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As global negotiations over addressing climate change lumber on, the problem itself has increasingly moved from a long-run threat to a more urgent problem.[1] Scientists put this starkly when they say that current concentrations of carbon dioxide, the main greenhouse gas, are higher than they have been for 800,000 years.[2] The effects of climate change are already manifesting in higher temperatures as well as extreme weather events that scientists can increasingly attribute to climate change.[3] Since the 2007 release of a series of think tank reports on climate change and national security, the US national security apparatus has moved to incorporate climate change into its strategic planning, both in terms of preparing for direct threats to the homeland and indirect threats to the country's overseas interests.

How should the United States properly align means and ends at a time of constrained resources? In a world of pressing security problems, how can those concerned about climate change make a compelling case for dedicating scarce resources to this problem? This volume has an expressed aim of encouraging triage and goal-setting: that some problems are more important than others and "all of the above" is not a national security strategy.[4] Climate change is a problem that asks the United States to do more at a time when public opinion, military exhaustion, and domestic economic imperatives counsel doing less.

This chapter seeks to reconcile that tension, beginning with the general case for incorporating climate change into the broader strategic calculus of the United States, given concerns about imperial overstretch and the need for more selective engagement on the world stage. My general argument is that self-interest and preservation demands US leadership on climate alongside China, which has now superseded the United States as the world largest emitter of greenhouse gases. Changes in relative economic power between the United States and

China create a danger of the equivalent of the interwar period between World War I and World War II, with both countries unable and unwilling to provide sufficient leadership to generate the global public good of climate protection. While the breakdown in cooperation on climate change is a possibility, US-China policy coordination in the lead up to the 2015 Paris climate negotiations suggest this is not destiny.

At the same time, even as climate change demands more attention, US policymakers have to be mindful of the risks of threat inflation by "securitizing" climate change. Labeling climate change a security threat has a certain attraction, as it may increase attention, resources, and support for action, particularly among conservatives. However, advocates of this strategy may have to be careful what they wish for. While it might deliver new efforts to mitigate climate change (that is to reduce greenhouse gases), the climate security agenda will likely lead to attention to homeland security and the consequences for the American military at home and abroad. A climate security agenda might also lead to a narrow agenda. Most academic studies focus on whether climate change will lead to conflicts such as civil wars, for which the evidence is mixed and the causal chains complex and poorly understood. Climate change already poses a present security danger through extreme weather events and their direct effects on populations and critical infrastructure. While a wide variety of climate security concerns have been incorporated in to national security planning documents, major investments in climate proofing infrastructure and investments domestically and internationally have only just begun. More attention needs to be paid to understanding the full set of risks, including potentially catastrophic impacts of low or unknown probability such as ocean acidification and permafrost melt.

In this chapter, I first discuss the origins of climate security both among practitioners and academics before synthesizing the state of knowledge on climate change and US national security, drawing from both US government assessments and the wider academic literature on climate and security. I focus on three dimensions of the problem, the direct effects on the US homeland, the indirect effects on US national security through overseas impacts, and the geostrategic implications of the policy environment as climate change becomes an increasingly

top tier issue in international relations. For each, I review the claims about the security connections and the state of knowledge. I close with some thoughts on US policy, risk assessment, and the meaning of sustainability and security.

THE ORIGINS OF CLIMATE AND SECURITY

To know what level of self-protection against climate change is warranted, it is helpful to understand the origins of the interest in environmental and, in turn, climate security. This section walks through the turn to climate security both among practitioners and scholars that began in the mid-2000s.

Environmental security has an established pedigree dating back to the 1990s and 2000s in policy and academic circles, led by the likes of the scholar Thomas Homer-Dixon who sought to demonstrate that environmental stresses had a major role in triggering conflicts.[5] The Woodrow Wilson Center's Environmental Change and Security Program was founded in 1994 as a transmission mechanism for connecting this kind of academic work to policy audiences.[6] Environmental scarcity was explicitly explored as a cause of conflict and state collapse in the work by the State Failure Task Force in 1999 (later renamed the Political Instability Task Force), a US government sponsored research project.[7] Given data availability, much of the environmental security literature was based on qualitative case studies, and ultimately, the efforts were somewhat inconclusive, with the association between environmental factors and security outcomes, notably conflict, contingent on other political phenomena such as the degree of government inclusiveness and the extent of societal cleavages.[8]

The connections between climate change and security did not emerge until later in the mid-2000s. In the face of political opposition to addressing the climate problem, climate advocates, particularly in the United States, began casting about for new ways to frame climate change as a way to broaden their coalition.[9] One way was to frame climate change as a security threat. In the aftermath of the 9/11 terror attacks, Tom Friedman and others began this framing,

linking fossil fuel dependence to unsavory regimes and also highlighting the connections between climate change and security outcomes at home and abroad.[10]

One of the early efforts to connect climate and security was a piece I co-authored with Nigel Purvis in 2004, commissioned by the Woodrow Wilson Center for the UN Secretary General's project on Threats, Challenges, and Change where we emphasized that the most important emergent threat was increasing humanitarian crises that might require military support.[11] The climate-security drumbeat began to accrue a constituency in policy circles in Washington beginning with some think tank studies in 2007 and 2008 by the CNA Corporation,[12] my paper for the Council on Foreign Relations,[13] and an edited volume from the Center for a New American Security and the Center for Strategic and International Studies.[14] All of these studies tentatively approached the causal role of climate change in security outcomes, notably conflict, by referring to climate change as a "threat multiplier" and as an additional "stressor."

Governments began commissioning studies on the effects of climate change and security such as the 2008 National Intelligence Assessment on climate and security by the National Intelligence Council,[15] its subsequent report on water security,[16] as well as reports and meetings by the Defense Science Board[17] and the National Academy of Sciences.[18]

While this interest in climate and security may not endure across presidential administrations if a Republican is elected in 2016, the Obama administration's incorporation of climate change in national security planning documents sprawls across multiple executive branch agencies. Prompted by an Executive Order from the president in 2009 (followed by others in 2013 and 2014) and the work of the Interagency Climate Adaptation Task Force, the Obama Administration directed executive agencies to take climate change adaptation concerns into their operations.[19]

Climate change has thus subsequently been incorporated into US Pentagon planning documents like the Quadrennial Defense Review (2010, 2014)[20] and the 2014 Department of Defense Adaptation Roadmap[21] as well as planning documents by other agencies, including the

2012 Department of Homeland Security Climate Change Adaptation Roadmap[22] and the 2010 and 2014 Quadrennial Homeland Security Review.[23] The US also issued strategic documents on the implications of climate change as part of the 2010 and 2015 national security strategy documents[24] as well as more focused investigations for the Navy and the Arctic.[25] USAID has also carried out research projects to assess the significance of climate change for state fragility,[26] and climate security concerns were incorporated in to the 2015 Quadrennial Diplomacy and Development Review (QDDR), a State Department planning document.[27] In May 2015, President Obama pulled these threads together in a 2015 commencement speech at the US Coast Guard academy.[28] Subsequent speeches by National Security Advisor Susan Rice and Secretary of State John Kerry reinforced these themes.[29] As of fall 2015, most of these appear to be planning documents with multi-billion dollar investments in protecting critical infrastructure and spending patterns for combatant commands and foreign assistance yet to materialize.

