-based coalitions have the clear political advantage when it comes either to maintaining the status quo or to securing benefits from the political system. The writings of Olsen and the lackluster political scorecard of climatologists and environmental groups versus energy interests point to the perverse problem of instituting even incremental solutions to global climate change. The perspective of the problem of ordinary citizens and collective goods is illustrated in “Americans’ Actions to Limit Global Warming in September 2012,” a report based on the findings from the nationally representative survey “Climate Change in the American Mind: Americans’ Global Warming Beliefs & Attitudes in March 2012.”¹ The survey results underscore the grim realities of collective behavior where political action by the ordinary citizen to support carbon reduction policies is extremely limited.

The survey shows that of those Americans who believe in global warming, only 8% believe their individual actions are making a significant difference, whereas 45% see their personal actions as making a little difference. Also, 21% believe their actions are not making any difference. Clearly, the public does not view personal action as having a consequent impact on global warming, and the public is, of course, correct: the political system is not responding to them, nor is the market place.

An overwhelming majority (80%) of those surveyed have never volunteered or contributed to an organization working to

reduce global warming, whereas only 2% donated a few times. This dismal record compares with energy interests that contribute millions to television ads, town-hall meetings, and direct lobbying to sustain an energy policy built upon the development of carbon-based energy sources. They also have the American Petroleum Institute (API), which is exceedingly well financed and stocked with economists supportive of a carbon future. During the last presidential election cycle, the API held multiple town-hall meetings for energy voters willing to hear the API's version of the truth when it came to energy development. Of course, it was a jobs message based on the development of carbon-energy sources. Not even the most powerful environmental organization has had the resources to equal the API.

Survey responses demonstrate how difficult it is to motivate individual political action even at the most minimal level. The responses show that 85% of those surveyed did not take political action by writing, e-mailing, or telephoning their elected officials about global warming. Imagine the difficulty in moving the entire US economy away from carbon-based sources of energy as advocated by Hansen. The responses to survey questions suggest that the advocacy efforts of climatologists who support a revolution in the way the US uses energy are bound to fail. Indeed, their monologue falls on deaf ears when it comes to Congress, where many members mistrust science.

Lesson 2: The Differing Core Beliefs of Key Interest Groups Will Impede the Development of a Political Consensus Necessary to Institute Timely, Fundamental Policy Changes

As important as the collective dynamics of group behavior in preventing change are the belief structures that inform various sides to the policy debate. Starting in the mid-1980s and continuing into first decade of the 21st century, Paul A. Sabatier and Hank Jenkins-Smith developed a framework for exploring long-term policy change, called the Advocacy Coalition

Framework (ACF). This seminal framework was developed with an eye towards exploring the dynamics of change (and no change) regarding environmental and energy policy (Sabatier, 1999; Sabatier and Jenkins-Smith, 1993). The primary components of this framework are that policy sectors (such as energy-climate) can be viewed best as a *policy subsystem*: change within a policy subsystem is best understood by taking a long-term view of policy change (usually a decade or more), and policy subsystems are typically dominated by 1–4 advocacy coalitions, each of which has its fundamental policy beliefs that define action and resist change.

In the case of climate change, there are at least three major coalitions and likely more. On first pass, they would be

Coalition 1. the carbon-based, energy development industry; including major energy development and transmission companies such as Shell, Exxon-Mobile; key associations such as the American Petroleum Institute; key members of Congressional committees overseeing energy and natural resources; many members of Congress; conservative think tanks such as the Heritage Foundation; some religious organizations; and a minority of climatologists. This coalition can be called the carbon-based energy development coalition (CEDC).

Coalition 2. Members of the environmental community, such as the Environmental Defense Fund, Sierra Club, and the Natural Resources Defense Council; advocates of alternative energy technologies and sources and related companies; certain long-standing primarily liberal civic associations, such as the Commonwealth Club of California; and significant segments of the American electorate. This coalition can be called the carbon reduction advocacy coalition (CRAC). It should be noted that internal differences of opinion within this coalition exist regarding what policy changes are sufficient. Some environmental organizations advocate market solutions such as cap and trade, while other organizations advocate carbon taxes and the redistribution of tax income to promote alternative energy technologies.