Outside of government, in addition to the long-time work of the Woodrow Wilson Center, there is a newer policy community in Washington that works on climate change and security nearly full-time, including at the CNA Corporation, the Center for Climate and Security,[30] the American Security Project,[31] and various universities. These professionals meet regularly to mainstream climate considerations into policy, mostly in terms of an adaptation and response agenda for the traditional US national security establishment. There are similar constituencies in other countries, notably the United Kingdom. Internationally, the UN Security Council held its first ever debate on the topic in 2007.[32] The European Union,[33] the G-7,[34] and various other governments also began engaging on the security dimensions of the problem.[35]

Alongside this policy preoccupation with climate and security, academics have also engaged on the topic with a large literature proliferating since the late 2000s, much of it quantitative in nature and narrowly focused on whether or not climate change causes internal conflict within countries.[36] A broader more qualitative literature has focused on the "human security" implications of climate change and wider harms to human welfare. From this perspective, in addition to food security and climate-induced migration, the cultural integrity of

communities and the effects of climate change on livelihoods are threats to human security.[37] The surge in academic research on the topic was sufficient to elicit a full chapter on human security in the 2014 IPCC Fifth Assessment Report.[38]

This background is important because the diverse motivations for framing climate change as a security problem and the various ways climate security is understood have major implications for how the problem is currently dealt with. Importantly, in order to justify action in this space, either to address the security implications themselves or to trigger a broader commitment to mitigation, climate security professionals have strong incentives to dramatize the problem and make sweeping claims about the contribution of climate change to global conflict trends[39] or the contribution of climate change to particularly salient geo-political events such as the Arab Spring[40] and the conflict in Darfur.[41]

This effort to "securitize" climate change is a familiar project that groups seeking policymakers' attention have engaged in to jump their particular issues up the queue. As Daniel Deudney noted in a 1990 *Millennium* article, evoking security allows normal politics and the standard policy process to be swept aside in favor of extraordinary measures. These may be expensive and focus on parochial national interests at the expense of wider global public goods concerns.[42]

Aside from these risks, securitizing a problem potentially leads to threat inflation as groups hype their preferred cause *du jour* because they think the instrumental use of security language will generate more interest and resources for their problem. The downside is that if those security consequences do not materialize, the issue might not have staying power on the international agenda. Though HIV/AIDS remained a high priority in the 2000s for other reasons, the security dimensions of HIV/AIDS largely dissipated as an active area of research and policy despite earlier claims that AIDS orphans were being recruited to become child soldiers and other ills.[43] The other negative consequence of successful securitization is that it identifies the military as primarily responsible for addressing the security consequences of climate change, even if other agencies and instruments are more appropriate for dealing with the issue.

This is not a negation of the connections between climate change and security but a recognition of incentives and motivations that have impelled the security cast of the problem to prominence.

THE SECURITY CONSEQUENCES OF CLIMATE IMPACTS

From the previous discussion, the strategic imperative that emerges is to review and evaluate the specific consequences of climate change that pose a real threat to US national security. This requires a tractable definition of national security that is both consistent with practice in policy circles and logically defensible. This section begins with a review of definitions of national security and provides a conceptual framework for thinking about climate security threats, distinguishing between direct threats to the homeland, indirect threats to a country's interests overseas, and the geostrategic implications of responses to climate change.[44]

Definitions of national security

Historically, national security threats were narrowly construed as armed external attacks by state actors against other states. Post 9/11, where non-state actors carried out attacks against the United States, that definition appeared anachronistic. However, even expanding the definition to include terrorists and other non-state actors as security threats still implies human agents actively seeking to harm another state. Some threats, such as diseases like Ebola, might not be directed by human agents but still constitute security threats to the United States. The consequences of a disease outbreak could kill large numbers of Americans and disrupt national confidence and stability enough to constitute security threats.[45]

By the same token, climate change might also give rise to consequences of similar severity to disease outbreaks. Put more generally, a threat that potentially causes massive challenges or disruptions to a country's way of life and poses a danger to the survival of large numbers of people is a national security threat. Another way of imagining security threats is to ask if those consequences were wrought intentionally, what would the state's response be? If a state, in other circumstances, would be prepared to use military force to prevent such an outcome, that would

also signal that the problem is severe enough to constitute a threat to national security, even if the tools required to address that challenge are not necessarily military ones. Indeed, if the military is required to deal with these threats, then that in and of itself is an indicator of failure of civilian early warning systems and humanitarian action to prevent hazard exposure from escalating into disasters that require emergency military mobilization.

There are two main ways that climate change could constitute a national security threat, as a *direct* threat to a country's homeland and as an *indirect* threat to its overseas or international interests.[46] This distinction between directs threats to the homeland and indirect threats overseas is largely consistent with how the wider policy community conceptualizes the nature of the threat. For example, the report that accompanied the 2015 commencement speech by President Obama emphasized this perspective, "The implications of climate change on national security are not all beyond US borders—they pose risks here at home."[47]

For both direct and indirect threats, I consider the causal connections between climate change and security outcomes, focusing on the claims and the state of knowledge for a select few processes along with some policy recommendations.

Direct threats to the homeland

For both direct and indirect security threats of climate change, we can identify the main potential pathways and evaluate the available evidence connecting each threat to security consequences that policymakers might care about given their relatively short-term time horizons. Climate change could conceivably constitute a security threat to a homeland if it threatened (1) the existence of the country, (2) its seat of government, (3) the state's monopoly on the use of force, (4) disrupted or destroyed critical infrastructure, (5) led to catastrophic short-run losses in human life or well-being to call in to question the legitimacy of the government (6) spurred sudden large-scale internal or cross-border refugee movements, or (7) altered a country's territorial borders or waters.[48]

For the United States, four physical forces might bring about some (though certainly not all) of these consequences, including: (1) abrupt climate change, (2) sea-level rise, (3) extreme

weather events, and (4) Arctic ice melt.[49] Of these, extreme weather and Arctic ice melt are two physical phenomena for which scientific evidence suggest a high probability of occurrence in the following one or two decades (though the pace of sea-level rise is accelerating quickly).[50] Focusing on the more probable consequences of climate change creates space for climate change as a security problem using conservative assumptions.[51]

Extreme weather events

The claims: Physical phenomena of extreme weather can be connected to possible security consequences for the United States. These included the effects of swift onset hazards like cyclones and floods on major urban populations, military bases, and critical infrastructure. Such events can lead to domestic humanitarian emergencies and compromise law enforcement and public safety in affected communities subject to looting, vandalism, and other damage to property. Moreover, failure by government to respond effectively can lead to protest and loss of public confidence.