Coalition 3. Most members of the scientific community engaged in climate research; prestigious, publicly chartered scientific organizations, such as the National Academies of Science; certain moderate and liberal members of Congress; and agencies of government, such as the National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA) are members this coalition. The current president also appears to be a member, although some would question the depth of the Obama administration's commitment, especially given the lack of action on the part of the Environmental Protection Agency during President Obama's first term. (Note: The administration's decision on the TransCanada pipeline will indicate the administration's position on carbon emissions.) This coalition can be called the carbon reduction scientific advocacy coalition (CRSAC).

As already briefly noted, advocacy coalitions are bound together by a series of beliefs ranging from deep core beliefs (involving ontological and normative beliefs), policy core beliefs (key policy commitments and causal perceptions regarding the promotion and protection of self-interest), and secondary aspect beliefs (narrower, more changeable beliefs that typically govern tactical or instrumental strategies).

- The ACF assumes the policy core beliefs, not deep core beliefs, are the glue that holds advocacy coalitions together because the former represent basic normative and empirical commitments within the primary domain of policy elites (Sabatier, 1999, p. 122). Thus, change that affects policy core beliefs of a key advocacy coalition will be very difficult to institute if comprise between advocacy coalitions is a prerequisite.
- Fundamental policy change involves the interplay of endogenous factors (such as beliefs and advocacy coalitions) and exogenous factors (such as recurring major climate events). Hence, *crisis is a condition for change*.
- Policy *learning* across advocacy coalitions is often a necessary condition for change. If endogenous factors (core policy beliefs) prevent consensus or learning about the probable causes of

exogenous events, change is likely to be delayed or avoided altogether.

- Policy learning and resultant change are more likely when advocacy coalitions engage on secondary aspects that do not threaten policy core beliefs such as the use of energy efficient technologies in automobiles. Policy change is also more likely when the political governing coalition is changed. Since climate change has become a partisan issue; thus, one could reasonably expect that climate policy reforms would be more likely (but not by any means a certainty²) if the Democrats and their environmental allies captured both houses of Congress while retaining the presidency. Nevertheless, given the political influence of the CEDC, the actions of a government controlled completely by Democrats are not certain.

Using the ACF as a guide, the likelihood of significant policy change leading to significant reductions in carbon emissions is unlikely, given the policy core beliefs of the aforementioned three advocacy coalitions. Specifically, one policy core belief held by some members of the CRAC is that there has to be dramatic alteration in the energy sources used in this country and that significant changes would involve such things as the use of a carbon tax and the redistribution of revenues back to taxpayers. This policy core belief, of course, runs directly up against the policy core beliefs of the CEDC, including the enduring right and necessity of developing carbon-based resources, the primacy of the market, and the constitutional right to maximize profits. Moreover, the CEDC does not generally share the dire predictions of the CRAC, although the CEDC often gives a pro forma endorsement of alternative energy sources especially when these endorsements have significant public relations value.

Although the CRAC and the CRSAC share many of the same policy core beliefs, together they are generally not a match for the smaller, profit- and stockholder-oriented CEDC. Moreover, elements of the current political governing coalition (i.e., Congress) contains pro-CEDC elements with more than sufficient institutional re-

sources to block major changes. It must be remembered that our political system with its separate branches sharing similar powers is designed to impede change, not facilitate it.

Given the economic and political power of the CEDC, dependence of the US economy on fossil fuels, the need for jobs and economic growth, new fossil fuel discoveries that promise energy independence, and the nature of our political system, fundamental change is all but impossible. Differences of beliefs within the CRAC and CRSAC regarding the viability of market-oriented (cap and trade) versus government-regulatory frameworks (taxation of carbon emissions and redistribution of revenues to citizens) further complicate the debate and reduce the likelihood that significant policy solutions can be instituted. Again, any government-based carbon reduction taxation scheme also triggers core policy beliefs within the CEDC that interpret new taxes on carbon and the redistribution of revenues as anathema to business and capitalism. The CEDC also has a sizable number of allies in the general public that oppose any actions that run counter to an unfettered, capitalist economy. A major element of their political agenda is to weaken or remove environmental regulation, not to increase its role in society.

Indeed, the possibility of change depends on exogenous factors such as severe and repetitive climatic events and irrefutable scientific data pointing to human-induced carbon emissions. This may cause CEDC members to rethink their positions. However, if CRSAC members are correct, by the time such synergistically interacting events occur, new awareness and the resultant policies may have little or no effect on reversing the climate change process. At the same time, the opposition to nuclear power and even to the deep geological disposal of spent nuclear fuel voiced by certain members of the CRAC complicates the institution of intermediate solutions that are more palatable than the accelerated transformation of the energy economy into one based primarily on energy efficiency, solar power, and wind power. It is also likely that enhanced support for nuclear power could fracture the CEDC coalition.

Unfortunately, the CEDC is always facing the dilemma of wanting to have its cake and eat it, too. Indeed, we could make a major dent in carbon-based emissions through the siting of smaller, more standardized nuclear power plants. However, this strategy runs counter to the positions of many environmental organizations that have been fighting nuclear power for the last 40 years, as well as opposing the deep, geologic disposal of spent fuel that is building up on 70 sites. Some of these sites are vulnerable to large-scale weather events. Others are vulnerable to terrorist attack.

There appears to be a split between certain members of the CRAC and CRSAC coalitions, with some climatologists such as Jim Hansen showing a greater willingness to entertain a renewed commitment to nuclear power. Clearly, the environmental community will require a dose of realism to become more influential in the climate change debate.

Lesson 3: The Reality That Climate Change Policies Create Winners and Losers (a Variant of the Zero-Sum Game Called the Prisoner's Dilemma) That Creates Asymmetrical Levels of Political Opposition Blocking Fundamental Reforms

The use of game theory in combination with institutional rational choice theories of political change also suggests that comprehensive solutions to global climate change are unlikely. Specifically, when we view opposing advocacy coalitions from the perspective of game theory, it is rational why these coalitions would be unlikely to develop a consensus on the road to resolve climate change. Both the CEDC and the CRAC tend to view climate change in absolutist terms.

Science points the CRAC towards solutions that are an overwhelming departure from the status quo; indeed, they would revolutionize the economy by rapidly moving it away from carbon-based energy sources. Indeed, the dislocations created

by this revolution might be as dire as many of the effects of climate change. Remember, we are talking about the largest carbon-based economy in the world rapidly moving towards a noncarbon energy future. Many advocates within the CRAC and the CRSAC view anything less than revolutionary change as insufficient and use both empirical models and simulations to back their policy positions. On the other side of the equation, anything but incremental changes such as pro forma investments in alternative energy sources are viewed as a fundamental threat to the interests of the CEDC.

What is set up is a variant of prisoner's dilemma game where only suboptimal solutions are possible:

Cooperation is usually analyzed in game theory by means of a well-known game called the "Prisoner's Dilemma" (Axelrod, 1984). The two players in the game can choose between two moves, either "cooperate" or "defect". The idea is that each player gains when both cooperate, but if only one of them cooperates, the other one, who defects, will gain more. If both defect, both lose (or gain very little) but not as much as the "cheated" cooperator whose cooperation is not returned. (Heylighen, 1995)

Such a distribution of losses and gains seems natural for situations involving the development of climate change policies since the cooperating advocacy coalition whose action is not returned will lose resources to the defecting advocacy coalition, without either of them being able to collect the additional gain coming from the synergy of their cooperation. The Prisoner's dilemma is a form of the general zero-sum game wherein there are distinct barriers against mutual cooperation: each gets 0 when both defect or, when one of them cooperates, the defector gets +10 and the cooperator -10, in total 0. On the other hand, if both cooperate, the resulting synergy creates an additional gain that makes the sum positive: each of them gets 5, in total 10. Hence, in debates between conflicting climate change advocacy coalitions, there is always a significant incentive for the CEDC to defect first from legislation involving major, controversial policy changes (Heylighen, 1995).

Lesson 4. The Inherent Differences of Interest between Nations in the Context of an Anarchic International Environment Will Always Produce Defections and Suboptimal Solutions

If gaining political support in the US for comprehensive policies to stop global warming climate are seen to be difficult, the problem of gaining international cooperation is more difficult by several orders of magnitude. This situation is best explained by the *stag hunt*, a game first proposed by the philosopher Jean-Jacques Rousseau, which describes a conflict between optimal and suboptimal solutions under conditions where there is no centralized authority (i.e., the international anarchic environment). The anarchic international environment (i.e., lack of centralized authority with the power to enforce policies) generally limits international agreements and protocols to suboptimal solutions. A suboptimal solution would be one wherein the solution does not adequately solve the problem at hand. In global change terminology, it would be an adaptive approach rather than a mitigation strategy.