The state of knowledge: Hurricane Katrina, for example, killed more than 1,800 people and dislocated another 270,000, caused eighty billion dollars in damages, and took offline critical energy infrastructure. Moreover, the mobilization of thousands of members of the National Guard diverted resources and attention that otherwise could have been dedicated to important national security priorities such as the on-going conflict in Iraq. Indeed, the government's ham-handed response to that episode was a stain on the George W. Bush presidency and created on-going challenges for the federal government's relationship with the New Orleans populace.

This take on the threats posed by extreme weather events are mirrored in official documents from the US government. Drawing on evidence from the third national assessment of climate change impacts on the United States,[52] the Obama Administration warned of the risks by mid-century of flooding and sea-level rise in coastal areas:

> Critical infrastructure, major military installations, and hurricane evacuation routes are increasingly vulnerable to impacts, such as higher sea levels, storm surges, and flooding exacerbated by climate change. Sea level rise, coupled with storm surge, will continue to

increase the risk of major coastal impacts on transportation infrastructure, including both temporary and permanent flooding of airports, ports and harbors, roads, rail lines, tunnels, and bridges.[53]

The White House referenced the response to Superstorm Sandy that affected the eastern seaboard in 2012, leaving 8.5 million without power and causing tens of billions of dollars in damage. Like Hurricane Katrina, the storm required mobilization of the National Guard, the Coast Guard, and other elements of the defense establishment to lead domestic humanitarian response, including delivery of emergency supplies and efforts to restore infrastructure.[54]

The Obama administration noted that these effects potentially go beyond humanitarian emergencies and storms. The Department of Homeland Security flagged the effects of heat, "In Western States, higher temperatures and more frequent or severe heat waves could buckle railways, damage roads, and strain power systems."[55] Together, the effects of storms, floods, sea-level rise, and irregular rainfall pose problems for energy production, electricity grids, and threaten to "overwhelm the capacities of critical infrastructure, causing widespread disruption of essential services across the country."[56] Particular military installations such as the naval base in Norfolk, Virginia are often identified as at risk from frequent flooding.[57]

Though climate-induced migration is frequently identified as an international problem likely to affect countries overseas, the United States itself might experience some cross-border migration of this nature.[58] The Department of Homeland Security for its part also recognized domestic threats from regional migration, noting that extreme weather events ultimately could spur migration to the United States: "More severe droughts and tropical storms, especially in Mexico, Central America, and the Caribbean, could also increase population movements, both legal and illegal, across the US border."[59]

Slow onset hazards such as droughts arguably too may constitute security concerns of a different nature. In the late 2000s and early 2010s, the Southwest, from Texas to California, has experienced devastating droughts. There are fears among scientists that these drought conditions across parts of the Southwest may endure for extended periods, perhaps for several decades.[60]

While on some level this is a domestic economic problem, an issue of water resources and agriculture, a multi-decadal megadrought could have wider ramifications for power generation, water access, and agriculture. Some cities and states could face existential questions for human habitability, requiring concerted efforts that go well beyond reforming decades old water withdrawal rights for farmers.

Policymakers would have to consider providing emergency water provision in the short-run and expensive investment in desalination in the long-run. While some residents might vote with their feet in a reversal of historic Dust Bowl migration, the US government might have to engage in more proactive efforts to facilitate population movements out of affected areas. With numerous military bases and training facilities dotting Western states, the confluence of persistent droughts, inadequate power generation from hydropower, declining agricultural yields, and insufficient drinking water might elevate aridity in the Southwest to a chronic national emergency.

Some scholars, such as Roger Pielke, Jr., downplay the significance of climate change as a driver of more storms and damages, instead attributing these changes to increasing numbers of people living along coasts and more valuable infrastructure to lose. Indeed, he notes, improved humanitarian response capacity and early warning systems have resulted in declines in mortalities caused by natural hazards.[61] While that perspective itself has been disputed by those who see a clearer signal in the empirical record for climate change's role in increasing the number and intensity of cyclones,[62] the reality is that America's coastal cities, infrastructure, and bases are vulnerable to extreme weather and the Boy Scouts motto "Be Prepared" is apropos regardless. On-going reviews of national vulnerabilities to climate hazards should create additional impetus for billions of dollars to climate-proof infrastructure investments as New York initiated in the wake of hurricane Sandy.

Arctic ice melt

The claims: In terms of Arctic ice melt, the risks are distinct from extreme weather, as the opening of possible sea lanes and territory is leading to jockeying by various countries with claims

to the Arctic, including Canada, Russia, Norway, and Denmark. Climate change is contributing to more ice-free days in the Arctic, making it possible to navigate, at least for more days in the summer, the two Arctic sea routes, the Northern sea route and the Northwest passage. The Northern route could potentially cut by two weeks the travel time from China to Europe in lieu of the longer route through the Suez Canal.[63] With Russia investing in ice fleet capabilities and exercising control over the route, there is concern that Russia could impede or impose costs on the movement of goods as this route becomes increasingly viable in coming decades.

The state of knowledge: While an increasing number of ships have been able in recent years to make it through the Northern route that connects the Atlantic to the Pacific above Siberia, they often require icebreakers to accompany them. Analysts have raised concerns about whether the United States (with one, possibly two icebreakers) and regional ally Canada (with six) possess adequate numbers and quality of icebreakers to defend their claims to the Arctic or respond to accidents, especially compared to Russia's more robust fleet of eighteen to twenty-seven icebreakers and China which has commissioned a second icebreaker.[64] While the Department of Homeland Security in December 2013 suggested that three heavy and three medium icebreakers might be required, the expense of a single heavy icebreaker could be nearly equivalent to the Coast Guard's entire annual budget of $1.1 billion.[65]

With the Arctic a source of valuable hydrocarbons, the risk of disputes over territory and sea lanes harkens back to the kinds of disputes that had resulted in armed conflict in previous centuries. The Arctic has seen a spate of action by states anticipating more regular access as sea ice melts, including plans approved by the Obama administration in May 2015 to allow Shell to drill for oil.[66]

Though institutions like the Arctic Council likely will help facilitate transnational cooperation to minimize the risks of conflict, increasing ease of transit, albeit seasonal, is creating new sources of friction between states.[67] The Obama Administration downplayed the risk of conflict over the Arctic but noted that melting ice will open the region will require more international cooperation:

While the Region is expected to remain a low threat security environment where nations resolve differences peacefully, the Navy will be prepared to prevent conflict and ensure national interests are protected. In the coming decades, the Arctic Ocean will be increasingly accessible and more broadly used by Arctic and non-Arctic nations seeking the Region's abundant resources and trade routes.[68]

The administration concluded that increased traffic will potentially lead to disruptions in marine food systems as well as more accidents:

As ice coverage in the Arctic continues to recede and shorter shipping routes become more accessible and more profitable, increased ship traffic and human activity in the region will require that the United States be more prepared to respond to emergencies in this remote region.[69]

Beyond investments in ice-breaking technology that could help shore up the US ability to defend its interests in the Arctic, another policy that the US should move forward on is ratification of the Law of the Sea Treaty. Russia pushed forward its territorial claims to the Arctic by submitting claims to the UN Commission on the Limits of the Continental Shelf. Other countries like Denmark are poised to do the same. By not being party to the Law of the Sea Treaty, the United States cannot put forward its own claims for jurisdiction of an extended continental shelf.[70] The potential loss of influence over the fate of the Arctic ought to be the final impetus the long-delayed US ratification of the Law of the Sea Treaty. In asserting its own territorial claims, the US also needs to work with other countries on measures to discourage oil exploration in the Arctic, which would only make the climate problem worse. After having earlier authorized drilling in the Arctic, the Obama in October 2015 cancelled planned future lease sales.[71]

Official government statements asserting future security risks do not necessarily make them true. Some of these potential effects such as migration are arguably more speculative than others or depend on longer causal chains and perhaps less predictable human behavior. While the fingerprint of climate change on the magnitude and number of extreme weather events

remains a source of debate, we already have vivid examples in Hurricane Katrina and Superstorm Sandy that underscore the risks of inaction. The potential effects of climate change on US national security extend beyond direct effects on the US homeland but also to the country's interests abroad. Again, it is important to examine the validity of potential threats that analysts have raised, reviewing the claims and the available evidence.

Indirect threats to the United States

Much emphasis in the climate security literature has been placed on the potential effects on US security interests overseas as a consequence of climate effects abroad. Climate change poses at least four sets of potential problems for US interests including: (1) US overseas assets including embassies and military bases, (2) violent conflict, (3) state failure, and (4) humanitarian disasters.[72] Migration, whether or not it leads to conflict, is often evoked as an independent climate security concern. Others include changes in the operating environment for the military and disruptions to strategically important raw materials and global supply chains. Of these, the connections between climate change and conflict have received the most attention, particularly by scholars.

Overseas Assets and Operations

The claims: In terms of US assets vulnerable to climate change, low lying military installations such as Diego Garcia and Guam are exposed to extreme weather events.[73] This mirrors the emphasis in discussions of homeland security on vulnerable physical infrastructure and bases.

The state of knowledge: The 2014 Department of Defense Adaptation Roadmap discussed an on-going assessment of 7,000 military installations and flagged the need to assess what significance "the changes in storm patterns and sea levels will impact the Department's Pacific Island installations, including their water supplies."[74] In addition, embassies located in countries vulnerable to climate change such as Bangladesh might face high physical exposure themselves, or, at the very least, be called upon to coordinate or assist humanitarian responses.[75]

The Obama administration has identified additional challenges, that of the effects on military operations, training and testing equipment, and provisioning and supporting military missions, coming from increasing temperatures, changes in precipitation patterns, increases in the frequency or intensity of extreme weather, and rising sea levels and storm surge. The Adaptation Roadmap argued: "sea level rise may impact the execution of amphibious landings; changing temperatures and lengthened seasons could impact operation timing windows; and increased frequency of extreme weather could impact overflight possibility as well as intelligence, surveillance and reconnaissance capability."[76] In terms of supply chains, the Obama administration highlighted the risk of "Reduced or changed availability and access to food and water sources to support personnel."[77] Pending the outcome of the various infrastructure vulnerability assessments, the likely outcome is the need for investments that would enhance the resilience of facilities to climate damages, through relocation, refurbishment, enhanced building codes, physical barriers, and improved emergency response measures.

Conflict and State Failure
The claims: The contribution of climate change to the increased likelihood of conflict has been the central analytical focus of much academic and think tank work in the climate security space and to a lesser extent government studies. This research has focused largely on internal conflict, namely civil wars; communal conflict; and protests, strikes, and riots. While there has been some limited discussion of disputes over shared aquifers and up-stream-downstream tensions as a consequence of dam construction along the Nile, the Mekong and other rivers, most work in this space is rather dismissive of the prospects for inter-state conflict. This is likely a function of the decline in inter-state wars[78] as well as the history of inter-state cooperation over river basins and aquifers, even in highly adversarial political situations such as between Israel and Palestine.[79]

While inter-state war is frequently discounted, tensions and conflict emanating from the cross-border movement of people is often evoked as a specific risk, but these risks are seen less as transnational or international conflicts and more as internal ones between migrants and their new host states and populations. Migration, particularly from low-lying island countries in the Pacific

as well as Bangladesh, is often identified as a likely consequence of climate change independent of whether or not it escalates to conflict. There is extensive debate about the likely magnitude of climate-induced migration and its consequences, as in many cases the climate signal driving migration is but one of many factors.[80]

The state of knowledge: As I noted earlier, based on the challenges of teasing out the specific contribution of environmental factors to conflict, the think tank community initially used the language of "threat multiplier," "stressor," "exacerbate," and "conflict accelerant" to describe the risks posed by climate change to the increased likelihood of conflict. That language and approach to the problem has permeated policy documents. For example, in the public Congressional testimony that accompanied the classified 2008 National Intelligence Assessment, the National Intelligence Council's Tom Fingar argued:

> We assess that climate change alone is unlikely to trigger state failure in any state out to 2030, but the impacts will worsen existing problems—such as poverty, social tensions, environmental degradation, ineffectual leadership, and weak political institutions. Climate change could threaten domestic stability in some states, potentially contributing to intra- or, less likely, interstate conflict, particularly over access to increasingly scarce water resources.[81]

In its 2012 successor report on water, the NIC and the Office of the Director of National Intelligence emphasized the near-term risks from too much and too little water and how this would translate into problems of food and energy production for particular places of interest to the United States in North Africa, the Middle East, and South Asia:

> During the next 10 years, many countries important to the United States will experience water problems—shortages, poor water quality, or floods—that will risk instability and state failure, increase regional tensions, and distract them from working with the United States on important US policy objectives.[82]

> The Navy's 2009 climate roadmap made a similar case: "Economically unstable regions will be more vulnerable to the effects of climate change, and climate change will be one of several

factors that may increase instability."[83] Policy documents like the 2010 QDR evade the challenge of establishing causality by saying that climate change on its own is not likely to cause conflict, but in concert with other factors will increase, magnify, or accelerate the risk.[84]

In its 2011 report, the Defense Science Board also exercised caution in its statements attributing causality to climate effects, focusing on the "indirect effects" on conflict in countries with low state capacity, where climate stresses likely to be an "an exacerbating factor for failure to meet basic human ends and for social conflict, rather than the root cause."[85] The 2014 QDR adopted the language of "threat multiplier" and sought to identify the potential pathways between physical effects of climate hazards and conflict emergence from the effects on water and food to local scarcities and competition for resources.[86]