The following is a short description of the stag hunt applied to global warming (Jervis, 1978):

Two hunters go out for the day looking for some prey. In this case, imagine that the hunters are nations trying to form a cooperative strategy to combat global warming. There are three possible targets: a large stag (or an end to carbon emissions) and a couple of hares (e.g., an incremental initiative to accelerate reforestation or restrict the building of houses on the ocean). The only way to bag a stag is for both hunters to work together. Or, if you are a nation, the equivalent would be for both nations to work hand in hand to develop an optimal strategy such as curtailing national global carbon emissions by 80%. However, if one assumes that it takes at least two hunters to kill a stag (or major developed nations) and one goes for the stag (optimal climate change policy) and the other goes for a hare (suboptimal, incremental climate change policy), the one that stays

with seeking the stag (or major climate change policy equivalent) will end up with nothing.

This situation is exemplified by one nation (or coalition of nations) significantly curtailing emissions and the other one (or coalition of nations) defecting and adhering to the status quo (exploitation of oil and gas) with minor changes. If you're hunting for two hares by yourself, you are more likely to get two for sure. If both hunters cooperatively go for the two hares, each is more likely to get at least one, and therefore both will bag dinner (or, in climate parlance, some reduction in emissions).

The stag hunt is a game that describes the structural conflict between minimizing and maximizing political cooperation. Here, the game is used as a metaphor to illustrate the factors that work against cooperation in killing the stag (the equivalent of the highest payoff in terms of reducing climate change). Indeed, killing the stag is the equivalent to ending or significantly diminishing carbon emissions within the constrained time frame outlined by certain climatologists (Table 1).

As illustrated by Table 1, the highest payoff is when there is cooperation between the hunters (nations) to secure the stag (100,100). The second highest payoff is when both hunters (nations) pursue the hare (i.e., equivalent to adaptive strategies). Of course, the lowest payoff is when one hunter (nation) defects and stalks the hare rather than the stag, leaving the remaining stag hunter out in the cold. The rules of the game are that at least two hunters must stay the course in order to bag the stag. The first defector earns a payoff of 50 while the other hunter (nation) gets 10. As mentioned before, there

Table 1. The payoff matrix of the stag hunt game

		Hunter 2/Nation 2	
		Stag	Hare
Hunter 1/ Nation 1	Stag	100,100	10,50
	Hare	50,10	50,50

is always a built-in tendency for nations to defect and seek the equivalent of the hare. Thus, suboptimal solutions typically result. This behavior holds true for controlling carbon emissions on a global scale especially when carbon-based fuels are readily abundant and fueling economic growth. Defection is always a serious temptation—hence, the lack of global progress on meaningful carbon reduction.

Clearly, the best strategy is where both countries (coalition of countries) cooperate and develop a strategy that reduces carbon emissions by an amount adequate to control global climate change. The global community wins the highest payoff in terms of a stable climate. However, if some nations stay the course and the other nations go for the equivalent of the hare or worse, the nations with the more ambitious programs may lose big. The nations that move away from the use of carbon energy sources are left holding the bag in terms of costly alternative energy investments with unproven relative payoffs in a world still exploiting cheaper carbon-based energy sources.

Moreover, defecting nations may gain by free riding off the policy changes and the new technologies instituted by those that continue to seek the stag. The rational strategy for all nations (under anarchy) is for all to pursue hares (or suboptimal solutions). While these nations will have lower payoffs, all will benefit marginally from some degree of reduced carbon emissions. In the stag hunt, no one nation can kill the stag, so if a country or hunter defects, the stag-seeking (comprehensive, systemic climate solutions) countries may be left in the policy cold.

Notably, however, if we have multiple countries attempting to cooperate to solve the global warming problem, the relative payoffs will be determined by the size and economic position of the cooperators versus the defectors. If the cooperators are the larger, more powerful countries, and the defectors are smaller countries with less power and significantly lower gross national products, the larger, more developed nations may win in the end by restricting imports of carbon-based energy resources in favor of the noncarbon

energy sources. This point harkens back to our earlier discussion of collective goods and how economically powerful national entities that comprise a relatively small subset of the international community have intrinsically more influence and political wherewithal.

Distribution of global emissions underscores the need for broad multilateral cooperation in mitigating climate change. Only 15–20 nations are responsible for roughly 75% of global emissions, but no one country accounts for more than about 26%. Efforts to cut emissions—mitigation—must therefore be global. Without international cooperation and coordination, some states may free ride on others' efforts or even exploit uneven emissions controls to gain competitive advantage. And because the impacts of climate change will be felt around the world, efforts to curtail the effects of climate change through adaptation will need to be global too.