While the policy community is largely content with this formulation of the problem, the academic community has plowed ahead to assess whether the likely future consequences of climate change (extreme temperatures, rainfall volatility, droughts, extreme weather events, etc.) historically have been correlated with the increased likelihood of different forms of conflict. That peer-reviewed literature has somewhat ambiguous and conflicting findings. In their review of the scholarly literature on the connections between climate and conflict, a 2013 National Academy of Sciences study stressed the nuanced nature of the connections, emphasizing that climate change together with other "socioeconomic and political conditions" can lead to social and political stresses and concomitant security risks.[87] The 2014 IPCC Fifth Assessment echoed this conclusion, focusing on "a need for theories and data that explain the processes that lead from changes in climate to violence, including on the institutions that help avoid violent outcomes."[88]

Most of the new work on climate and conflict is quantitative statistical research that seeks to test the direct relationship between a climate variable of interest (such as rainfall scarcity) and conflict onset (such as civil wars). Many take Africa as their specific region of focus. Initially, studies focused on national level analyses and found promising results that suggested rainfall volatility in particular might be an important trigger for conflict.[89] Improvements in data made disaggregated sub-national analysis increasingly possible. Studies found different effects for

different kinds of climate-related phenomena. Some studies found no association between drought and civil wars in Africa.[90] Others found evidence that undermined the nascent theory that scarcity was driving conflict. Rather, it appeared that abundance might be a more potent mechanism triggering certain forms of conflict as groups had more reason to clash in time of plenty. Indeed, better rains might give groups, particularly raiding parties engaged in communal conflict, more forage cover to conceal attacks.[91]

Despite these findings, some scholars made broad claims of a causal connection between climate impacts and violence. For example, a 2009 Miguel paper found a strong correlation between temperature and civil war onset and concluded that for every 1 degree increase in Celsius, there was a 4.5% increase in the incidence of violent conflict. Using climate projections, Miguel estimated that Africa would experience a fifty-four percent increase in civil conflict by 2030 and nearly 400,000 additional battle deaths based on average conflict deaths.[92] Those claims were rejected by Halvard Buhaug who suggested the results did not hold up when one included additional data or used alternative model specifications.[93]

A follow-on meta-analysis by Solomon Hsiang and co-authors bundled a variety of climate effects (temperature increases, positive deviations in rainfall, negative deviations in rainfall) and sought to examine the average effect on violence across sixty different studies. They examined both "personal violence" (which included studies of baseball pitchers beaning more batters on hot days) as well as "inter-group" violence (which included studies of state collapse, civil wars, and other measures). Their provocative claim in *Science* was that: "For each one standard deviation change in climate toward warmer temperatures or more extreme rainfall, median estimates indicate that the frequency of interpersonal violence rises four percent and the frequency of intergroup conflict rises fourteen percent."[94]

This particular study came under criticism again from Halvard Buhaug and others on methodological grounds that resulted in a series of point counterpoint arguments about model specification and other arcana.[95] The Hsiang et al. piece included studies of ancient Egypt and fifteenth century China, whose relevance to the contemporary period is questionable. In

addition, in the meta-analysis, the authors combined a number of different climate phenomenon together to try to establish some average effects across studies at a time when the field was increasingly moving to try to establish differentiated causal pathways between specific climate phenomena (such as too much rain) and specific categories of conflict outcomes (such as increases in communal violence). On some level, this meta-analysis resembles early debates of the "democratic peace," the empirical finding that democracies almost never go to war with each other, which was likened to a finding in need of a theory.

The emergent findings in the climate security literature, to the extent they are robust, still lack clear causal arguments that link climate hazards and security outcomes.[96] As I mentioned earlier, most of the academic studies have tested direct relationships between a physical hazard and conflict, rather than indirect pathways through plausible mechanisms such as economic growth or food prices.[97] As the IPCC chapter on human security noted, climate hazards are correlated with effects that are known correlates of conflict: "Though there is little agreement about causality, there is robust evidence that shows that low per capita incomes, economic contraction, and inconsistent state institutions are associated with the incidence of civil wars. These factors are sensitive to climate change."[98]

Some policymakers are ready to accept that climate change will be a conflict accelerant in the absence of scientific guidance on the specific connections. However, without clarity of the conditions under which climate hazards might lead to conflict, it is impossible to identify nodes of leverage by which one might intervene to make conflict less likely.

A number of questions still beg answers: Under what climatic or weather conditions do people fight? When it is hot? If so, why? Do they become more aggressive in the heat? How hot is too hot? Do people fight when it is wet? Does wetness increase forage and pasture, leading to more abundant valuable resources that triggers competition? Does rainfall scarcity lead to conflict by lowering the opportunity costs of fighting? Does rainfall scarcity affect conflict patterns through agricultural production or economic growth? Do extreme weather events trigger conflict resolution or escalation? Are certain kinds of states more subject to these kinds of problems than

others? Without better understanding of the configurations of factors that together yield violence, policymakers could invest in efforts to reduce imaginary or misplaced vulnerabilities for the wrong threats and places.

This challenge is made all the more difficult by the fact that the historic data testing correlations between climate phenomena and conflict may be a poor guide to future patterns. The geographic distribution and intensity of weather events (of rainfall, temperature) may not resemble past patterns, making causal inference from history a problematic basis for planning for the future.[99] In terms of policy, this is an area where greater research on the causal pathways linking climate hazards to conflict outcomes could help identify the various factors that conjoin to make conflict onset more likely. With more robust understanding, it may be possible to identify indicators of early warning as well as investments that might mitigate conflict potential. Absent this improved comprehension of the conditions under which climate hazards trigger different forms of conflict, policymakers may be hard-pressed to identify appropriate interventions.

Humanitarian Emergencies and Natural Disasters

The claims: With the causal connection between climate outcomes and conflict difficult to disentangle, perhaps more proximate security threats of climate change for US national security are the effects of climate change yielding more humanitarian emergencies from natural disasters, leading to more demands for US military mobilization for humanitarian assistance.[100]

The state of knowledge: While scientists continue to dispute whether or not climate change will yield more numerous or intense cyclones and other extreme weather events,[101] the world has ample evidence of climate-related hazards causing massive dislocations requiring emergency response from the international community, from Typhoon Haiyan in the Philippines in 2013, to the famine that afflicted Somalia in 2011, to the floods that displaced millions in Pakistan in 2010 to Cyclone Nargis that killed thousands in Myanmar in 2005.