Unfortunately, global efforts to control carbon emissions are clearly not working. As the Council on Foreign Relations (2012) reports in a recent issue brief,

The Kyoto Protocol includes firm commitments to curb emissions only from developed countries, but does not include the United States and has no meaningful consequences for noncompliance; it has also come under unprecedented strain as Canada officially withdrew from the accord in December 2011. As Japan and Russia follow Canada's example, the hopes for a legally binding climate accord are fading. Additionally, the regime, other than providing numerous exemptions regarding greenhouse gas emissions, fails to provide emerging big emitters like China and India with meaningful targets and incentives to curb their emissions. The architecture for global climate governance looks particularly shaky after the fifteenth Conference of Parties (COP-15), in Copenhagen, failed to overcome entrenched differences among the major parties and deliver targeted emissions cuts. Following Copenhagen, COP-16, in Cancun [Mexico], made limited strides toward effective multilateral action, but the regime still falls well short of promoting needed action to effect positive change, including committing to a post-Kyoto framework.

Similarly, little progress was made during the COP-17 meeting in Durban [South Af-

rica]. While parties agreed to extend the Kyoto Protocol until at least 2017 as well as solidified an operating structure for the Green Climate Fund, little was clarified concerning the form of a successor accord to the Kyoto Protocol. Delegates to the COP-17 did agree, however, that the new accord would include reduction targets for all nations, rather than exclusively those considered to be developed. (Peterson, Stott, and Herring, 2012)

In the Durban, Cancun, and Copenhagen, reporting mechanisms, funding pledges, and unilaterally declared nation-specific emission reduction goals were agreed upon. Hence, it would appear at first glance that the international community was making reasonable progress towards a new cooperative carbon reduction regime that works.

However, if past is prologue, these are hollow victories. The lack of an international enforcement body (i.e., the dilemma of an anarchic international environment) will leave these promises largely unfulfilled, and individual nations are unlikely to comply when their commitments run counter with economic growth and/or carbon-based resource development.

The limitations of the Durban Platform, as well as declining status of the Kyoto Protocol, are leading to serious concerns regarding the structural viability of international cooperation on climate. Many of these concerns stem from the continuing refusals of large nations, including India, China, and the US, to accept legally binding targets for admissions. In turn, this leads to doubt regarding the extent that other significant greenhouse gas emitters will participate in any cooperative regime (voluntary or otherwise) (Hansen, 2012).

At the heart of the matter, nations disagree over climate monitoring and financing stipulations in the Kyoto Protocol and other potential legally binding emissions accords. Climate frameworks struggle to monitor greenhouse gas outputs effectively, especially in developing countries. Other countries lack the domestic capacity to determine their total emissions even if they are able to monitor national levels (Council on Foreign Relations, 2012).

Still others, like China, argue that an international monitoring system represents an infringement on national sovereignty and that developing states should be afforded some leniency in emissions as they are currently in critical stages of economic development. Nor do the current or evolving climate regimes adequately address the sources of financing needed to help developing nations cope with climate change. To date, the total disbursed funds for climate change initiatives add up to only about \$2.1 billion (Council on Foreign Relations, 2012).

The international community is caught in a version of the stag hunt game where fundamental solutions are always undermined by the urge to defect for outcomes that may be suboptimal in the long run but appear to be fully rational, optimized actions in the present. Unfortunately, if the most dire climate predictions do prove to be true, nation-states will ultimately regret their prior actions. However, if climatologists such as Jim Hansen are correct, by that point it will be too late to reverse those actions.

Conclusion

For those who doubt the reality of climate-based events, I suggest a visit out to the Midwest and Far West. You will observe an already arid climate in regions like southern New Mexico that are suffering from a long-term drought that is killing hardy cacti, turning the once-proud Rio Grande into an empty ditch such that recently there was not enough water to irrigate pecan groves, and the unsustainable tapping of groundwater to support the continuing unrestrained demographic expansion of once small towns such as Las Cruces, New Mexico, which has grown from 40,000 residents in the early 1970s to over 100,000 citizens in the first part of the 21st century. Although climate change does not necessarily cause in- or out-migration, it does affect the carrying capacity of regions already straining to support projected larger populations. This is particularly true in arid geographic areas dependent on the upper and lower Colorado River for water (US Bureau of Reclamation, 2012).

Unfortunately, land-use planning is usually a local responsibility and, even in states like New Mexico that have a state water engineer, there seems to be a reluctance to develop and implement policies that constrain economic development and growing water use. Again, the need for state and local revenues typically trumps the enforcement of sustainable policies. At some point, and anathema to the CEDC coalition, it will be critical to develop a greater role for the federal government to develop national and regional land-use plans especially on environmental issues that cut across state lines.

Based on several lessons from the literature on collective action and policy change, developing and enacting comprehensive solutions that stop global warming will be very difficult.

The noted second NASA administrator, James Webb, observed over 40 years ago that this nation functions adequately only in times of crisis, especially when the solution requires large-scale investments and organizations (Webb, 1969). His statements are even truer today as we face a return of ideological and sectarian thinking (Douglas and Wildavsky, 1982)³ in tandem with a political process where large amounts of money are often (but not always) more important than votes. What holds for this country also holds for the international community where the urge towards short-term benefits from carbon-based forms of energy tends to trump cooperation among nations.

Without crisis, there often is little or no policy change. With crisis, it may be too late to reverse the damage done by pumping large amounts of carbon into our atmosphere.

Still, *a caveat is in order*. Indeed, for multiple reasons, there is still hope: First, it is possible that some technological (sequestration) technology can be developed and instituted that will resolve the problem and avoid a crisis. Second, it is intuitively possible that the vast majority of climatologists are wrong or that their time line for instituting effective change is too constrained.

The possibility that climatologists are incorrect is not far-fetched. Consensus within the scientific community is no absolute guarantee that events will transpire consistently with that consensus. Thomas Kuhn's (1962) seminal treatise on scientific revolutions documents how consensus within scientific communities has been overthrown time and time again via anomalies that force a new paradigm into acceptance. In addition, a reading of the of the book *Einstein's Luck*, by John Waller (2002), illustrates how the progression of science is not a straight line and that many times scientists have been dead wrong or, conversely, right for the wrong reasons. Science, like all human activities, is imperfect and retains a significant political component.

A third factor may lead to change. The US and the globe are undergoing a fundamental revolution in communication technologies ranging from the Internet to smartphones to laptop notebooks. This revolution cuts by significant margins the costs of mass communications and in certain situations can trump the advantages provided to small groups with massive economic resources. If used effectively in tandem with political leadership, there is a chance that the overwhelming barriers to climate policy change could be overcome especially if unusual physical phenomena, such as 100-year weather events, occur every couple of years. The costs of repetitively rebuilding coastal communities may convince the most ardent critic of global warming that something about carbon emissions has to be done beyond public relations, including the more creative use of zoning powers. Of course, the US Supreme Court might curtail the use of zoning to limit the ability of government to interfere with privately owned coastal property (see US Supreme Court, 1992).

Indeed, if the time line for the most dire effects of climate change is longer than many climatologists expect, this will provide a chance to engage in a global learning process that could enable us to invent a more positive future in which political processes both domestically and internationally respond more effectively to global warming. During the last Earth Day, over 2 billion people participated in a variety of

environmental activities. If social communications can harness this reservoir of “person energy” to promote meaningful carbon reduction policies, we have a chance.

Despite the overall negative thesis of this opinion piece, rays of hope are on the horizon. It is not impossible that the US and the international community together can develop fundamental solutions to climate change. Unfortunately, this optimism runs counter to the tenants of human social and political behavior already outlined. They, unfortunately, suggest a more negative set of outcomes.

Many years ago, the Ford Foundation published the report “A Time to Choose” (Ford Foundation, 1974), which outlined an alternative energy future. Similarly, we are at a point where we must decide whether to act to the best of our ability or allow events to take their uncertain, potentially devastating course. The future of the globe depends both on luck and the willingness of individuals to take purposeful action.

Notes

1. “Americans’ Actions to Limit Global Warming in September 2012” (Leiserowitz et al., 2013) is based on findings from the nationally representative survey “Climate Change in the American Mind” conducted by the Yale Project on Climate Change Communication and the George Mason University Center for Climate Change Communication (Leiserowitz et al., 2011). Interview dates: August 31, 2012–September 12, 2012. Interviews: 1,061 adults (age 18+). Total average margin of error: ± 3 percentage points at the 95% confidence level. The study was funded by the Surdna Foundation, the 11th Hour Project, the Grantham Foundation, and the V.K. Rasmussen Foundation.
2. It is interesting that President Obama’s ambassador to the United Nations and onetime proposed Secretary of State is an investor in TransCanada, Inc., the designated builder of the international pipeline that would transport from Canada comparatively dirty tar sands to Texas.

3. There has been a tendency on the part of certain members of the CEDC, CRAC, and CRSAC to gravitate to almost religious (secularian) perspectives regarding the climate change situation.

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