In these cases, the United States government was frequently called upon (or offered) to provide lift support, relief, and logistics. For example, after Haiyan, 9500 military personnel

helped respond to the crisis, with delivery of 750,000 pounds of relief supplies and airlift of almost 6,000 survivors from the affected city of Tacloban.[102] In response to the 2010 floods that affected some twenty million people in Pakistan, the United States delivered approximately $390 million in aid and 20 million pounds of relief supplies.[103] After both the Somalia and Myanmar disasters, the international community had difficulty delivering aid supplies. In the case of the 2011 Somalia famine, the Islamist al-Shabaab militia impeded relief supplies, resulting in the excess deaths of some 250,000 people.[104] Similarly, in Myanmar, offers by the US to provide relief, including landing 4,000 Marines to deliver aid,[105] were partially rebuffed, with an estimated 140,000 deaths.[106]

More broadly, between FY 2000 and FY 2009, the US government spent some $25.3 billion on disaster response globally (in 2009 inflation-adjusted dollars). That includes funding for complex emergencies, particularly for the conflict in Darfur (which some attribute to resource conflicts between herders and grazers as a result of drought conditions), though aid for explicitly climate-related disasters was about one out of ten of the overall total.[107]

Although the contribution of anthropogenic climate change to those particular events is debatable, they remind us of the terrible power of nature. Some of the places affected are locations of strategic interest to the United States. And, while the literature on whether disasters contribute to conflict remains contested,[108] the US government and the military in particular is increasingly called upon to play a supporting role in major humanitarian emergencies.

While academics have been slow to recognize this dynamic, the US government has integrated this concern centrally in to its planning documents with the 2010 QDR and the 2014 Pentagon Adaptation both recognizing that extreme weather events at home and abroad will lead to increased demands for humanitarian assistance.[109] For its part, the 2013 National Academy of Sciences report concluded that these complex emergencies are likely to become more frequent and "produce consequences that exceed the capacity of the affected societies or global systems to manage and that have global security implications serious enough to compel international response."[110]As the 2008 NIC report noted, the implications of increased demands of disaster

response could be potential strains on US capacity, readiness and strategic depth for combat operations.[111]

Beyond these concerns, leaders have periodically invoked the wider strategic implications of disaster relief for public diplomacy. After the 2004 Asian tsunami, the 2006 earthquake in Pakistan, and after the 2010 Pakistani floods, the US saw opportunities for improving its image in the region. However, a 2012 Pew study found that Indonesian attitudes towards the US improved slightly after the 2004 tsunami but deteriorated thereafter and only returned to pre-Iraq War levels when Barack Obama was elected president. Pakistani public opinion deteriorated further despite America's flood relief.[112]

The United States could reject or scale back such global responsibilities if it were to find its military too stretched in a world of many severe humanitarian emergences. The experience in South Asia suggests that there is no automatic or durable public favorability boost from relief efforts, but it is not clear if failure to respond to a humanitarian emergency would have *no* effect on the country's international reputation. States may not get a lot of credit or permanent boosts in international goodwill from a single act of altruism or enlightened self-interest, but they potentially face international opprobrium for failure to act (or act with sufficient vigor, as China experienced in response to its lackluster support for efforts to suppress the Ebola virus in West Africa).[113] The United States, as the architect of the liberal international order, would potentially face greater international condemnation than other countries if it decided that it had to scale back its disaster response. As a matter of policy, the US should minimally identify the places most likely to be severely affected by such climate-related humanitarian disasters through vulnerability assessments. Beyond this, the US should use such assessments to pre-position humanitarian supplies for likely hot spots of vulnerability and support civilian efforts by local actors to shore up resilience.

Geostrategic implications

The previous observation raises a third dimension where actions or inactions on climate change could have wider strategic significance for the United States. I address the reputational

consequences of climate diplomacy before turning to the potential strategic considerations of policies that countries might pursue to either mitigate climate change or adapt to its consequences such as geoengineering, territorial claims, land concessions in other countries, border tax adjustments, divestment campaigns and bans on international finance for carbon-intensive energy sources, and possibly even more coercive measures to keep fossil fuels in the ground.

Climate diplomacy and reputation

The claims: The elevation of climate change to the sphere of higher if not high politics potentially affects US standing in the world and pursuit of its national interests. While the Bush administration was able to endure nearly a decade of international opprobrium for its hostility to action on climate change, failure in the future could engender negative reputational consequences for the United States.

The state of knowledge: What significance does negative international standing have on the US power position in the world, if at all? States that are powerful, determined, and view acquiescence to international opinion as costly can endure international disdain and even sanctions (witness Vladimir Putin in Russia). Normative pressure and shame on their own are weak signals. Even when accompanied by material punishment, the costs may ultimately be modest since punishment is costly.[114] However, states with bad reputations face higher transactions costs of achieving cooperative outcomes on issues they care about.[115]

George W. Bush was able to pursue the Iraq War despite the hostility of traditional European allies. A future US administration that takes a hard line on climate policy, as the Bush administration did, may raise the costs of securing cooperative agreements with others on defense, trade, etc. It is an interesting counterfactual to ask if the Bush administration been less obstructionist on climate and other multilateral initiatives, might it have had an easier time leveraging the support of its European allies for the war effort in Iraq or at least the rebuilding phase?

We will never know, but as concerns about climate change increase and expectations of progress rise, international processes like the climate negotiations in Copenhagen in 2009 and in Paris in 2015 create opportunities for politicians to either burnish or damage their international standing with repercussions for their room for maneuver at home.

Thus, when it appeared that the Copenhagen climate negotiations would fail to reach an agreement or an agreement that met advocates' expectations, the Obama administration sought to deflect blame for the outcome on China. The US delegation suggested that the United States was prepared to leverage $100 billion in public and private money to assist developing countries, but China was blocking a final agreement, thus pitting the rest of the developing world against China.[116] As China's carbon dioxide emissions now dwarf those of the United States, that strategy of blame defection may increasingly work (some twenty-eight percent of the global total for China in 2013 compared to fourteen percent for the US), but will not solve the problem.

At the same time, it is not as if the United State can avoid blame. It is still the second largest emitter, and the country's cumulative emissions between 1870-2013 lead the world at twenty-six percent. Countries will still be prepared to label the United States a climate scofflaw, more so because its per capita emissions exceed much of the rest of the world by orders of magnitude. Moreover, the US contribution to current emissions rises still further if one includes the carbon content of imported products from countries such as China.[117]

From a strategic perspective, countries, the United States included, will not do things that are very costly for them even if highly desirable by other states, unless other states possess tremendous coercive power. That said, countries facing high climate exposure will increasingly look for venues to remind the world of their plight, as the Philippines did after Typhoon Haiyan at the 2013 climate negotiations. Even if the science of event attribution is not settled, vulnerable countries will blame climate change for disasters and in turn implicate countries responsible for the problem.

The United States and China are going to be the primary recipients of that finger-pointing. Climate change presents a curious problem for the two countries, especially given the

power transition process that is currently underway with the United States experiencing relative decline and China a rapid ascent. We know from history that such moments are especially dangerous times when fading hegemons face revisionist challengers seeking to re-make the world in their image. Yet, that logic of relative gains and preoccupation with narrow national self-interest runs against the wider liberal logic of mutual gains from trade.[118]

Moreover, climate protection is a global public good; neither the US nor China, despite being the largest emitters, can resolve the problem on their own. From the standpoint of self-protection against global climate change, states have strong incentives to band with coalitions of the relevant (i.e. the major emitters) to stave off suboptimal outcomes for everyone. Despite its relative decline, the United States is, as Bruce Jones notes, "the largest minority shareholder" in the international order, and, as such, still possesses sufficient capability to lead by example and shepherd consolidation of a the liberal international order in which China is embedded.[119]

As a consequence, even as there is inevitable friction over China's ambitions in the South China Sea, the US and China possess shared goals and vulnerabilities because of economic interdependence and exposure to climate hazards. In this context, the countries need to rise above their sources of discord and enter into a mature relationship of quasi-rivalry on some dimensions of policy and cooperation on others. Even in the climate space, the United States may have to engage in technical cooperation on emissions monitoring, but at the same time prepare for differential ambition on climate change by exploring coercive instruments such as border tax adjustments to induce greater Chinese engagement.[120]

There are positive signs that the US and China are heeding this advice. In November 2014, China and the United States reached a potentially historic agreement on greenhouse gas emissions. China for the first time pledged to peak its greenhouse gas emissions by around 2030 and to increase the share of non-fossil energy (nuclear and renewables) to twenty percent by that same year. The US, for its part, extended its target to reduce greenhouse gas emissions by twenty-six to twenty-eight percent below 2005 levels. This agreement put pressure on other fast developing countries such as India to play a constructive role going in to the 2015 Paris climate

talks where a new kind of climate agreement based on country pledges of action was set to be negotiated.[121]

That dynamic of somewhat competitive and virtuous promise-making over climate change with China, what Levy called tote-board diplomacy, may be a useful one if ultimately followed up by action.[122] This approach might need to extend beyond the mitigation (emissions reduction) agenda to support for adaptation (preparing for climate change), particularly in East Asia. For example, outside of Guam, small island countries in the Pacific may not be all that consequential for US national security or the world. That said, the United States will have stronger incentives to react to claims from larger, more populated countries in the region like Indonesia and the Philippines. Those countries have historical and ongoing value to the United States, in terms of concerns about Islamist radicalization, bases, and Chinese territorial claims in the South China Sea. Densely populated countries in South and Southeast Asia may be valuable partners on other issues of importance to the United States, and if they come to believe that their future security depends on climate adaptation and mitigation efforts, then the United States may have compelling reasons to do more.

Beyond its own actions to mitigate its own greenhouse gas emissions, the United States should also put a high priority on overcoming its own domestic impasse over providing climate finance. In 2014, the Obama administration committed three billion dollars to the Green Climate Fund over four years, but found its contributions snared in partisan politicization over the budget.[123] Moreover, at the 2009 Copenhagen meeting, the Obama administration created political space for a new bottoms up process of country commitments on climate change based on the promise to leverage by 2020 $100 billion annually in public and private money to address climate change in the developing world. Failure to make good on that commitment would undermine the credibility of the US response but also limit the international community's ability to invest in climate and conflict management.

Unilateral climate mitigation and adaptation

The claims: From the perspective of system and order maintenance, the United States also risks damaging the legitimacy of international, rule-based processes if the climate arena, like other domains, increasingly is seen as irrelevant and ineffectual. If that outcome of "ossified" zombie politics returns to the climate arena,[124] individual countries or groups of countries may take matters in to their hands, by seeking to shore up their own position through resource and territorial claims, acquisition of access rights to land in other countries, and through dam-building to the detriment of downstream users.

The state of knowledge: Though somewhat far-fetched, people are beginning to worry about the legal regime to regulate how countries engage in geo-engineering, efforts to alter the atmosphere to insulate countries from the effects of climate change. If left as an ungoverned free-for-all, such schemes might be highly risky and lead to unanticipated and catastrophic global consequences, including counter-measures by states trying to stop others' geoengineering projects.[125] Other policy responses to climate change, such as foreign land acquisitions to shore up domestic food security, may become contested as "land grabs."[126] In this context, the United States has an interest in steering these unilateral or small group impulses in a constructive direction as it has on hydrofluorocarbons (HFCs), potent contributors to the greenhouse effect, through the Climate and Clean Air Coalition.[127] While some of these various unilateral initiatives remain on the horizon, the United States has an interest in establishing multilateral codes of conduct and dialogue to ensure that states do not seek to shore up their own protection with disastrous consequences for others.

CONCLUSION: US POLICIES, RISK ASSESSMENT, AND SUSTAINABLE SECURITY

The starting premise of this volume when we began our collective deliberations was based on a sense of US overextension and diminished national capacity. Since then, the country's economic recovery from the 2008 financial crisis and new-found domestic energy supplies may have eased some of the exigency and urgency of a retrenchment agenda. At the same time, the

rise and specter of ISIS in Syria and Iraq have frightened the American public, providing them with renewed appetite to engage internationally. Moreover, as the introduction to this volume noted, even if one acknowledges the need for selective engagement, that is distinct from counseling isolation and withdrawal from the international scene. What that means, however, is that climate change, arguably a more long-run threat than many contemporary emergencies, has to compete for attention with other pressing concerns. In this crowded landscape with increased competition for resources, the justification for acting now to combat climate change is to minimize later costs that would be considerably more expensive, highly undesirable, and/or irreversible.[128]

The previous sections included a range of policies that the United States should pursue to address specific threats to the homeland, its overseas interests, and wider geostrategic position. Beyond this, there is a wider philosophy of governance, namely risk management, which ought to infuse US approaches to climate, much as it already does for defense establishment and the corporate sector.

Those concerned about climate change increasingly have justified action by evoking the language of managing risk. While many climate impacts are known and highly likely, some of the most severe potential impacts of climate change such as melting permafrost, changes to the Gulf Stream, or more catastrophic sea-level rise are likened to the threat of nuclear war during the Cold War, presenting so-called "tail risks" of low probability but very high impact.[129] A challenge is that some of these most extreme consequences are highly uncertain, but may become more likely at higher temperatures and concentrations of greenhouse gases. Some kinds of climate events have an irregularly high likelihood of catastrophic consequences, what are referred to as "fat tails" of the probability distribution. Others reference similar kinds of high impact but hard to predict "black swan" events.[130] Under such circumstances, a risk management perspective would invest in contingency plans to ensure that the worst consequences do not come to pass.[131]

Preparing for contingencies and investing in risk management are familiar practices for national security officials. During the Cold War, the US invested vast amounts of money and

intellectual energy to ensure that the (generally) low probability but high consequence risk of a nuclear exchange with the Soviet Union did not come to pass. Similarly, in the contemporary era, the US military has to prepare for possible contingencies of war-fighting in multiple theaters and the remote possibility of military conflict with a rising China over flashpoints such as the South China Sea. In addition to regional deployment of troops through the Pacific Fleet, the US military also engages in regular military exercises with allies.[132]

One of the challenges of this "fat tail" problem is that it becomes difficult to anticipate how much preparation is enough. Traditional cost-benefit analysis based on expected outcomes may lead us to be insufficiently prepared for the Hurricane Sandy and Katrina type events. On the other hand, we cannot spend an infinite amount of money to prepare for possible climate catastrophe. The strategic dilemma is ultimately calibrating the appropriate level of insurance given other competing priorities.

With such considerations, how should we conceive of "sustainable security" amidst a world that manifestly appears to be on an unsustainable path with respect to nature? In this book, sustainability refers to the material resources that sustain US national security and the reservoir of public support to use those resources for their intended purposes. However, in environmental circles, the word "sustainability" has a historically contingent meaning referencing the work of the 1987 World Commission on Environment and Development. The commission's report *Our Common Future* introduced the concept of "sustainable development" in to the lexicon, defining it as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[133] Since its introduction, sustainable development has become an elastic concept with little operational value, simultaneously used by people to support environmental protection and by those who favor human development at the expense of the environment.

There is an effort to reclaim the environmental roots of "sustainability." Indeed, *In Pursuit of Prosperity*, a 2014 book from the environmental advocacy group WWF, sought to put environmental sustainability at the heart of US foreign policy. That project is an explicit framing

attempt to convince national security elites to care about conservation and the environment.[134] While that project may be successful, connecting environmental issues to security consequences potentially has unintended effects. On climate change, the security discussion has, alongside an expanded set of actors interested in the issue, brought attention and resources to an array of other concerns, from climate and conflict to defending US sovereignty over the Arctic. For advocates of using climate and security as a means to boost support for climate mitigation, that may not be what they had in mind.

While sustainable development has little analytical leverage, it would be ironic if a book on sustainable security was devoid of that environmental connotation. What then does sustainable security look like with an environmental sensibility? Sustainable security must mean calibrating ends and means in the current period with the need to sustain the planet's core life-sustaining ecological functions in the future. This dynamic view of security has to anticipate future risks to humanity and the natural world arising from demographic change and increasing consumptive possibilities, particularly in Asia where demand for resources has led to unprecedented air and water pollution and pressures on global stocks of fish, wildlife, timber, and other resources. Without dramatic decoupling of economic growth from carbon-based fuels, adoption of modern pollution control, improvement in the productivity of agriculture and aquaculture, and change in the consumptive patterns of individuals, the 21st century may yield a dystopian polluted and degraded future.

For the United States, the challenge narrowly is how much insurance is necessary to protect the country from catastrophic damages from global public bads like climate change. Economists will counsel some cost-benefit calculus such that the discounted future benefits of avoided climate damage exactly equal the costs of action. However, this quickly devolves into a somewhat unproductive discussion about the appropriate discount rate by which we value future benefits.[135] It also requires burden-sharing with other major emitters and confidence that our actions are being matched by others.

In this context, political leaders have established a somewhat artificial goal of preventing global greenhouse gas emissions from reaching concentrations that would cause global average temperatures to rise two degrees Celsius above pre-industrial levels. This goal was somewhat informed by scientists who described it as a threshold above which the world might experience dangerous climate change. The reality is that so little has been done that this goal is unlikely to be achieved, and it is unclear if it in fact represents a singularly critical threshold.[136]

In general, on the mitigation front, there is consensus that the world needs to move dramatically towards decarbonization of the energy supply by the mid 21st century. What that means for policy is ultimately a price on carbon and other incentives to keep hydrocarbons in the ground and technological innovation to either sequester carbon dioxide underground or to have some biological or chemical process for taking it out of the air. Putting a price on carbon through a tax or establishing some sort of quantity limit on emissions (and allowing for actors to trade emissions permits depending on their costs of mitigation) are thought of as cost-efficient strategies, relative to other efforts that have been tried. A comprehensive survey of the various actions major emitting economies are pursuing on this front is beyond the scope of this chapter, but the hardest part of the mitigation challenge has simply been getting started and being able to send clear, consistent signals to the private sector that greenhouse gases are pollution and need to eliminated.

In terms of adaptation and preparation for the security consequences of climate change, which is really the heart of this chapter, we do not know how likely certain outcomes will be, either in terms of direct impacts on the homeland or US overseas interests (some are known better than others). In terms of domestic infrastructure, we will ultimately have to make some rules about what flood, storm, and other extreme weather risks the country's infrastructure specifications should be built around. New York, after Hurricane Sandy, adopted new building codes to ensure resilience of new construction, such as wind-resistant windows and elevation of base level construction to account for flood risks.[137] New York is better positioned to adopt such

changes given its relative wealth, but poor countries in the developing world facing high exposure to climate risks lack the capacity to afford or implement such measures.

While the US and other rich countries pledged to mobilize up to $100 billion in public and private finance annually for climate mitigation and adaptation by 2020, it is difficult to see those amounts fully materializing. Indeed, the US three billion dollar pledge to the Green Climate Fund housed in Korea is in doubt, given President Obama's difficulty in securing appropriations in the US Congress.[138] Beyond these challenges, the international community under-invests in disaster risk reduction (DRR) because the political rewards for emergency response, despite being more expensive, are greater than preventive activities. Voters do not necessarily reward decision-makers for averted disasters.

There is a robust international framework in place to encourage more front-end investments in DRR, which began with the ten-year Hyogo Framework for Action in 2005.[139] In March 2015, a new commitment was developed in Sendai, Japan.[140] The challenge going forward is both analytical and financial. To start with, the United States can and is supporting analytical work to identify the places where large numbers of people could die from exposure to climate hazards. Second, the US should use leverage resources from the World Bank and other multilateral bodies to help communities plan for those situations. Finally, the US should work with other donors and financial institutions, including the Asian Infrastructure Bank, to find additional support to fund early warning systems, infrastructure investments and capacity building so communities and countries can protect themselves in times of need.

The United States, as the most influential state in the international system, can at least rally the resources to begin the process of better understanding the vulnerabilities and helping countries jump-start the planning process.[141] In June 2015, the Obama administration announced a new thirty-four million dollar initiative with partner organizations that included in-kind contributions from the Red Cross, Google, and ESRI to support climate contingency measures in three vulnerable developing countries, Bangladesh, Colombia, and Ethiopia.[142] Such investments in the millions can minimize if not eliminate the number of multi-million and/or

billion dollar emergency disaster responses later, conserving US strategic assets and financial resources for other purposes. All of this is happening at a potentially dangerous moment in the international system as the relative economic advantage of the United States declines as China rises. As the United States becomes more selective in its choice of areas of strategic investment, climate change has to be one of those areas.

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[1] Savannah Kumar assisted in the research for this chapter.

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